RENEWING THE EIA PLANNING PROCESS

by

David P. Lawrence

A thesis

presented to the University of Waterloo

in fulfilment of the

thesis requirement for the degree of

Doctor of Philosophy

in

Planning

Waterloo, Ontario, Canada, 1997

0-612-21363-3

The University of Waterloo requires the signatures of all persons using or photocopying this thesis. Please sign below, and give address and date.

ABSTRACT

The EIA planning process has and continues to assume a central role in EIA theory and practice. It encompasses activities prior and subsequent to a proposal decision and operates at both a regulatory and an applied level. It provides the framework for stakeholder interactions, methods application and the determination of conclusions. The EIA planning process is conceptually ill defined, is often poorly applied in practice and has been insufficiently responsive to changing needs and conditions. A pool of knowledge, insights and perspectives, comprised of EIA literature, literature from related fields (most notably planning) and Canadian EIA legislation, guidelines and example EIAs, provide the basis for a means for renewing of the EIA planning process. The resulting EIA planning process is founded upon a redefinition of EIA and a reordering of EIA objectives. The reordered EIA objectives stress the role of EIA in furthering a sustainable environment and in contributing to other environmental and societal objectives. The conventional EIA planning process provides the touchstone for reforming, redesigning and refining the EIA planning process. The conventional process is comprised of a sequence of discrete steps, can be applied in any setting and resembles the rational planning model. Although numerous steps and interactions have been added, the essential features of the conventional process remain unaltered.

A reformed EIA planning process is based upon ideal planning process characteristics, blends in variations of and alternatives to the rational planning model, appreciates the lessons of postmodernism and integrates sustainability perspectives and imperatives. A redesigned EIA planning process sees EIA components as continuous activities, rather than as discrete steps, that collectively and progressively probe a decision space. It addresses the regulatory level and it envisions a plurality of processes for a plurality of contexts. This contingent approach is also transcended with core attributes, sustainability principles and frameworks that integrate the EIA planning process with other forms of environmental management. A refined EIA planning process enhances the application of selective EIA activities, notably screening, scoping, significance interpretations, cumulative effects assessment, uncertainty and risk analysis, evaluation, monitoring, auditing and conflict resolution. The resulting process is far from complete and will encounter numerous obstacles to implementation. Nevertheless, it provides a foundation for needed change.

ACKNOWLEDGEMENTS

I would like to thank, first and foremost, my advisor Dr. L. G. Martin, for his continuing support throughout my doctoral studies. He also provided key suggestions that led to a more succinct and focused second draft, contributed to refinements to the second draft and ensured that the readmittance and thesis review procedures stayed "on track". In addition, I am grateful to the other committee members, Dr. G. Francis, Dr. R. Suffling, Dr. G. Michelenco and Dr. R. Gibson, all of whom provided valuable insights and suggestions and to Ms. Edie Cardwell who was of great assistance in addressing administrative procedures and requirements.

I would especially like to thank my wife Barbara, without whose support, patience and encouragement I would never have been able to complete my doctoral studies.

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

LIST OF TABLES

LIST OF TABLES (Cont'd)

LIST OF ILLUSTRATIONS

INTRODUCTION

This chapter identifies the thesis purpose, highlights the research topic background, describes the background of the writer that led to the research topic, explains the thesis scope and research objectives, presents the research methodology and identifies the research limitations.

Purpose of Thesis

This thesis contributes to the renewal of the EIA planning process by 1) integrating ideal planning process characteristics, planning theory insights and the concept of sustainability and, 2) redesigning and refining the overall planning process, together with key activities within the planning process, at the regulatory and at the applied levels.

Background to the Research Topic

Evolution of Field

Environmental impact assessment (EIA) is a prominent, action-forcing instrument for incorporating natural and social environmental concerns into public and private decision-making. The emergence of EIA, as a distinct inter-disciplinary and inter-professional field of analysis and application, is a significant phenomenon within the environmental movement. Although the need to anticipate, avoid and reduce the adverse consequences associated with human activities has long been recognized, the primary impetus for the rapid development of the field was the passage of the National Environmental Policy Act in United States in 1969. Over the past 25 years EIA requirements have been extended to scores of countries, levels of government and to private sector proponents (Ortolano and Shepherd 1995). The early emphasis on the natural environmental consequences of capital projects has been broadened to encompass the natural, social and economic effects of projects, policies, programs, plans, technologies and activities. Significant advances have also been made in methods and procedures (Sadler 1995).

After more than 20 years EIA should be a well established field of theory and practice. Adherents to this inter-disciplinary and inter-professional field should have a thorough understanding of both the conceptual foundation of EIA and of the nuances of professional practice. It might be expected that the emphasis now should be on how best to extend and refine the field. However, EIA became an institution before the conceptual and applied formulation of the field was defined and established. Consequently the concepts, assumptions and methods that underpin the field were rapidly determined and largely served to provide a framework for regulatory compliance. The hasty construction of a theoretical basis for EIA made it necessary to draw heavily, and often uncritically, upon related fields of theory and practice.

EIA Practice

EIA practice is widely acknowledged as not realizing its full potential in contributing to informed decision-making (Sadler 1995). In a recent survey of impact assessment practitioners (324 responses), half members of the International Association of Impact Assessment (IAIA), respondents identified EIA as less than highly successful in influencing decision-making (e.g., 48% and 31% moderately successful and 24% and 40% marginally successful for environmental and social factors respectively). Perceived EIA results also were unimpressive. Only 28% of respondents indicated that EIA always or often minimized development effects to as low as reasonably practical and only 17% and 15% respectively concluded that EIA always or often avoids irreversible changes or ensures that development is placed on a sustainable basis (Sadler 1995). EIA shortcomings often are attributed to the inappropriate choice of methods or to the poor execution of proven methods. The limitations of EIA, as a field of theory and practice, are, however, more complex, more deeply embedded and more intransigent than simply flawed methods or methods applications. The framework, within which methods are applied (i.e., the EIA planning process), must also be re-evaluated, together with many other EIA attributes such as EIA objectives, EIA effectiveness, the institutional arrangements for EIA and the role of EIA relative to other forms of environmental management.

Trends in EIA Practice

EIA is a rapidly evolving field. Prominent trends in recent years have included a greater emphasis on indirect, trans-boundary and cumulative impacts, increased attention to conflict resolution, a more strategic planning process, greater prominence for risk and health-related concerns, a shift in orientation from pre-approval evaluation to post-approval monitoring and auditing and the linking of EIA to related environmental management fields and, most especially, to the concept of sustainable development (Morris and Therivel 1995; Sadler 1995; United Nations 1994). There are, moreover, significant differences in perspective regarding both the current and emerging conceptual basis of EIA. These conflicts encompass such matters as the role of EIA (e.g., to advance science or to facilitate decision-making), underlying world views (e.g., biocentric or anthropocentric), the role of practitioners (e.g., technical advisors or environmental advocates), the application of EIA (e.g., to projects only or also to plans, programs, policies and technologies) and the choice of methods (e.g., major differences regarding the most appropriate evaluation and site selection methods).

The EIA Planning Process

Within this context, the EIA planning process has and continues to assume a central role in EIA theory and practice. It encompasses the sequence and scope of activities that precede (and in some instances follow) the approval of a proposed undertaking. The EIA planning process operates at the regulatory level and in EIA preparation. It represents the framework within which stakeholders interact, methods are applied and judgments and decisions are made. A poorly designed and executed planning process can confound the best of intentions, the procedural and substantive contributions of participants and the most rigorously applied methods. The EIA planning process will determine if data are efficiently and effectively applied, if the interests of potentially affected parties are fully and fairly represented in process outcomes and if EIAs objectives regarding sound decision-making and an enhanced environment are realized. It will be through the EIA planning process that changes necessary to ameliorate current deficiencies in EIA theory and practice will be integrated. It also will be through the EIA planning process that the reforms necessary for EIA to realize its potential and to meet future challenges must be addressed.

Given the pivotal role of the EIA planning process in advancing the state-of-the-art and practice of EIA, it would be expected that designing and refining the EIA planning process would be a recurrent theme in EIA literature and a central feature of EIA practice. Such is not the case. Although significant innovations and refinements have been formulated within EIA theory and selectively applied in practice, the individual pieces have not been integrated and have not led to a fundamental redesign of the EIA planning process. The tendency instead has been to continue to apply a planning process, that largely parallels the attributes of the rational planning model, as depicted in planning theory up to the 1960s. Some refinements have been introduced but there has been little benefit derived from the planning theory debates that have transpired over the past thirty years. As a consequence, the refinements and extensions, that have occurred over the past twenty five years, have been added to a framework that was poorly designed and that has failed to adapt to meet changing needs and conditions.

Background of the Writer

Interest in EIA and Planning Theory

The writer came to his concern with the EIA planning process over a period of more than twenty years. Trained in urban and regional planning, with a particular interest in planning theory and EIA, the writer embarked on a career in planning with a planning and engineering consulting firm in 1974. For the first two to three years, the writer divided his time between traditional land use planning projects and community and development impact studies. The introduction of the Environmental Assessment Act in Ontario in 1975 represented a watershed in environmental legislation in Ontario and arguably in Canada. It also had significant implications for the activities undertaken by planning and engineering consulting firms. Over the 1976 to 1983 period the writer worked almost exclusively on EIA projects, largely as either a project manager or as a project coordinator working with a project manager, usually an engineer. Since 1983 the writer has been self employed but has continued to assume a similar set of responsibilities, in addition to providing specialized advice in such areas as planning process design, evaluation methods and site selection. The writer taught EIA at the graduate (for three years) and at the undergraduate (for one year) levels during this period.

The writer also maintained an interest in planning theory during this time and commenced a doctoral degree at the University of Waterloo in 1979. He took courses in both planning theory and in EIA-SIA, eventually settling on planning theory as the focus of the thesis. Unfortunately, external consulting responsibilities prevented him from completing the thesis. The writer, however, maintained his interest in the theoretical components of both planning and

EIA and increasingly the interconnections between the two fields. He taught planning theory at the graduate level for three years and published an article in Plan Canada addressing the the interrelationships between planning and EIA (Lawrence 1992a). The article pointed out that, notwithstanding the many similarities and shared interests of the two fields, planning and EIA theory and practice, to their mutual detriment, have largely evolved separately. This article was the impetus for a further series of articles addressing various aspects of the conceptual roots of EIA (Lawrence 1992, 1994a, 1994b, 1994c, 1996, 1997a, 1997b), with a particular focus on the EIA planning process. One pattern, that became evident from this conceptual exploration, was the failure to knit together the various innovations and refinements in thinking in this rapidly evolving field and to trace through their implications for EIA planning process design. The exploratory analysis, represented by these articles, was informed by the writer's interest and knowledge in planning theory. It was also grounded by over twenty years of EIA practice.

EIA Experience

Although the writer's EIA experience has been gratifying in many ways, it also has been frustrating, particularly with regard to EIA planning process design. In the writer's experience EIA planning process design in practice is rarely informed by planning theory or, indeed, even by EIA theory. To some degree this is attributable to planning process design decisions being made by engineers and scientists and, more recently, by lawyers, few of whom have training in planning process design or, for that matter, in EIA. Thus EIA planning process design tends to be viewed from the perspective of the contents of legislation, regulations and guidelines and occasionally introductory EIA texts. Planners, in the writer's experience, do sometimes assume a role in the design of EIA planning processes. However, the unfortunate tendency is for such individuals to uncritically apply the rational planning model, in its most basic form, and / or to focus on the substance of physical planning, although frequently from an environmental planning perspective. The net result of the above is often a repetition of the commonly identified deficiencies generally associated with the rational planning model (See Chapter 4), most notably a top-down approach to planning, a failure to adapt to context, implicit values and a neglect of implementation. Compounding these limitations has been the propensity, consistent with the old adage - "a little knowledge is a dangerous thing", to adopt excessively rigid positions regarding how best to design and execute the EIA planning process. In light of the above, it is not surprising that EIA practitioners are poorly equipped to confront the new challenges represented by cumulative effects, the application of EIA to programs and policies and the sustainability concept. In the writer's judgment a significant contributing factor to the deficiencies of EIA theory and practice, is the failure to redesign and apply the EIA planning process consistent with the available knowledge base. This thesis is the writer's contribution to addressing that deficiency.

Thesis Scope and Research Objectives

Overall Objectives

The overall research objective is to propose a means for renewing the EIA planning process by drawing upon the existing knowledge base of EIA theory and practice and of related fields, most notably planning. This overall research objective is addressed through two secondary objectives. First, a means is proposed for reforming the EIA planning process by integrating ideal planning process characteristics, planning theory and the sustainability concept. Second, a means is proposed for redesigning the EIA planning process, both overall and for selected activities, at both the regulatory and the applied levels.

Specific Objectives - Description and Rationale

The renewal process begins by identifying EIA properties, objectives and process characteristics as conventionally depicted (Lewis 1982; Clark 1983a). This characterization is revisited at the end of the renewal process. Ideal planning process characteristics are identified to provide direction to the exercise (i.e., the properties that should be reflected in the planning process reforms, modifications and refinements)(Burdge 1994; Beattie 1995). They also provide a guidepost for future initiatives in the same area. The review of planning theory and its potential implications for the EIA planning process are necessary because the EIA planning process has, to its detriment, largely mirrored the basic characteristics of the rational planning model (although not always consciously) (Canter 1995; Culhane, Friesema and Beecher 1987; Hyman *et. al.* 1988; Amy 1990; Culhane 1993; Bartlett 1990; Briassoulis 1989) and because of the failure to draw upon the rich planning theory literature that has provided a detailed critique of rationalism as well as offering numerous variations and alternative theories and perspectives (Lawrence 1992). The sustainability concept is introduced because it can provide to the EIA planning process greater focus, a measure of effectiveness and a mechanism for integration with other forms of environmental management (Gilpin 1995; Smith 1993; Gibson 1993; Sadler 1996; Gardner 1989; Htun 1990).

Within this framework the EIA planning process is redesigned in both an overall sense and for selected activities. The redesigned process operates at both the regulatory and the applied levels. There is a tendency, in EIA planning process design, to move immediately to the scope and sequences of steps within a pre-defined regulatory framework. The formulation and refinement of the regulatory framework also requires redesign. At the regulatory level, there is a further tendency to focus exclusively on legislation and regulations. Generic and project-specific guidelines are often more important in shaping the conduct and outputs of individual EIAs. Consideration is, therefore, given to how such guidelines are and could be designed and applied.

The major subject areas addressed for overall planning process design are: design at the regulatory level, the sequence and arrangement of major EIA activities (and their interrelationships), adapting the process to suit different contextual conditions and the integration of sustainability at the regulatory and at the applied levels. Regulatory design is the often neglected dimension of EIA that shapes and directs planning process design application (Sadler 1995; Gibson 1993; Lawrence 1994c). The review of the sequence and arrangement of major EIA activities counters a largely linear EIA planning process (notwithstanding general assurances that the planning process is highly iterative) and the propensity to treat continuous activities as discrete stages in the EIA planning process (Culhane, Friesema and Beecher 1987; Holling 1978). The exploration of process and context interrelationships challenges the assumption that a single ideal EIA planning process is equally applicable regardless of context - a mistake long since identified and addressed in planning theory (Beattie 1995; Lawrence 1994c). The regulatory and applied integration of EIA and sustainability extends from the conceptual analysis presented as part of the EIA reform analysis.

Three sets of EIA activities - analysis and synthesis, evaluation and impact management - merit further planning process design refinement. In each case themes and issues are identified within selected subject areas. These analyses provide the basis for criteria that are, in turn, applied to generic and project-specific guidelines and to ten individual EIAs as a means of drawing upon the regulatory and applied EIA knowledge base. The subject areas selected are generally those most topical, controversial and most poorly applied in practice, in the writer's experience. Subject areas, thoroughly addressed by other sources, generally well performed or readily executed receive limited attention.

The major analysis and synthesis activities addressed include screening and scoping (scoping is well entrenched in the United States but rarely applied systematically in Canada) (Wolfe 1987; Sadler 1996; Gilpin 1995; Sadler 1995), baseline and impact prediction (a central activity well developed in theory but from conflicting perspectives and often poorly applied in practice) (Beanlands and Duinker 1983; Culhane, Friesema and Beecher 1987; Dickman 1991), impact significance interpretations (a topical subject area in EIA theory but one that is only starting to be addressed systematically in EIA practice in Canada) (Thompson 1990; Canter and Canty 1993; Gilpin 1995; Sadler 1995; Sadar 1996) and cumulative effects assessment (CEA) (a topical and important subject area where theorists and practitioners struggle to move beyond conceptual frameworks) (Shoemaker 1994; Spaling 194; Mitchell 1991a; Reckhow 1994; Arquiaga, Canter and Nelson 1992; Conacher 1994). Evaluation activities addressed include the evaluation process (a controversial subject where process considerations have been overwhelmed by intense debates among adherents of conflicting method types) (Sadler 1995; Ortolano and Shepherd 1995; Maclaren 1985; Elliott 1981; Hollick 1981), lessons from policy, plan and program evaluation (a means of accelerating the learning curve for EIA process design as EIA requirements are extended beyond capital projects) (McAllister 1985; Lichfield 1996; Talen 1991; Faludi and Voogd 1985; Patton 1987) and lessons from site selection (the "leading edge" for EIA evaluation) (Rabe 1995; Gerrard 1995; Morrell 1984; Massam 1993; Lawrence 1996). Impact management activities considered include mitigation and compensation (a central consideration in the determination of relative preference among alternatives and in the determination of proposal acceptability) (Burdge 1994; Sadler 1995; Wlodarczyk 1990; Sadler 1996), public involvement and conflict resolution (a central feature and purpose of the EIA planning process) (Gilpin 1995; U.S. Army Corps of Engineers 1983; Daneke, Garcia and Prescoli 1983), monitoring and auditing (a topical subject area in EIA where the practice tends to fall well short of the theory) (Duinker 1985a and 1985b; Meredith 1991; Serafin, Nelson and Butler 1992; Culhane 1993; Burdge 1994; Wolf 1983) and management and implementation (a neglected area in both EIA theory and practice) (Formby 1990; Torgerson 1980; Blaug 1993; Ensminger and McLean 1993; Hart, Enk and Hornick 1984; Dorney 1989; Culhane 1993).

Approach and Perspective

Major themes, distinctions and concepts are linked together within conceptual frameworks. Greater attention is devoted to synthesis than to the analysis of individual planning process components. The emphasis placed on synthesis over analysis reflects the writer's perception of EIA theory as a loose amalgam of methods, concepts, procedures and frameworks. Although analytical theory building is still necessary, there is a greater need for integrating those disparate elements of the EIA knowledge base concerned with the EIA planning process.

The perspective of a pragmatic but reflective practitioner is adopted (Schon and Rein 1994). Concepts and frameworks are viewed in terms of their contribution, directly or indirectly , to enhanced practice by practitioners at both the regulatory and applied levels. This pragmatic approach is not atheoretical. EIA and related theory-based knowledge, especially planning theory, is assessed in terms of its potential contribution to a renewed EIA planning process. Concomitantly, EIA practice, as exhibited in legislations, regulations, guidelines and EIA documents, is assessed in terms of its potential contribution to EIA planning process theory building.

Subject Areas Not Addressed

A great many subject areas could be encompassed within a review of the EIA planning process, even given the selective nature of the analysis described above. Further circumscription is required. The choices regarding what to address or not to address are difficult and are, in part, arbitrary. The analysis of EIA from the regulatory level, for example, is limited to requirements and guidelines within Canada and for the ten provinces. Each of these eleven jurisdictions has a different set of EIA requirements. An interesting cross-section of approaches is, therefore, evident. EIA requirements in the Yukon and the Northwest Territories have not been addressed because of the different legal basis for EIA in those jurisdictions. Similarly EIA requirements at the municipal level, in other countries and an international level are not considered, although EIA requirements in each case represent potentially fertile ground for further analysis. [1] The analysis is also limited to an overview of the planning process implications of ten EIA documents, with specific reference to selected analysis, synthesis, evaluation and impact management activities. The rationale for the choice of the ten EIA documents is provided later in this chapter.

EIA methods, that fit within the EIA planning process, are not addressed. Methods are generally adequately addressed in EIA texts (Sadar 1996; Gilpin 1995; Morris and Therivel 1995; Bisset 1983; Canter 1983, 1996; Hart, Enk and Hornick 1984; Westman 1985; Erickson 1994; Rau and Wooten 1980). Different disciplinary perspectives (e.g., ground water, air, biology, heritage resources) and procedures are not addressed for the same reason (Canter 1996; Bregman and MacKenthan 1995; Westman 1985; Morris and Therivel 1995; Erickson 1994). Well-trodden ground not addressed in the analysis include data base management (O'Neill *et. al.* 1993; Schibuola and Byer 1991; Rodriguez and Bachiller 1995), study team management (Grenell 1977, 1978, 1985; Weaver *et. al.* 1996; Dorney 1973; 1989; Erickson 1994) and institutional arrangements (Smith 1993; Marshall *et. al.* 1985; Rau and Wooten 1980) for EIA.

A particular effort is made to complement the analyses contained in a recently released series of reports on EIA effectiveness (Doyle and Sadler 1996; Sadler 1994, 1995, 1996; Shillington and LeBlanc 1995) and a recently completed doctoral dissertation (Sargent 1996). In the case of the EIA effectiveness studies this involved making use of the EIA effectiveness surveys where pertinent, addressing strategic environmental assessment (SEA) only to the extent of highlighting differences between EIA and SEA (Wood and Dejeddour 1990; Sadler 1996; Therivel 1993) and not addressing international EIA experiences. This thesis also builds upon the Canadian regulatory analysis (Doyle and Sadler 1996) by conducting a more detailed review of regulations and guidelines and draws upon the effectiveness studies analyses, together with many other sources, in exploring such issue areas as scoping, impact significance interpretations, impact management and the relationship of EIA and sustainability. The doctoral dissertation (Sargent 1996) provides a detailed evaluation of the relationship of EIA and planning in one jurisdiction - Ontario. It provides an insightful, and complementary, example of how EIA and planning requirements have and could be integrated in one jurisdiction. This thesis addresses the issue of the relationship of EIA and other forms of environmental management at a more conceptual level.

This thesis stops short of specific recommendations for regulatory reform or planning process application. Further refinements would be required to take the general principles and conclusions presented here and to use them as a basis for, for example, deriving performance standards that could be applied in reshaping EIA legislation, regulations and guidelines. The analysis presented is, however, indicative of the types of changes that would be required to renew EIA planning practice.

Interrelationships Among Objectives

Interrelationships among the various thesis objectives are illustrated in Figure 1. Figure 1 also highlights the thesis structure. The methodology, presented in this chapter, frames the remaining analyses. The EIA planning process, as conventionally described, is then presented. This sets the stage for reforming, modifying and refining the EIA planning process. The analysis then splits into two activity streams. The first activity stream (reforming the EIA planning process) encompasses three means (ideal planning process characteristics, planning theory and sustainability) by which reforms (largely derived from knowledge bases outside EIA) can be integrated into the EIA planning process. These reform initiatives provide a framework within which a largely internal redesign and refinement to the EIA planning process can take place. The redesign and refinement process, as illustrated in Figure 1, occurs at an overall level and for selected activities within three planning process components (analysis and synthesis, evaluation and impact management). It also encompasses a regulatory level (legislation, regulations, guidelines) and an applied level (as represented by the ten EIA documents). The products of the two activity streams are brought together in overall conclusions and in the identification of future directions. The formulation of overall conclusions and future directions also entails revisiting the conventional EIA planning process and highlighting changes to that process.

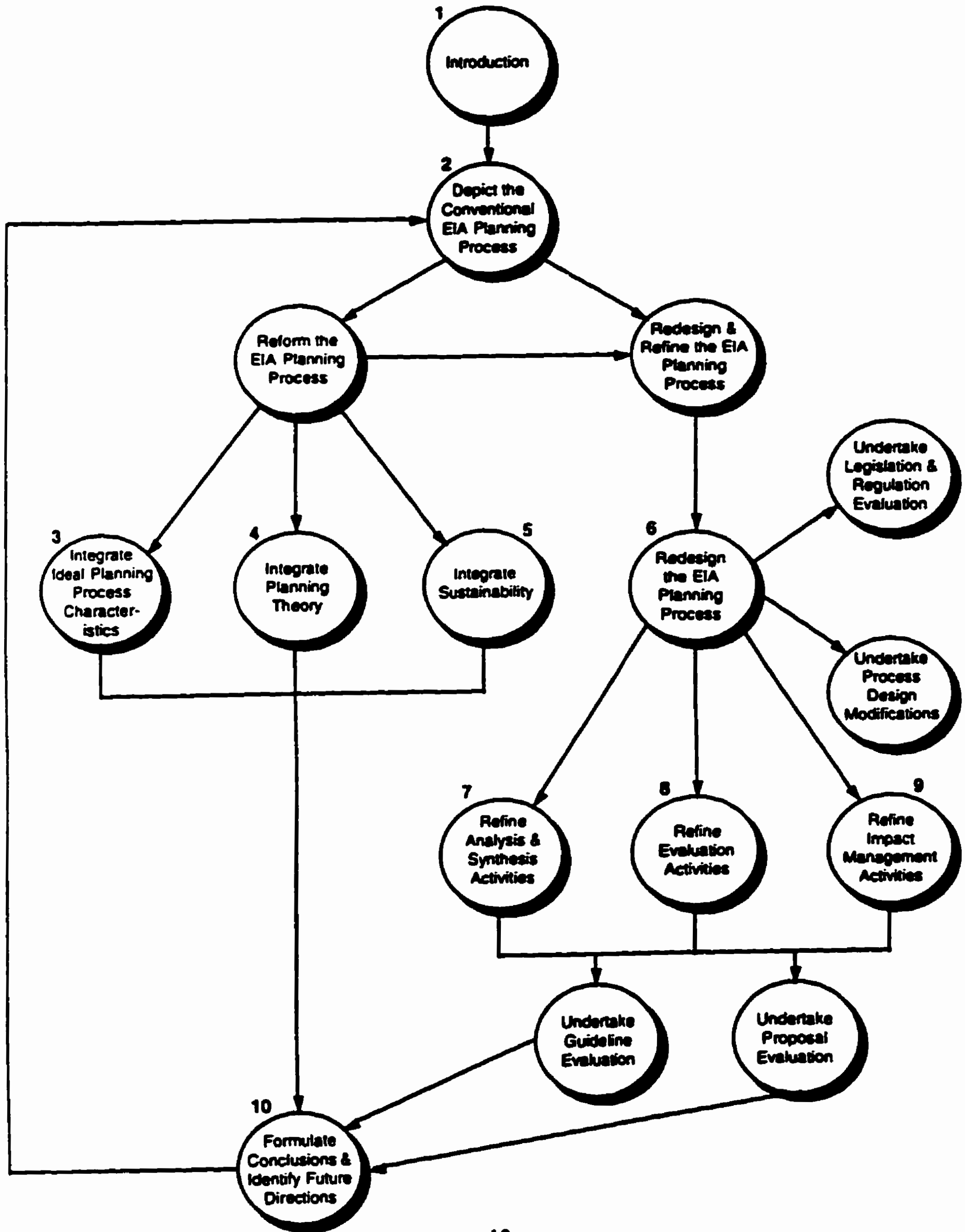
Research Methodology

EIA Theory Building

Before embarking on a description of and rationale for the methodology used in this thesis, it is first necessary to describe how the EIA planning process is approached in terms of EIA theory building.

Theory is a symbolic construction, distinct from both fact and practice, but necessarily linked to reality (Kaplan 1964). Theory is both symbolic (i.e., abstract or conceptual) and empirical (i.e., grounded in observation and experience). However, it is distinct from both fantasy at the one extreme and data classification, statistical

Figure 1. Interrelationships Among Thesis Objectives



generalizations, facts, methods and practice at the other extreme. Theory entails structure. Theoretical elements are arranged in a coherent and consistent system or pattern (Neuman 1997). A theory extends beyond the confines of the unique or the particular. A theory has explanatory or prescriptive power as distinct from speculation and unsubstantiated assertions. An appreciation of these distinctions in EIA theory and practice helps guard against empty abstractions, unsubstantiated speculations, standardized solutions, unstructured practice and the exclusively anecdotal analysis of experience. Theory also is a yardstick against which practice can be judged. Theory can, in turn, be judged by the outcome of practices adhering to the theory.

Theory explains, guides and enhances understanding. It analyses, subdivides, connects and recreates objects, concepts, experiences, knowledge and actions in different ways (Rapoport 1990). It also sensitizes users to important variables in a situation (Forester 1980; Goffman 1974). Explanatory theory arranges objects in a causal connection (Mayer and Greenwood 1980). Prescriptive theory provides a normative guide to future action (Faludi 1973). Theory sets the stage for less abstract theories and methods (Kaplan 1964). EIA theory should further our understanding of proposed actions, the environment and critical interactions between proposed actions and the environment. Cause-effect relationships should be identified, practice structured and a framework established for the selection and use of approaches and methods in different contexts. EIA concepts should be linked by theories and then integrated into theory networks (Rapoport 1990).

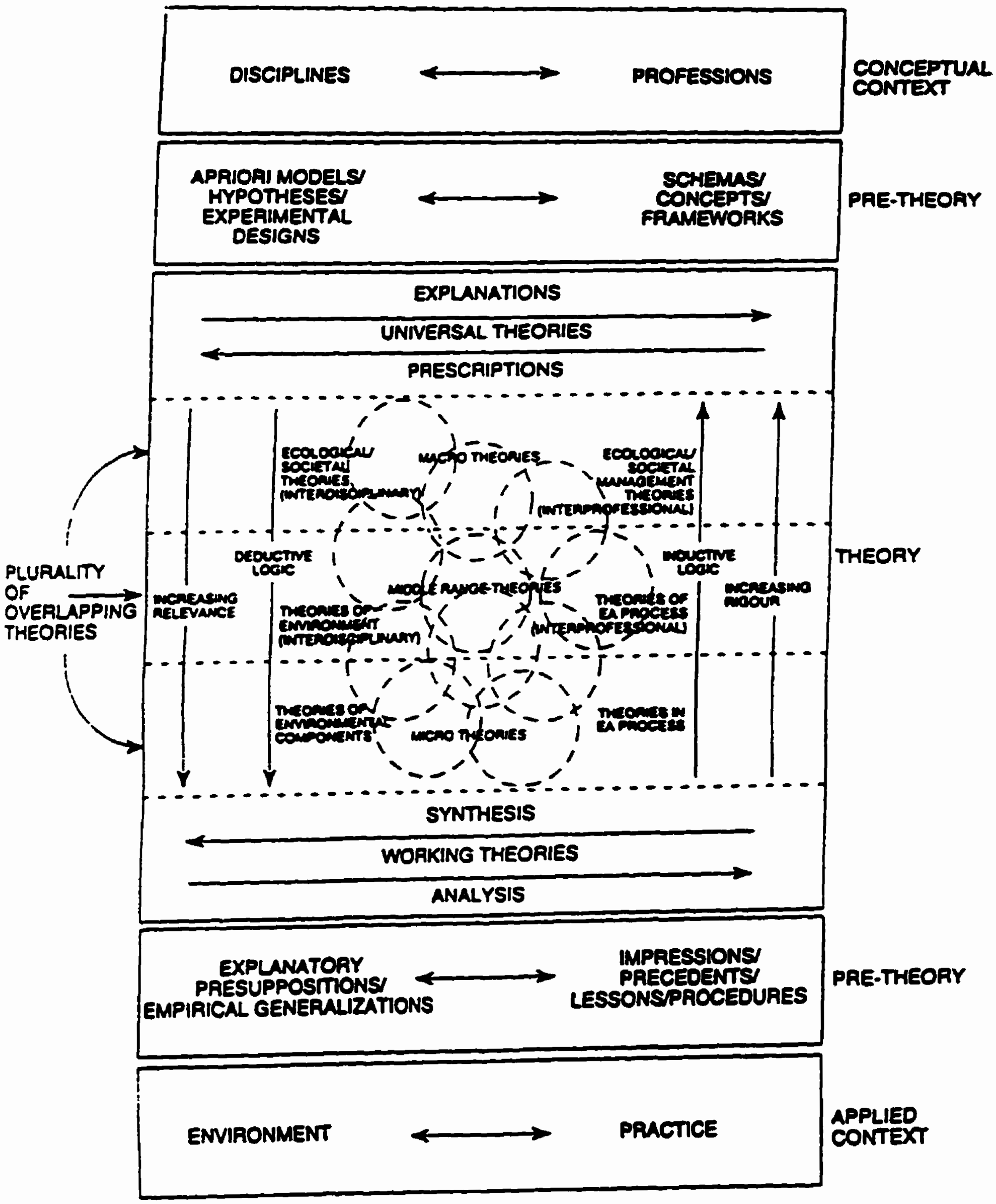
Explanatory and prescriptive theories, respectively, represent the "is" and the "ought" of theory building (Cambris 1979). Explanatory theory contributes to knowledge accumulation (Mayer and Greenwood 1980). Prescriptive theory provides the basis for the resolution of practical problems. Explanatory theory informs prescriptive theory (Breheny 1983). There are theories of the EIA planning process (i.e., theories of EIA), substantive EIA theories developed in other disciplines (i.e., theories in EIA) (Hightower 1969; Faludi 1973) and theories for EIA (i.e., theories of the role of EIA in society) (Hendler 1995). Substantive EIA theory encompasses disciplinary (e.g., social, biological, economic) and EIA activity theories (e.g., interpretation, evaluation, impact management). Both explanatory and prescriptive EIA theories serve and are constrained by decision-making requirements. A failure to appreciate these distinctions can inhibit dialogue between planners and scientists because of the very different meanings ascribed to terms such as theory.

Theory, in the social and natural sciences, is often depicted as a continuum ranging from the universal (i.e., holistic or basic theory) to the particular (Merton 1949). The search for a universal theory has been a fruitless exercise in both social science and planning (Bolan 1980). A search for a universal EIA theory is likely to suffer the same fate. Theory is necessarily fragmented and conditional. It is fragmented because different types of theory explain different things (Craib 1984). It is conditional because a theory only holds true for a certain range of phenomena (Kaplan 1964).

The conditional and fragmentary nature of theory means theories of relevance to EIA are, of necessity, located somewhere between the universal and the particular. As illustrated in Figure 2, a series of partially overlapping levels falls within this range. Nearest to the universal end of the continuum are the more formal macro or grand theories (Babbie 1995). These contrast with the informal, more concrete, micro theories (Babbie 1995). Middle range theories, located at the intersection of the macro and micro theories, seek to balance inclusiveness (rigour) and precision (relevance) (Merton 1949). At the applied end of the continuum are working and common sense theories. These theories are less rigidly structured than micro theories. They provide insights concerning what is possible and desirable in specific situations. Pre-theory, at each extreme, is the precursor to theory-building. Pre-theory also organizes information (Wyant, Meganeck and Horn 1995).

The number of theory levels and the degree of structure can vary significantly (Etzioni 1968; Schon and Rein 1994). With a highly ordered structure higher levels incorporate and explain lower levels. Lower levels, in turn, support higher levels (Thomas 1979; Etzioni 1968). A more loosely defined structure entails partially overlapping and competing theories (Thomas 1979) and theory networks. Theory to practice linkages are addressed through deductive, formal analysis (Neuman 1997). Inductive analysis addresses practice (substance) to theory connections (Neuman 1997). Abductive analysis concerns how one reasons from data or hypotheses or new ideas (i.e., how concepts, hypotheses and theories are engendered) (Rapoport 1990, 90). Interactions among these forms of analysis, together with theory testing, can be envisioned as a spiral (Rapoport 1990). The EIA domain is the sum of these parts (i.e., the subject matter and the important questions addressed by the EIA field) (Rapoport 1990). An enhanced sense of wholeness can evolve from initial definitions of domain as interconnections within and among concepts, theories and practice are

FIGURE 2 - EIA THEORY LEVELS



progressively explored (Lasswell 1971). Care should be taken to avoid dogmatism in theory building (e.g., the universal application of Marxist political theory regardless of contextual variations.

Theory and practice are not fully divisible. Thought is not independent of existence (Mannheim 1936). We inevitably draw upon our experiences and our "common-sense" theories, concepts and methods in the course of identifying problems and solutions (Hoch 1984; Thomas 1979). Accordingly, no observation is purely empirical (free from ideational elements) and no theory is purely ideational (Kaplan 1964). Theory building, moreover, is a practical, moral endeavour (Hoch 1984). As such it is consciously directed toward a purpose (a problematic human need) external to both the theory and the action (Hoch 1984; Beauregard 1971).

Although theory and practice are not fully separable the proportions of each can be varied. Theory building strives to incorporate facts without being overwhelmed by them (Mills 1959). It is advanced by ideas but is disciplined by facts (Mills 1959). A theory should be general enough to be transferable from one situation to another but also reflective of problematic situations that demand solutions in real world terms (King 1974).

Theory - practice relationships are akin to a cyclical and evolving dialogue (Gillingwater 1975). Dialectical reasoning identifies and resolves contractions between ideas and reality (thought and practice) (Taylor 1980; Friend, Power and Yewlett 1974; Jonas 1959). Deductive (theory to practice) and inductive (practice to theory) reasoning represent the two iterative and complementary routes to theory building (Mayer and Greenwood 1980).

The overlapping theory-practice relationship demonstrates the need for grounding EIA concepts and frameworks (Hanson 1995). Detailed field work and case study knowledge can be especially helpful (Shrader-Frechette and McCoy 1994). However, facts and experiences should still be structured by means of inductive reasoning, into empirical generalizations, to formulate explanatory (or prescriptive) presuppositions and, in turn, to develop theory (Mayer and Greenwood 1980). EIA theorists and practitioners should jointly and recursively explore theory-practice relationships at varying levels of abstraction. The purpose of an EIA theory, together with its ethical assumptions, need to be made explicit. Care must also be taken to ensure an appropriate level of generality (i.e., neither irrelevant nor impractical).

Taking into account the distinctions cited above, this thesis is consciously directed toward EIA theory-building, with specific reference to the EIA planning process and to specific activities within the EIA planning process. It is concerned with prescriptive rather than explanatory theory-building, although it provides a framework within which explanatory theories can be applied. The prescriptions presented are at the level of pre-theories tending toward working theories, both at the conceptual (the schemas, concepts and frameworks presented in Chapters 2 to 9) and at the applied levels (the impressions, lessons, procedures and precedents associated with the regulatory and applied examples considered in Chapters 6 to 9) ends of the theory-practice continuum. Greater emphasis is placed on pre-theory at the conceptual end of the continuum. The prescriptive theories presented are fragmented (although an effort is made to address interconnections) and conditional (will vary by context and context type). The analysis presented is both deductive (concepts directed toward practice) and inductive (generalizations from practice). The theory-practice relationship is addressed as an evolving, iterative dialogue.

Data Collection and Analysis Methods

Conventionally literature in a thesis is treated as a context or foundation from which focused original research can be undertaken. This thesis treats an extensive array of literature as the principal data source. The focus is less one of extending from the literature (i.e., treating the literature as a given) than of identifying, linking and placing concepts, derived from the literature, within broader frameworks (i.e., treating the literature as a resource to be shaped and reconfigured in an original manner). Breadth and synthesis are stressed over depth and analysis.

The reforming of the EIA planning process components (Chapters 3 to 5) uses EIA literature, where applicable, but rely more heavily upon planning theory, environmental planning and management, and selective general natural and social science, public administration and policy literature. The reverse is the case for the redesign and refinement of the EIA planning process components. The writer also makes reference to related research (most notably the recently completed EIA effectiveness studies (Sadler 1996) and extends, refines and cross references his own previously published work, bearing on the subject of the EIA planning process.

EIA is a relatively recent field of theory and practice. There are no, broadly accepted, generally acknowledged seminal works and authors in EIA. Seminal works, schools of thought, theories and authors are more readily identifiable in related fields, particularly planning theory. The boundaries between EIA and related fields are not well defined. The same is true for related fields such as environmental management. Thus there is an immense array of books and articles, bearing directly or indirectly on the EIA planning process, scattered across a range of related fields of theory and practice. The literature in related fields of theory and practice is even more extensive than in EIA. Thus there is no, clearly defined "stopping rule" for a subject with the breadth of the EIA planning process. The approach taken, within each subject area, was to use a preliminary framework to successively review examples of directly relevant literature. Frameworks and concepts were then progressively refined with each iteration. Research by the writer in several of these areas has extended over a period of years. It was, therefore, necessary to supplement the analysis every few months. As the "net" was progressively cast more widely, "diminishing returns" were increasingly evident. Futher literature review was then focused on clearly identifiable analysis gaps. The literature review was undertaken, for Chapters 3 to 5, until a basis could be provided, in the form of conceptual frameworks and specific lessons, for reforming the EIA planning process. A similar approach was applied in the Chapters 6 to 9 analyses. The latter analyses also were extended by identifying criteria, together with scaling levels for each criterion, as a means of structuring the analysis of EIA legislation, regulations, guidelines and documents.

The regulatory reviews involved reviewing all the EIA legislations, regulations and generic guidelines, together with examples of project-specific guidelines, for the Federal government and for the ten provinces. The criteria application process involved preparing detailed tables (to address subtle distinctions and to provide appropriate qualifications and elaborations) and summary tables (based on the application of the scaling levels). Both the detailed and the summary tables were then reviewed to identify general patterns and lessons. The same approach was used to analyze the ten EIA documents. Lessons, drawn from a further set of ten site selection examples, (Lawrence 1996) were also integrated into the analysis. The breadth of the regulatory and applied example analyses (eleven jurisdictions, twenty examples, over forty criteria) inevitably meant some sacrifice in depth and precision. A broad analysis was, however, essential to match the breadth of the literature review. This need for breadth necessitated limiting the regulatory and example analyses to document review.

Chapter-by-chapter summaries of EIA planning process implications were prepared. These summaries were, in turn, integrated into overall conclusions and suggested future directions.

Paradigm Types

Qualitative and quantitative research are two commonly identified social science paradigms (general frameworks or viewpoints) (Babbie 1995; Creswell 1994; Newman 1997). This thesis employs a mixed methodological design (i.e., integrates quantitative and qualitative components) (Creswell 1994; Patton and Sawicki 1993).

Consistent with a qualitative research design, the thesis analysis is subjective (value-laden), assumes multiple realities, draws upon the researcher's own experience and knowledge, employs a thematic analysis structured within an evolving design and context, uses informal language and inductive analysis, focuses on what works (i.e., pragmatic) and seeks to create a complex holistic picture using words (Creswell 1994; Neuman 1997). Unlike a qualitative analysis, limited use is made of the personal voice, multiple rather than a few cases are used and the analysis does not take place in a natural setting (Creswell 1994).

In common with a quantitative research design, reality is viewed as largely separate from the researcher (especially in the analysis of EIA regulations and documents), cause and effect relationships are considered (to the extent that the application of a renewed practice can "contribute to" enhanced practice), there is a degree of quantification (through the application of ordinal scaling levels) and a deductive approach (from concept to practice) is applied (Creswell 1994; Newman 1997). Unlike a quantitative research design, reality is not seen as singular or objective, the analysis is not value or context free and it does not use set definitions, accepted quantitative terms or statistical analysis (Creswell 1994).

As with a mixed methodological design, the thesis seeks a convergence of results (inductive and deductive), seeks complementarity of methods (literature review and regulatory and example analyses), uses one method to inform the second, uses the two methods to identify contradictions and fresh perspectives and uses method combinations to add scope and breadth to the study (Greene, Caracelli and Graham 1989).

The thesis research design differs from both the qualitative and quantitative social research designs (alone or in combination) to the extent that it stresses prescription over explanation, integration over analysis and breadth over depth. In addition, neither validity and reliability (as would be expected with a quantitative analysis) nor verification (as would be expected with a qualitative analysis) can be provided within the thesis. Conclusions can only be verified if they are adopted and successfully applied in practice. It is, however, hoped that the thesis will, over time, make a substantive contribution to enhanced practice.

Methodological Approaches

Three commonly identified methodological approaches are positivist social science, interpretative social science and critical social science (Newman 1997). The EIA planning process, and consequently this thesis, is firmly embedded in the positivist tradition. The rational choice model parallels the conventional EIA process (described in Chapter 2, detailed in Chapter 4 and refined in Chapters 6 to 9). A positivist approach is evident in the stress placed on rigour in the planning process (Chapter 3), in the impact prediction and management frameworks and procedures presented in Chapters 7 and 9), in the use of deductive logic in the literature analysis (concept to practice) and in the scaling procedures used in the Chapter 6 to 9 analyses to consistently apply criteria to EIA regulatory requirements and proposals. In contrast to the positivist approach, this thesis does not assume a single stable reality, does not seek to derive universal causal or prescriptive laws or theories, does not separate facts and values, is not value free, is not context free, and does not see knowledge as exclusively additive or people as only rational.

The positivist perspective adopted in the thesis is tempered by alternative perspectives consistent with elements of both interpretative and critical social science. In common with interpretative social science, the thesis is empathetic (impacts as viewed from the perspective of those affected by the process and its impacts), embedded in context (a contingent approach to planning process application), practical (how best to enhance EIA practice) and subjective. Multiple theories and multiple and fluid realities are also assumed as is the need to explore for meanings and direction below the surface (Neuman 1997). Both the socio-ecological idealism planning model (as described in Chapter 4) and social sustainability (as depicted in Chapter 5) are more consistent with interpretative social science than with positivist social science. The interpretative science views that common sense is a sufficient guide for action, that research involves telling a story and that the researcher should be a passionate participant (Neuman 1997) are not, however, fully adopted.

A critical social science approach is evident in the thesis through references to the political nature of the EIA planning process (Chapter 3), through the characterization of the political economic mobilization planning model (in

Chapter 4), in the global, change-oriented perspective adopted with regard to sustainability (in Chapter 5), in the stress placed on conflict resolution (in Chapters 6 and 9) and in the consideration of political and administrative obstacles to change (in Chapters 5, 7 and 9). Also consistent with critical social science, the thesis is value-full and action-oriented. In contrast to critical social science, the thesis stops short of advocating direct political action, does not employ historical comparative analysis and identifies the limitations associated with an exclusively critical approach to the EIA planning process.

A less fully developed social science approach, postmodernism (Newman 1997) has also been partially addressed, although arguably postmodernism is a rejection of social science. The potential implications of postmodernism for the EIA planning process are addressed in Chapter 4. A postmodernist perspective is also evident in the consideration of risk, complexity and uncertainty in Chapter 3, in the rejection of the conventional EIA planning process (as depicted in Chapter 2), in the integration of the writer's personal experiences and in the rejection of single solutions. Notwithstanding the obstacles that exist to the renewal of the EIA planning process, the writer does not adopt the pessimistic view associated with postmodernism.

Research Types and Methods

The thesis encompasses elements of exploratory, applied and evaluative research (Newman 1997). Although the EIA planning process is not new, arguably the broad and integrative approach taken is an original treatment of the subject. Definitive answers are not provided but the many concepts and frameworks presented can provide a sense of direction for further research and application. The thesis is applied research because it facilitates enhanced practice. It is evaluation research because it applies criteria to evaluate EIA requirements and guidelines. Prescriptive direction for EIA auditing (in Chapter 9) - a form of evaluation research, also is provided.

As described above, the principal thesis data collection and analysis methods used are literature and regulatory review, supplemented by a broad range of tightly circumscribed, applied examples. Other social science methods are less compatible with the thesis purpose and approach. Surveys or interviews, for example, can provide useful data and perceptions but are less helpful in integrating concepts and frameworks from a diverse array of literature and experiences. To the extent that interviews and surveys are instructive, reference has been made to the surveys undertaken in support of the recently completed EIA effectiveness studies (Sadler 1996). These studies include a survey of EIA regulators in Canada and an extensive survey of EIA practitioners.

A broad ranging prescriptive research effort would not be greatly advanced by methods such as participant observation, unobtrusive research or field research. Such methods lack the breadth required and are more conducive to the explanation of behaviour or physical phenomena than the integration and application of knowledge for prescriptive purposes. Content analysis tends to focus on the frequency with which issues and ideas are raised (Babbie 1995; Patton and Sawicki 1993). More important, in this context, are the ideas themselves, regardless of their frequency, together with the means by which they can be integrated. A less formal approach to document review is required. In a similar vein, a large number of applied examples, rather than two or three in-depth case studies, is essential to rise above contextual considerations and to identify broad patterns and directions for change. The complex, qualitative and subjective nature of the subjects addressed through the thesis do not lend themselves to the strictures of experimental research or statistical analysis. Historical comparative research is more suited to comparing varying cultures and social characteristics in different eras (Neuman 1997). The thesis does, however, consider trends in EIA theory and practice (as highlighted earlier in this chapter) and makes extensive use of comparative analysis (across jurisdictions and across EIA documents).

Selection of Applied Examples

As noted above, criteria are applied to ten EIA reports in the Chapters 7 to 9 analyses. It is an overstatement to view these analyses as case studies. They are, therefore, referred to as applied examples. There are quite literally hundreds of EIAs that have been prepared under EIA requirements in Canada. Each is, in some senses, unique. Given the diversity of EIA requirements and contextual variations, EIAs could be categorized in scores of way. It would be difficult, and ultimately unproductive to argue that any subset is representative of a larger whole. Table 1 lists and highlights key characteristics of each of the ten proposals considered. At best the ten EIAs constitute a range of EIA experiences in Canada, sufficient to provide minor elaborations and refinements to the conceptual distinctions drawn in Chapters 7 to 9. There are four public and six private undertakings scattered across eight provinces. Three fall under Federal or joint federal - provincial jurisdiction and seven are under provincial jurisdictions. The ten examples

Table 1 - Example EIAs

EIAs (proposal / proponents)	Key Proposal Characteristics	Settings / Jurisdictions
Steepbank Mine Project Application - Suncor Inc. Oil Sands Group (1996)	-construction and operating of proposed mine and related modifications in access, ore transport, extraction and tailings handling to existing synthetic crude oil and other oil sands products -20 year mine plan and conceptual reclamation plan; production level 107 kbped of ungraded crude oil - hydro power supply line and several pipelines -modifications to existing oil sands plant -capital cost of $336 million -1400 full time employment and 300 contractors	-across the Athabasca River from current operations near Fort McMurray in Regional Municipality of Wood Buffalo in northeastern Alberta -EIS in accordance with requirements of the Alberta Environmental Protection and Enhancement Act
McArthur River Project EIS - McArthur River Joint Project (1995)	-mine uranium ore from the McArthur River mine -transport ore to Key Lake over a new haul road -mill the ore at Key Lake -dispose the resulting tailings in the Deilmann in-pit tailings management facility at Key Lake -surface works situated within a 1050 ha surface lease -proposes to mine 420 million pounds -full time employment - 500 -estimated capital costs - $336 million -project life - 20 years or more	-located in the Athabasca region of northern Saskatchewan -referred by the provincial and federal governments to the Joint Federal / Provincial Panel on Uranium Mining in Northern Saskatchewan under the Federal Environmental Assessment Review Office
Oriented Strand Board Plant - Saskfor MacMillan Products Limited Partnership (1995)	-proposed plant will produce 476,000 cubic metres of oriented strand board (OSB) annually from an input of 860,000 cubic metres -20 year forest management plan subject of a separate EIA -capital cost of $130 million; 137 employees -no time horizon for decommissioning	-within the town limits of Hudson Bay, Saskatchewan (east of Prince Albert) on industrially zoned land -an Environmental Impact Statement in accordance with the requirements of the Saskatchewan Environmental Assessment Act
Condie to Queen Elizabeth 230 kV Transmission Line Project - Saskatchewan Power (1995)	-a 230 kV transmission line between the Condie switching station near Regina and the Queen Elizabeth switching station at Saskatoon (226 km); also involves additions to two switching stations -estimated project cost $39.4 million -post construction employment limited to inspection and maintenance -intended to complete the Shand generating station, commissioned in 1992, into SaskPower transmission power grid -38 m right-of-way -estimated life span - 50 years	-located in the Saskatchewan Plains region; flat to gently rolling terrain; dominant use is agriculture -in accordance with the requirements of the Saskatchewan Environmental Assessment Act
East Prince Sanitary Landfill Facility - East Prince Waste Management Committee, PEI (1993)	-a sanitary landfill facility for non-hazardous wastes; also includes recycling and composting operations -developed within the context of a waste management strategy -50 trucks per day; 77 tonnes daily -20 to 30 year landfill -total net annual cost (including composting) $6.5 million; start-up cost - $2.5 million -93 ha site	-intended to meet the needs of 12 small incorporated communities -rural setting - mixed wooded areas and agriculture; site is combination of crown land and private holdings -in accordance with the requirements of the Environmental Protection Act and the Environmental Assessment Act for Prince Edward Island

Table 1 - Example EIAs

EIAs (proposal / proponents)	Key Proposal Characteristics	Settings / Jurisdictions
Churchill - SpacePort 138 kV Transmission Line, Manitoba Hydro (1995)	-proposed 138 kV transmission line -starts 10 km south of Churchill South Station and proceeds 20.4 km to the northeast terminated at the proposed SpacePort substation -55 m right-of-way -construction workforce 25 to 40; operations employment - inspection and maintenance only	-located in northeast Manitoba -all land crossed is crown land; land use limited to recreation and subsidence activities -an Environmental Impact Statement in accordance with the requirements of the Manitoba Environment Act
Landfill Service Continuation - Laidlaw Environmental Services, Ontario (1996)	-continuation of hazardous waste landfill disposal at a private integrated hazardous waste treatment and disposal facility -average annual waste quantity of approximately 120,000 tonnes -secure, entombed landfill; expansion within existing property boundaries and would include berm relocation, a new landfill cell, new surface water collection and control structures and a new leachate storage reservoir -14.3 ha expansion within 121 ha property -site life 15 to 25 years -no new employment	-located on a site designated for waste disposal, in a rural setting in Moore Township near Sarnia in southwestern Ontario -an environmental assessment in accordance with the requirements of the Ontario Environmental Assessment Act
Proposed Northumberland Strait Crossing Project - Strait Crossing Inc. (PEI) (1993)	-bridge from Prince Edward Island to New Brunswick -bridge and tunnel alternatives addressed in previous documentation at a generic concept level -13 km bridge; major components - approach roads, abutments, approach spans in shallow water, deep water marine spans and navigational span and administrative facilities -also includes land based infrastructure -five year construction period -private operation for 35 years and then to Crown -design life - 100 year -60 operations job; construction employment - direct -2000; contractors - 2000 -total cost $800 million	-a bridge across the Northumberland Strait, between Borden Prince Edward Island and Jourimaini Island, New Brunswick -specific environmental evaluation; initiating department Public Works Canada under the Federal Environmental Assessment Review Process (EARP) Guidelines Order; also subject to EIA requirements of New Brunswick and PEI -bridge to privately constructed, operated and owned for 35 years and transferred to Crown
Military Flying Activities in Labrador and Quebec - National Defence (1989)	-present and future low-level flight training pursuant to agreements between Canada and NATO (Component 1) -establishment and operations of a Tactical Fighter Training Centre including all associated activities, facilities and installations (Component 2) -15,300 sorties (day) and 2,700 (night) sorties - Component 1 ; 12,750 sorties (day) and 2,250 (night - Component 2 -the existing training area occupies a total area of just under 100,000 km^2; involves an expansion of northern training area by 20,000 km^2 and the establishment of an offshore sea range -10 year planning period -total employment - 3,902 (Component 1) and 6,681 (Component 2) -capital cost $26 million (Component 1) and $305 million (Component 2)	-2 training areas within a large study area encompassing most of the Quebec-Labrador Peninsula -in accordance with the requirements of the Federal Environmental Assessment Review Office -FEARO process takes precedence over land claims agreements with assessment procedures; areas likely to be raised by agreement to be addressed in EIS

Table 1 - Example EIAs

EIAs (proposal / proponents)	**Key Proposal Characteristics**	**Settings / Jurisdictions**
Water and Sewer project for Town of Salmon Cove in Newfoundland (1994)	-a municipal water and sewer disposal system; includes a diffused ocean outfall -feasibility of system assessed in previous study accepted by Town and Province -to serve the communities of Salmon Cove and Victoria -water and sewer mains already upgraded -4 ha site -facility capable of handling 46,440 cubic metres -estimated capital costs $2.7 million -operating staff - 12 -20 year project life	-to be located on the shoreline of the Town of Salmon Cove -combined populations of Victoria and Salmon Cove 2622 in 1991; communities located along Conception Bay Highway -in accordance with the requirements of the Newfoundland Environmental Assessment Act

encompass seven project types. There is one area-wide, one multi-project (three others are multi-component with subassessments), three linear and five point source EIAs. One of the projects is primarily over water, another is partially over water and a third is on the shoreline. The balance of the projects are primarily in terrestrial settings. Two undertakings are in small town settings, three are in rural settings and the balance are in resource and remote areas.

General evaluation lessons, drawn from ten site selection examples, are also highlighted in Chapter 8. The ten examples all represent substantial site selection exercises for large, highly controversial, facilities. Each siting process extended over a period of years, necessitated a substantial financial resource commitment and provided for significant public and agency involvement. Although the question of whether these examples are fully representative of facility siting experiences in Canada is always open to debate, the scale and resources committed to these exercises certainly offered the potential for the introduction and application of innovative siting procedures. At the very least the examples provide ample opportunities for identifying positive and negative siting experiences. Further details are provided in the article prepared by the writer on the subject (Lawrence 1996a).

Research Limitations

This thesis seeks to narrow the gaps between EIA planning process theory and EIA practice. Further refinements would, for example, be required to derive performance standards that could be applied directly at either the regulatory or the applied levels. This thesis represents a series of probes that inform practice rather than specific methods and frameworks for direct application in practice. The scope of the thesis is extremely broad. Depth has necessarily been sacrificed. This lack of depth has been for the sake of spanning boundaries - boundaries that are too infrequently spanned and that have inhibited the enhancement of EIA theory and practice. The decision to emphasize breadth over depth has implications for the treatment of the relationship of theory and practice and, more specifically for the applied examples. A very detailed treatment of a narrowly defined area can lead to quite precise explanations and prescriptions. The broadly-based approach, adopted for this thesis, necessarily means that prescriptions are more general and more qualified.

The boundaries of and within EIA are not well defined. In some respects this is inherent to interdisciplinary - interprofessional fields of theory-practice. Bounding this analysis is, therefore, arbitrary. Ill-defined boundaries are, however, an opportunity because they make it easier to span and transcend internal boundaries and to more readily draw upon concepts and insights from other related fields. The recognition of permeable boundaries also reduces the likelihood of artificial distinctions and rigid positions. When positions and preferences become prematurely entrenched in requirements and guidelines, EIA practice is severely inhibited.

EIA is not underlain by a single unified theory or indeed a clear consensus regarding alternative theories. Thus, it is not possible to sharply delineate the conceptual core of EIA or that portion that pertains to the EIA planning process. The identification of major, mainstream theories and concepts of direct relevance to the EIA planning process is a more realistic objective. An additional complicating consideration is the difficulty of tracing the historical evolution of principal concepts for a field that is little more than twenty years old. Early concepts in EIA have not been fully replaced by more elegant and refined approaches to the EIA planning process. Many of the historical concepts are untested or their application has not been rigorously assessed. These concepts may be as valid or more valid than many contemporary concepts. In reviewing depictions of the EIA planning process, a recurrent pattern is the presentation of "new" approaches that frequently duplicate previously formulated approaches. Appreciating this tendency, this thesis has concentrated on the substance of concepts and frameworks of direct relevance to the EIA planning process.

Language in EIA can clearly inhibit any structuring and synthesis effort. Unfortunately there has been a tendency to use language loosely and inconsistently in EIA literature. The excessive use of arcane and technical jargon also is endemic. These constraints need not defeat analysis and synthesis efforts. The careful and consistent use of language, together with a concerted effort to clarify muddled and overlapping concepts and frameworks, can further the demystification process.

A final research limitation is the impossibility of fully embracing all concepts and frameworks bearing on the EIA planning process. The thesis, therefore, focuses on major distinctions and key issue areas in the selected areas identified earlier in this chapter. The selective nature of the approach is both inevitable, and to some degree, arbitrary. However, a concerted effort has been made to encompass a diverse array of major themes and issue areas pertaining to the EIA planning process, especially those that are most contemporary, are less fully developed and are more subject to varying interpretations.

Summary

The thesis renews the EIA planning process by integrating ideal planning process characteristics, planning theory insights and the concept of sustainability. It also redesigns and refines the overall planning process, together with key activities within the planning process, at the regulatory and applied levels.

EIA is a rapidly evolving field of theory and practice but the conceptual basis of EIA is not well developed and EIA practice falls well short of its potential. The EIA planning process, although central to EIA theory and practice, is in need of renewal, redesign and refinement. The writer has had a long term interest in planning theory, in EIA and in the interconnections between the two fields. The writer's experiences in EIA have underscored his concern with the poorly developed and applied state of the EIA planning process.

The research objective is addressed by drawing upon the existing knowledge base of EIA theory and practice and of related fields, especially planning theory. The specific research objectives are explained and a rationale is presented for the aspects of the EIA planning process that are and are not addressed. A pragmatic perspective and an integrative approach are adopted. Interconnections among research objectives are illustrated and described.

The research methodology is directed toward prescriptive EIA planning process theory building, although the concepts and frameworks presented are largely at the pre-theory and working theory levels. Both inductive and deductive reasoning are applied, with an appreciation that any resulting theories will be fragmented and conditional. The principal data sources are EIA and related field literature, a selective review of Canadian EIA regulations, guidelines and documents and previous research by the writer. The data analysis uses the literature, regulatory requirements and EIA examples as a pool of knowledge and experience from which to formulate, integrate and refine concepts and frameworks directly bearing on the EIA planning process. The research methodology mixes elements of qualitative and quantitative research. It also contains elements of positivist social science, interpretative social science, critical social science and, to a much more limited extent, postmodern theory. The thesis encompasses exploratory, applied and evaluative research. The principal data collection and analysis methods are literature and regulatory review, supplemented by an analysis of several applied examples. These methods are appropriate to the thesis objectives and to an exploratory and integrative approach to a broad, but ill-defined, subject area. A summary rationale is provided for the selection of the applied examples.

The major strengths and the major limitations of the research relate to the stress placed on breadth over depth and synthesis over analysis. The treatment of the research topic is also constrained by the permeable boundaries of the field, a poorly-defined and weakly developed conceptual core to EIA, loose and inconsistent language use in the literature and the necessity of, at least in part, arbitrarily excluding literature and experiences of potential relevance to the EIA planning process.

Endnotes

[1] A cross section of EIA experiences in other countries is presented in a recent report on EIA effectiveness (Sadler 1996), in recent comparative reviews of EIA requirements (Wood 1995; Gilpin 1995) and in adaptation s of EIA for developing countries (Bismas and Agarwala 1992).

THE CONVENTIONAL EIA PLANNING PROCESS

Introduction

This chapter describes the EIA planning process as conventionally depicted in EIA texts and guidelines[1]. EIA characteristics and objectives are first presented because EIA planning process characterizations are interdependent with assumed EIA characteristics and objectives.

The descriptions of EIA characteristics and objectives are a refinement of a previously published article by the writer (Lawrence 1994a). The descriptions are a composite rather than a consensus. Depictions of EIA characteristics, EIA objectives and the EIA planning process vary greatly from source to source. These variations are more the result of the varying perspectives of different writers than clearly defined schools of thought. Although there has been a progressive process of elaboration over the past two decades, there also are many instances where elements suggested in earlier works have not been incorporated into more recent portrayals.

This overview of the conventional EIA planning process is a point of departure for the modifications and refinements suggested in Chapters 3 to 9. The conventional portrayals of EIA characteristics, EIA objectives and the EIA planning process are revisited in Chapter 10, taking into account the combined implications of the Chapters 3 to 9 analyses.

The Characteristics of EIA

The following are EIA characteristics as commonly depicted in introductory EIA literature and guidelines. Although the ascribed characteristics are not necessarily appropriate or practical, conventional characterizations must be considered if a basis for reform to EIA characteristics and, in turn, to the EIA planning process, is to be established.

As a field of study EIA draws upon many social and natural science disciplines (Jain, Urban and Stacey 1977). This is necessary to understand pertinent aspects of the environment and to predict how those environmental attributes might change over time - with and without a proposed action. Boundaries between and links to both traditional disciplines and to other transdisciplinary and transprofessional fields, such as planning (Lawrence 1992) and environmental management, are poorly defined. EIA must transcend individual disciplines if a holistic image of the environment, with and without a proposed action(s), is to be presented. Hence EIA should be viewed as a transdisciplinary field.

EIA is not restricted to the study of the environment as it is and could be. It also is a decision-making aid that should be applied prior to any environmental intervention. In this regard EIA is a normative procedure that seeks to identify natural and social environmental norms or ethical standards and to infuse these into planning and decision-making.

For EIA to incorporate environmental norms into decision-making, it must address both environmental ethics and values and human ethics and values, perceptions, attitudes and beliefs. It is an objective procedure for identifying, measuring and predicting environmental attributes and changes brought about by existing or proposed actions, but is subjective in the interpretation, aggregation and management of those changes. Although driven by an environmental ethic, the links between EIA and ethical theory in general and environmental ethics in particular, have been tenuous at best. The tendency has been to assume that concepts and methods developed to predict and explain environmental change provide a sufficient knowledge base.

The practice of EIA involves, usually implicit assumptions regarding the known environment, environmental impacts and environmental norms. It is, for example, generally assumed that: aspects of the environment and their interrelationships can be identified, described or measured and monitored; changes, with or without a proposed action, can be predicted to the extent that cause-effect relationships can be established; stakeholders' values can be determined; measures of impact magnitude and importance can be combined; individual and cumulative environmental consequences can be interpreted, aggregated and managed; and issues of probability and uncertainty can be managed sufficiently to decide whether a proposed action should proceed and, if so, in what fashion. These knowledge assumptions are questionable, especially in the subjective realm of conflicting values, perceptions and human behaviour.

The primary focus of EIA was initially on the physical and natural environment and, to a lesser extent, on the socio-economic consequences of physical and natural environmental changes. The "environmental," aspect of EIA now generally embraces both natural (physical, biological, ecological) and human (human health and well being, social, cultural, economic, built) environmental components and systems (Wiesner 1995) and their interrelationships (Jain, Urban and Stacey 1977; Estrin and Swaigen 1978; CEARC, 1988b). There are varying opinions regarding whether social impact assessment (SIA) or socio-economic impact assessment is or should be a sub-field of EIA (Morris and Therivel 1995). A broad definition of the environment for EIA facilitates a more comprehensive approach to environmental management but it leaves open the possibility that certain elements of the environment will not receive sufficient attention. The question of how best to integrate ecological, social and economic data and perspectives remains unresolved.

Human actions alter the environment (Jain, Urban and Stacey 1977; Mitchell and Turkheim 1977). In EIA, the term "impact" generally refers to the expected environmental consequences (Meredith 1991) of a proposed action or set of actions (Rau and Wooten 1980), and less frequently to the actual consequences of an existing activity. Distinctions also are often drawn between changes or effects (measures of magnitude) and impacts (measures of magnitude in combination with measures of importance), between alternations of environmental conditions or the creation of a new set of environmental conditions, and between environmental condition changes caused or induced by actions (Rau and Wooten 1980).

Although the traditional focus of EIA has been capital projects, EIA requirements are increasingly applied to legislative proposals, policies, programs, technologies, regulations and operational procedures. (Munn 1979; Estrin and Swaigen 1978; CEARC 1988b; Therivel *et. al.* 1992; Sadler 1996). The expectation that the conceptual basis for EIA, largely developed at a project level, can be readily extended and applied to policies, programs and technologies is questionable. At the policy and program level the range of interrelated choices tends to multiply, impacts tend to be more generic and less amenable to precise prediction and EIA overlaps with policy and program evaluation, planning and environmental and resource management.

A distinction is sometimes drawn between project-level EIA and the strategic environmental assessment (SEA) of policies, plans and programs (Sadler 1995). Risk assessment, technology assessment and environmental health impact assessment are viewed as either subfields within EIA (Sadler 1995) or as distinct fields that partially overlap with EIA. In most cases EIA applies to the actions of both public and private proponents (Meredith 1991; Mitchell and Turkheim 1977). Alternative methods of achieving a proposed end and of managing the impacts associated with a particular choice are also usually considered in an EIA planning process.

In EIA definitions, the "impact" element is often prefaced by one or more dimensional distinctions, such as; positive and negative (Mitchell and Turkheim 1977; Rau and Wooten 1980), time (short term, long term, frequency, duration), space (on-site, off-site), direct and indirect, quantitative and qualitative, individual and cumulative, and likelihood of occurrence (Burchell and Listokin 1975; Rau and Wooten 1980)[2].

The "assessment" component of EIA includes "analysis", "synthesis" and "management". Analysis involves data collection and compilation, the identification of likely environmental conditions and interactions among environmental conditions and systems (Munn 1979; Munro *et. al.* 1986; Armour 1990; Erickson 1994) and the description, measurement and prediction of likely effects and interactions among effects (Munn 1979; Hyman and Stiftel 1980; Munro, Bryant and Matte-Baker 1986; Bisset 1983). Synthesis includes the interpretation of the significance of effects and interactions among effects (Munn 1979; CEARC 1988b) and the aggregation and evaluation of individual and cumulative effects (cumulative environmental assessment - CEA) , both with and without mitigation (Westman 1985; Lang and Armour 1981; Armour 1990; Erickson 1994; Shoemaker 1994) Management includes mitigation (Jain, Urban and Stacey 1977), compensation and local benefits (Armour 1990), the management of residual impacts (CEARC 1988b), monitoring and contingency measures, and communications / consultation activities (CEARC 1988b).

In summary, EIA is a process that identifies, predicts, evaluates and manages the potential (or real) impacts of proposed (or existing) human activities on both the human and natural environment. The EIA planning process includes analysis, synthesis, management, communications and consultation activities. The consequences of such activities and their alternatives will result in specific impacts.

Underlying EIA practice are, usually implicit, application assumptions. Formal or informal institutional mechanisms are, for example, anticipated to be in place to help to compel, or at least facilitate, public or private proponents to initiate and complete an EIA planning process and the necessary documentation, as a prerequisite to project approval. Along with requisite methods it is expected that a systematic planning process can be devised or adapted for analyzing and synthesizing the appropriate data and for involving relevant agencies and the public. It is further assumed that: there is appropriate expertise to tackle the necessary technical work and to review whatever outcomes the planning process produces; there is a basis for choosing among alternative plans and for deciding if an undertaking should or should not proceed; the people who make the decisions will rationally use the information provided to guide their actions; the requirements for approvals can be enforced and the impacts managed; and if unforeseen impacts occur, the appropriate contingency measures can be instituted. These application assumptions have been increasingly challenged in the EIA literature and in decisions of courts and hearing panels and boards. The expectation that knowledge and expertise are sufficient may be especially dubious in situations characterized by emerging technologies, poorly understood environments and complex interrelationships within and among proposed actions and components of the environment.

The extension of EIA from the conceptual to the applied presupposes that EIA must also be a transprofessional field of practice. In common with other professional fields of practice, EIA comprises a core body of knowledge, skills and methods. Social and natural sciences provide the initial knowledge base. EIA seeks to integrate and, thereby transcend, the inputs and insights of a range of professions with expertise in the proposed action, the environment and their interactions, within a public policy setting. Frameworks, procedures and methods have been formulated and refined through practice, which over time, has resulted in the emergence of EIA as a recognized area of expertise.

EIA is a planning tool (Bisset 1983; Clark 1983a; Smith 1993). It is a form of applied policy analysis or, more specifically, a form of resource management and environmental planning (Smith 1993). Consequently, the formulation and application of environmental planning processes (Armour 1990; CEARC 1988b; Burchell and Listoken 1975) is one aspect of EIA. It, therefore, tends to be assumed that an EIA planning process should be anticipatory (prior to decision-making) (Meredith 1991), systematic or orderly (Burchell and Listokin 1975) and rational. The results and conclusions from the EIA planning process should also be documented (Meredith 1991; Burchell and Listokin 1975), generally in the form of an EIA report or statement.

EIA is a generic planning process intended to contribute environmental information to decision-making

(Meredith 1991; Beanlands and Duinker 1983; Smith 1993; Sadler 1995). It provides a regulatory basis for forcing the explicit consideration of environmental concerns by public and private decision-makers (Meredith 1991; Bartlett 1990). As such EIA forms a part of the institutional fabric through legislation, public policy or administrative procedures (Mitchell and Turkheim 1977; Meredith 1991). Institutionalization requires mechanisms to prepare, review and document the process, to co-ordinate inter-agency and public/private interactions, to adjudicate disputes, and to monitor and enforce compliance.

EIA has been implemented through numerous institutional arrangements in Canada and in other jurisdictions. These arrangements pertain to such matters as who prepares the EIA, the role of government regulators and reviewers, the role of various publics, the use of mechanisms to mediate and adjudicate disputes, and monitoring and enforcement procedures. What is far from clear is the relative efficiency and effectiveness of the available structures and procedures, or whether there may be alternative approaches that may be more appropriate for incorporating environmental concerns into public and private decision-making.

In a broader sense, EIA is a socio-political phenomenon (Beanlands and Duinker 1983). It is both a policy strategy that seeks to reform administrative procedures and a political process (Smith 1993). EIA represents an institutional response to a public awareness of and demand for a greater sensitivity to natural and social environmental considerations. It attempts to counterbalance an historical preoccupation with economic and technical concerns, and is part of a larger socio-political movement to avoid and reduce the negative externalities frequently resulting from too narrow a decision-making agenda (Meredith 1991).

EIA has long been criticized for the socially and politically naive assumptions of unitary decision-makers and the expectation that a "rational" knowledge basis is sufficient to ensure implementation. Consequently, there has been an increasing shift toward more pluralistic, flexible and cooperative approaches to EIA that emphasize consensus building, conflict resolution and ongoing impact management. Whether, and the extent to which, these modifications have made EIA more socially responsible and more politically effective is unclear.

Ultimately, EIA is a form of environmental intervention. It can either lead to more positive changes in the built, biophysical and socioeconomic environments or it can create the illusion of change and, in so doing, reinforce adverse environmental conditions and consequences (Livingston 1981). This expectation of a positive environmental role presupposes that a distinction can be drawn between positive and negative environmental changes. It also presumes that the interpretation of such changes can be placed within the context of general indicators of environmental and social quality. Environmental impacts result from both the EIA planning process and from the resulting decisions. The assessment of the environmental outcomes of EIA (i.e., EIA effectiveness) has been extremely limited (Sadler 1996).

The Objectives of the EIA Planning Process

Many objectives have been advanced for the EIA planning process as summarized in Table 2. Direct EIA objectives can be realized by EIA alone. Indirect EIA objectives require a co-operative approach with other public and private initiatives. Both types of objectives of EIA are not always achieved. Indeed, the EIA planning process and documentation can inhibit rather than enhance their realization. Moreover, the range of objectives is so broad that they may work at cross purposes, rendering it virtually impossible to assess how well each is achieved. Nevertheless, EIA aspirations regarding what it "can" seek to accomplish represent a useful point of departure for a critical assessment of whether those aspirations are appropriate and practical for guiding and shaping the EIA planning process.

Direct EIA planning process objectives pertain to the planning and decision-making process, to organizational and administrative settings and to the environment and society. EIA can provide better environmental information for use in planning and decision-making (Torgerson 1980; Jain, Urban and Stacey 1977; Holling 1978; Meredith 1991). By enhancing the decision-making knowledge base, there can be a greater understanding of environmental information, values and consequences (Craig 1990; Beanlands and Duinker 1983, ; Grima *et. al.* 1986). Competing economic, social and ecological needs and demands can also be reconciled (Wiesner 1995). As well, there can be a greater - and earlier - consideration of potential environmental consequences (Estrin and Swaigen 1978; Jain, Urban and Stacey 1977, Westman 1985). The increased weight attached to environmental information, values and consequences in planning and decision-making (Craig 1990) can, in turn, assure that non-environmental, technical and economic

Table 2 - EIA Objectives

DIRECT	INDIRECT
PLANNING / DECISION MAKING	
• better environmental information (knowledge basis) • enhanced understanding of environment (knowledge/values) • greater consideration of environmental consequences- ecological rationality • earlier consideration of environmental consequences • reconcile environmental, social and economic needs and demands	• less partisan (objectivity) • more open and accountable (public involvement) • more rational (rationality) • improved environmental data base and environmental analysis methods • vehicle for involvement by scientific and professional communities
ORGANIZATIONS - ADMINISTRATION	
• better environmental information (knowledge basis) • change in organizational perceptions and attitudes toward environment (knowledge/values) • change in organizational behaviour toward environment (behaviour)	• vehicle for intra and inter-agency coordination (cooperation) • vehicle for public/private cooperation (coordination) • vehicle for greater scientific and professional involvement (coordination) • more open organizations (values/behaviour) • less partisan - political organizations (values/behaviour) • more rational organizations (values/behaviour)
ENVIRONMENT	
• prevent environmentally unsound undertakings • choose environmentally sound undertakings • reinforce environmentally and socially sound undertakings	• protect and preserve environment • enhance environment • harmonize human and built environment • harmonize human environment • harmonize human and natural environments • sustainable environment (natural, economic, social)
SOCIETY	
• mitigate negative impacts of an industrial society	• enhance environmental understanding (knowledge) • further environmental ethic (values) • facilitate environmentally conscious behaviour (behaviour) • consider future generational implications (behaviour)

rationality does not dominate. Ecological rationality is instead required, fostered and reinforced (Bartlett 1990). Public and private decision-making can, therefore, become more environmentally and socially responsible.

Within organizational and administrative settings, EIA can provide an improved environmental information base and, in turn, a greater understanding of environmental concerns. This enhanced understanding can not only facilitate changes in organizational perceptions and attitudes toward the environment (Beanlands and Duinker 1983) but also contribute to changes in organizational behaviour. The direct environmental benefits can be fewer environmentally unsound projects (Burchell and Listokin 1975; Meredith 1991), more environmentally sound projects (Marshall *et. al.* 1985) and the reinforcement of environmentally sound actions (Brown 1990). On a broader scale EIA seeks to mitigate the destructive potential of an industrial society (Bartlett 1990).

Ideally, EIA can contribute to less partisan (Jain, Urban and Stacey 1977), more open and accountable (Lang and Armour 1981), and more systematic and rational (Grima *et. al.* 1986) decisions. EIA can further the integration of science and the involvement of scientists and professionals in planning and decision-making (Twiss 1974). It can also provide and enhance environmental data bases and analysis methods, and contribute to transdisciplinary communications and analysis. EIA can be a vehicle for intra- and inter-agency coordination (Twiss 1974). In addition, it can be a tool, through its action-forcing mechanisms, for opening up organizational / administrative procedures to the public and to the scientific community, and for making organizational and administrative procedures less partisan and more rational (Diamond and Noonan 1996).

EIA can assist in protecting and preserving the environment (Jain, Urban and Stacey 1977; Sadler 1996), enhancing the environment (Meredith 1991; Westman 1985), and harmonizing the human and the natural environments (Meredith 1991; Jain, Urban and Stacey 1977; Westman 1985). More recently EIA has been identified as a potential tool for contributing to the goal of sustainability - environmental sustainability assessment (ESA) (WCED 1987; United Nations 1992; Sadler 1995, 1996; Smith 1993).

As previously noted, EIA is a socio-political phenomenon (Beanlands and Duinker 1983). As such, it can further societal understanding of the environment (Jain, Urban and Stacey 1977). EIA can be a means for society to use knowledge to anticipate and ameliorate potential environmental consequences. Ideally, environmental concerns should no longer be labelled as "externalities" that require action-forcing mechanisms to ensure their consideration. Rather, they should be intrinsic and central components of any decision-making process. And finally, EIA can help to protect the interests of future generations (Meredith 1991). This objective is concerned with greatly extending the temporal perspectives of public and private decision-makers, again consistent with the concept of sustainability.

All of the preceding objectives represent examples of what EIA literature identify as what "can" be realized through EIA requirements and procedures. What has yet to be determined is whether and to what extent these objectives "will" or "should" be realized. Also unresolved is whether efforts to realize some objectives detract from the realization of others and whether they may be instances where other instruments, such as ecologically-based planning, resource and environmental management, may be more appropriate for realizing EIA objectives.

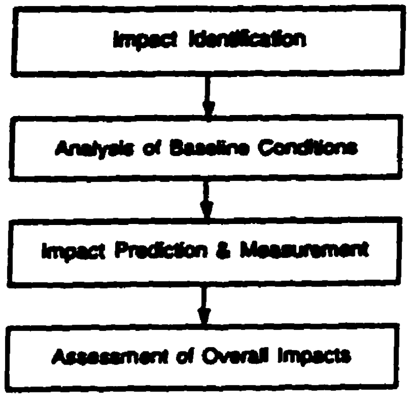
The Conventional EIA Planning Process

It is something of a misnomer to refer to a "conventional" EIA planning process because of the variety of forms in which the EIA planning process is presented. Curiously, each portrayal is presented as if there is only one EIA planning process, although it is occasionally conceded that minor variations do exist. There are, however, many shared elements, a few shared assumptions and a general trend toward more elaborate depictions of the EIA planning process in recent years.

The foremost assumption, that "cuts across" most of the depictions, is the expectation that most planning process components represent distinct stages rather than continuous activities. It is further assumed that these stages can be arranged in a logical order, that major interconnections can be identified, and that the resulting process can be applied to any EIA planning process, regardless of contextual variations. None of these assumptions stands up well to scrutiny in the analysis presented in the remaining chapters.

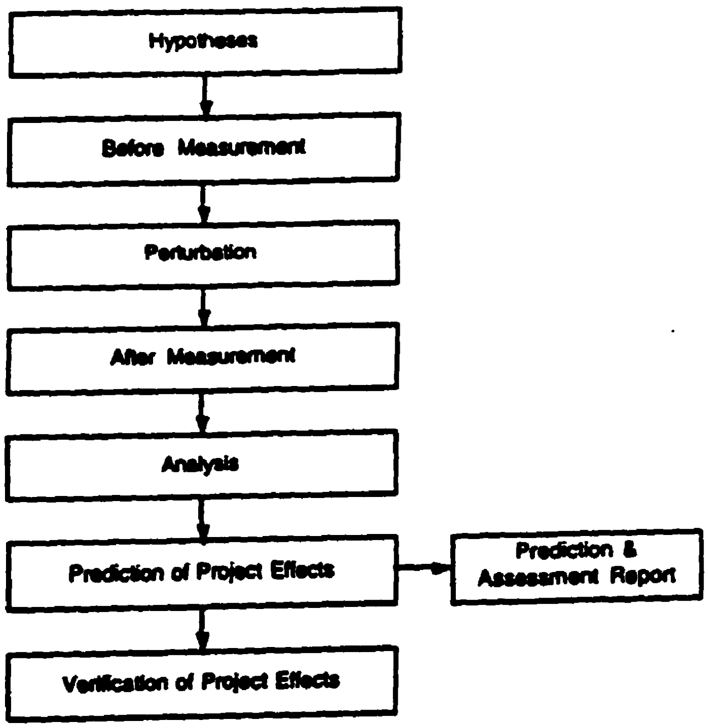
The EIA planning process, in its most basic form, is illustrated in Figure 3. Under this process, project characteristics have already been determined external to the process. The process begins with the identification of impacts. Baseline conditions, within potentially affected areas, are then analysed. Assuming that baseline conditions

Figure 3. Basic EIA Process



(after Rau and Wooten 1980)

Figure 4. Basic EIA Process - "Scientific" Variation



(after Beanlands and Duinker 1983)

will not change over the operating life of the proposed project, impacts are next measured and / or predicted. Finally, overall conclusions are reached based on the pattern of identified positive and negative impacts.

A more "scientific" variation of this process is presented in Figure 4. This characterization treats the EIA as a scientific experiment (Beanlands and Duinker 1983). The process commences with a series of hypotheses concerning potential impacts. Pre- and post impact measurements are then undertaken. These measurements are combined into predictions of project effects and then recorded in a prediction and assessment report. After the project is implemented, hypotheses are verified through measurements of actual impacts. Although this scientific variation of the EIA planning process is not widely evident in EIA literature, it's influence is reflected in the stress placed on rigorous impact prediction procedures and on impact verification through monitoring.

A great many elaborations of these basic characterizations of the EIA planning process have been introduced over the years, although not in a consistent or logical manner. Examples of major additions include: integrating the determination of proposal characteristics (Erickson 1994; Sadler 1996); adding in the screening and comparison of alternatives, both as a means of deciding on an undertaking and as a way of reducing adverse and enhancing positive features of an undertaking (Gibson 1991; Wood 1995; Westman 1985; Branch *et. al.* 1993; Burdge 1994); incorporating interpretative steps (examples include the formulation of goals, objectives and criteria, the determination of the significance of impacts, the evaluation of alternatives and the formulation of overall conclusions and recommendations) (Wood 1995; Westman 1985; Sadar 1996; Erickson 1994); providing for public and agency communications, consultation and participation (Clark 1983b; Burdge 1994); extending the process to encompass review, approval and implementation steps as well as the production of EIA documents (Wiesner 1995; Wood 1995; Sadler 1996; Gibson 1991) and integrating impact management steps such as the mitigation of adverse impacts for both alternatives and the proposed undertaking, the monitoring of environmental changes and impacts and the formulation of an overall impact management strategy (Sadler 1996; Sadar 1996; Morris and Therivel 1995; Branch *et. al.* 1993).

More recent refinements have included: the addition of a screening step (to determine the regulatory requirements that apply) (Wiesner 1995; Sadler 1996), the inclusion of a scoping step (as a mechanism for identifying key issues, stakeholders, choices and environmental components and interactions) (Sadar 1996; Wood 1995; Sadler 1996; Branch *et. al.* 1993; Morris and Therivel 1995; Wiesner 1995); the explicit consideration of cumulative effects (Erickson 1994; Morris and Therivel 1995; Burdge 1994); the integration of mechanisms to improve scientific rigour (examples include a specific study design step, the review of comparable projects and the use of peer review) (Beanlands and Duinker 1983); the identification of interactions among steps in the process (Burdge 1994; Branch *et. al.* 1993; Wood 1995; Westman 1985; Morris and Therivel 1995; Whitney and Maclaren 1985; Sadar 1996); and the addition of an EIA auditing step (to assess the effectiveness of the EIA planning process and its outputs) (Sadler 1996; Wiesner 1995).

Figure 5 integrates these additions and refinements to the basic EIA planning process. None of the characterizations of the EIA planning process considered includes all the steps and interactions illustrated in Figure 5. There are many variations among the depictions of the EIA planning process, with no consistent pattern over time and many differences in terminology.

An interesting variation of the conventional EIA planning process is adaptive environmental assessment (AEA) (Holling 1978). The major components of the AEA process conform quite closely to the scientific variation of the EIA planning process, although the centre-piece of the exercise is model building and modification. Explicit consideration is also given to the role of a specialist group and a core group. Of particular interest, from an EIA planning process design perspective, is the view of process steps as continuous and/ or recurrent activities, that vary in intensity through the course of the process. This theme is pursued in much greater detail in Chapter 6.

In addition to the many characterizations of the EIA planning process, there has been an effort to place EIA with a broader planning and decision-making framework. Figure 6 illustrates the types of elements often included in such frameworks. General direction, for example, tends to be established through a combination of an ecosystem approach to planning and sustainability goals, objectives and imperatives. The problems and opportunities, identified within this context, are addressed through a loosely integrated planning and decision-making system that encompasses such elements as strategic environmental assessment (SEA), area-wide EIAs, general policy-making and systems planning, environmental and resource management and planning and environmental protection procedures. Cumulative

Figure 5. Composite EIA Process

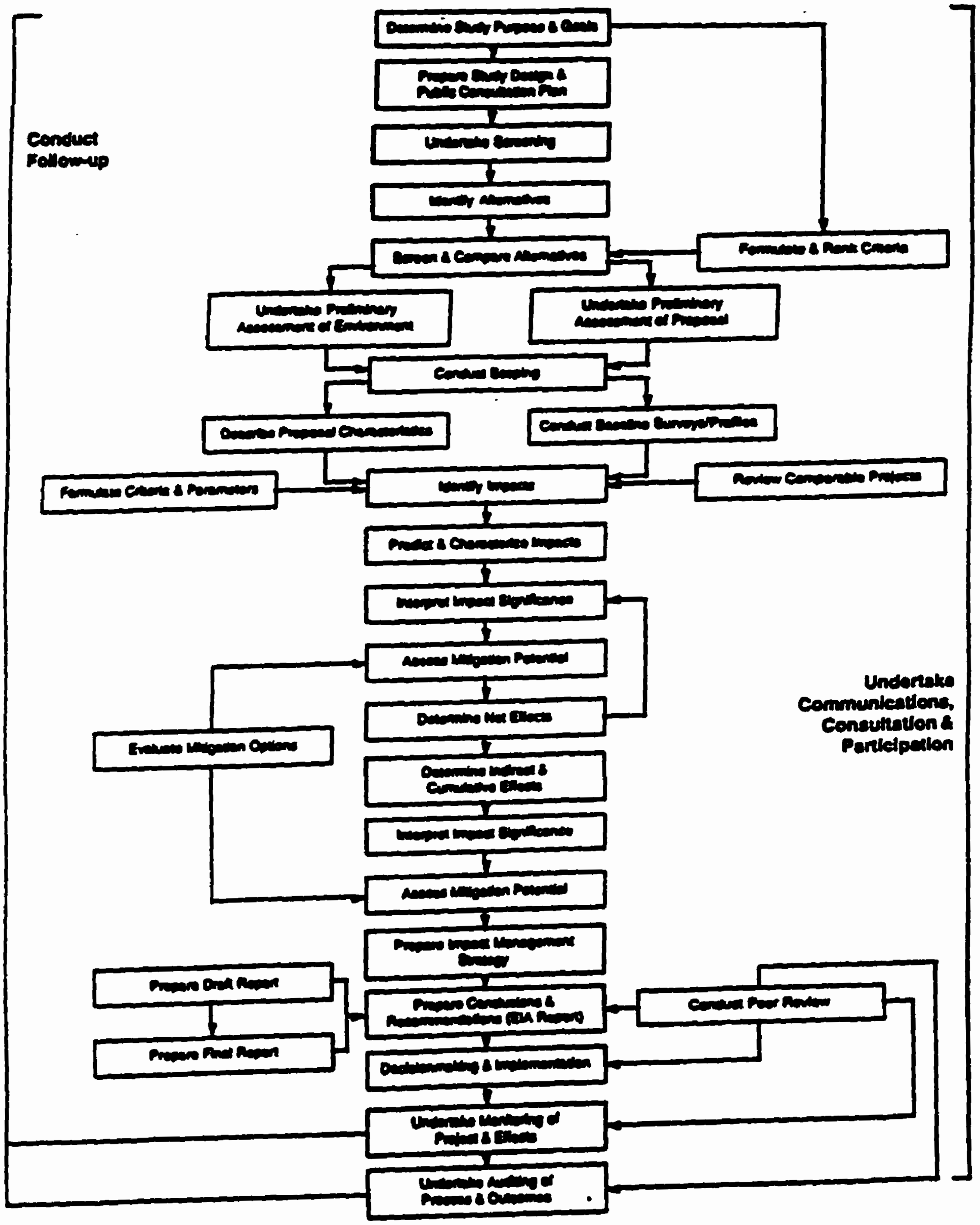
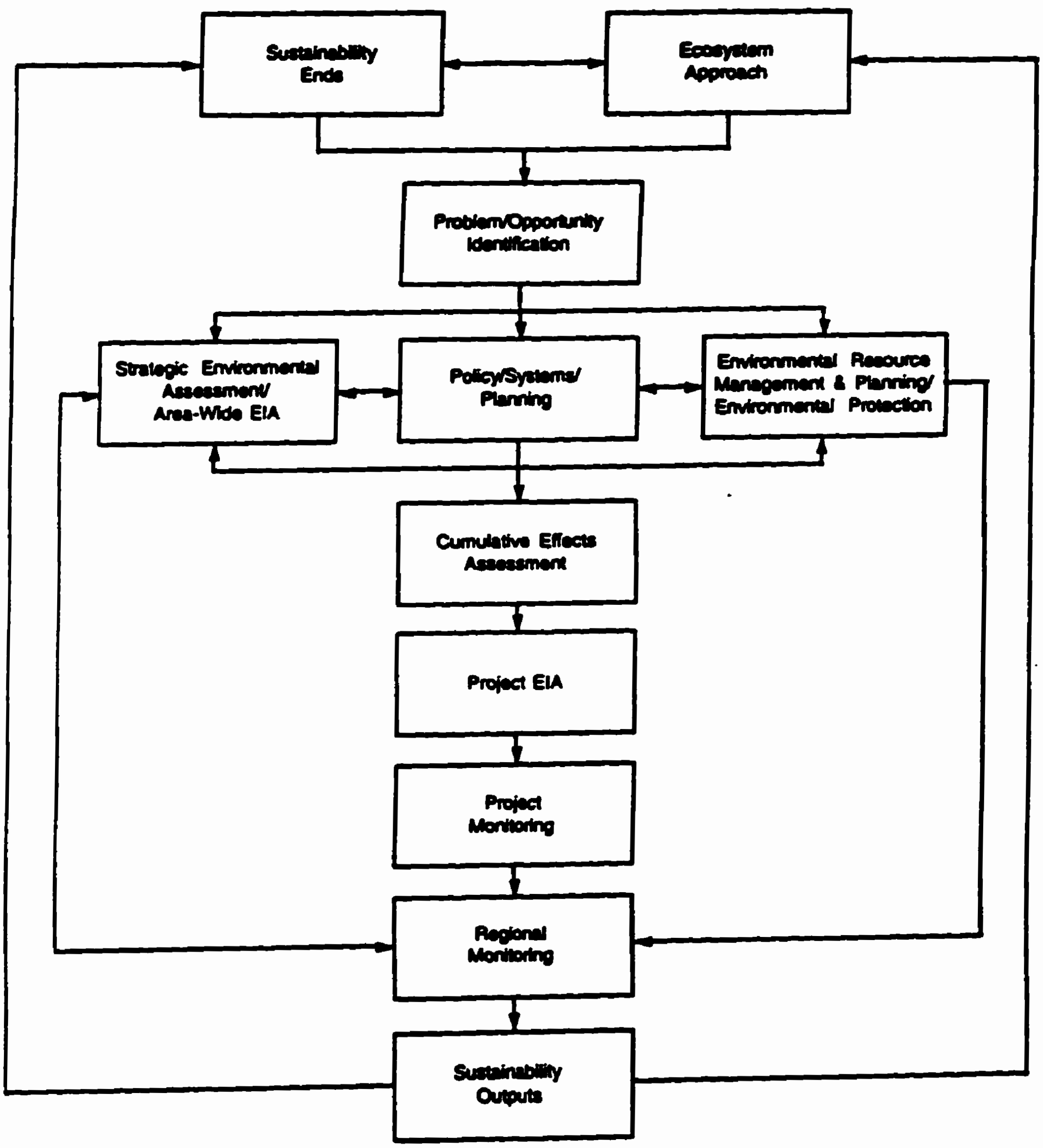


Figure 6. Frameworks for Integrating EIA and Other Forms of Environmental Management



(after Smith 1993; Sadler 1996)

effects assessment (CEA) provides a bridge between these broader forms of systems-level planning and project-level EIA. Regional monitoring also provides the context for project-level monitoring. Products (both decisions and environmental changes) from this interactive system are assessed against sustainability ends and for consistency with the ecosystem approach. Appropriate adjustments are then made at both a systems and a project level. These types of frameworks are generally quite conceptual (Smith 1993; Sadler 1996). They receive more detailed consideration in the remaining chapters, particularly in Chapters 5, 7 and 9.

Summary and Conclusions

EIA characteristics, EIA objectives and the EIA planning process, as conventionally depicted, are presented. Although the depiction of each varies greatly within the EIA literature, there are no well defined schools of thought, only a limited acknowledgement of differences from source to source and numerous inconsistencies in terminology.

EIA is a field of theory and practice, built upon a mix of, often implicit, knowledge and application assumptions. EIA seeks to transcend disciplines and professions. It includes both objective and subjective elements and encompasses processes and methods. The scope and nature of the EIA planning process is shaped by how "environmental", "impact" and "assessment" are defined and applied. EIA is formalized through institutional arrangements and has intentional and unintentional, positive and negative environmental, social and political impacts and implications. Many EIA characteristics are loosely defined, are of questionable validity and require closer scrutiny.

The EIA planning process is directed toward numerous direct and indirect planning, decision-making, environmental and societal objectives. Although EIA may contribute toward the realization of these objectives, it is far from firmly established whether these objectives are appropriate, are being realized, may operate at cross purposes or may be better addressed by other environmental management instruments.

There are numerous variations of the EIA planning process evident in the EIA literature, although the existence of these variations is rarely acknowledged. Two basic EIA planning processes are presented that focus on the measurement and prediction of environmental change, with and without a proposed undertaking. A composite planning process is then described that adds such elements as proposal characteristics, alternatives, interpretations, evaluation, impact management, public and agency involvement, documentation, implementation, screening, scoping, cumulative effects, measures to enhance scientific rigour, interactions among steps and auditing. A further variation, adaptive environmental assessment, that treats process components as continuous activities, and a composite framework for integrating EIA with other forms of environmental management, are also presented. The assumptions underlying most depictions of the EIA planning process are questionable, especially the view that each component is a single stage and the expectation that the process can be applied regardless of context.

The conventional EIA characteristics, EIA objectives and the EIA planning processes presented in this chapter are the "point of departure" for the modifications and refinements introduced in Chapters 3 to 9. Overall implications are addressed in Chapter 10.

Endnotes

[1]The conventional planning process, as described here, is, as demonstrated in Chapters 7 to 9, more comprehensive than the EIA planning process as conventionally applied in practice.

[2]There are some differences of opinion regarding whether the field should be described as "environmental assessment" or "environmental impact assessment". Ontario, for example, has an *Environmental Assessment Act.* There are also debates concerning whether the term "effects" or "impacts" is more appropriate. Labouring over such fine distinctions is, from the writer's perspective, of limited value. EIA has been used in this thesis because it is more descriptive of the focus of the field (i.e., measuring and predicting impacts resulting from a proposal as distinct from environmental changes that would have occurred in any event). "Effects" and "impacts" are used interchangeably.

IDEAL PLANNING PROCESS CHARACTERISTICS

Introduction

This chapter is the first of three that seeks to reform the EIA planning process. It draws upon many sources, both within and external to EIA literature, in an effort to identify key attributes of an ideal planning process. These attributes represent a touchstone for assessing further planning process reforms and refinements.

Analytic and Integrative

The EIA planning process should be both analytic and integrative. Analysis articulates, clarifies and creates a structure of meaningful distinctions (Douglas 1972). Integration or synthesis binds, blends and embraces distinctions drawn through analysis. Science is analytic (Cross, Naughton and Walker 1991). Design is constructive or integrative (Mills 1959; Lawrence and Lorsch 1967). Analysis and synthesis are complementary and iterative (Etzioni 1968). Both represent universal elements of the EIA planning process (Etzioni 1968).

The identification, prediction and interpretation of individual alternatives, impacts and mitigation measures represent analytical activities in the EIA planning process. The integration of alternatives into strategies, cumulative effects assessment and the formulation of impact management strategies are examples of synthetic EIA planning process activities. Traditionally analysis has received greater attention in EIA practice. This imbalance is being progressively corrected.

It is an oversimplification to label some EIA activities as exclusively analytic or integrative. A predominantly analytic activity still requires a sense of the whole - an image that must be reconsidered and refined based on analytical insights. Concomitantly, insights acquired during integrative actions will lead to the re-creation of analytical constructs. Care must be taken to facilitate interactions among analytical and integrative actions in the EIA planning process.

Directed, Rigorous and Practical

The EIA planning process is not an end in itself. It is a means to achieve an enhanced environment, better decision-making and improved practice. As noted in Chapter 2, the value of the EIA planning process is its contribution to the realization of EIA objectives. Will, for example, the process enhance our understanding of the environment and, in turn, contribute to the more effective integration of environmental values in decision-making? Will it contribute, directly or indirectly, to an enhanced environment or, at least, a better fit among the human, built and natural / physical environments?

It is sometimes argued that scientific rigour is unrealistic in the EIA planning process because of time and resource restrictions, political and organizational constraints and imperatives and data base limitations (Beattie 1995; Dickerson and Montgomery 1993). Yet without theoretical rigour the accuracy of predictions cannot be empirically tested and assumptions and findings and methods cannot be fully and fairly represented, evaluated and subjected to rigorous neutral criticism (Culhane 1993; Malik and Bartlett 1993; Beanlands and Duinker 1983; Rapoport 1990).

EIA cannot be held to the same standards of scientific rigour as traditional scientific research because of valid constraints to practice (Beattie 1995). As pointed out in Chapter 1, the EIA planning process tends to be further along the continuum toward practice (i.e., more informal and concrete). This does not preclude treating impact predictions as hypotheses to be tested, making assumptions, temporal and spatial boundaries and methods explicit, using appropriate statistical methods and, where applicable, control and comparative studies (Burdge 1994) and evaluating analyses through the use of peer review (Hirschman 1994) and post hoc assessment. It is also necessary to identify valued ecosystem components (VECs), place significance interpretations in context, establish clear spatial and temporal contexts, present explicit strategies for the investigation of interactions between projects and VECs, make predictions (together with the basis for predictions) explicit and demonstrate a commitment to monitor effects (Beanlands 1985). Where appropriate data can be obtained EIA impact predictions can be further enhanced with the greater use of quantitative forecasts and conceptual and quantitative modelling (Beanlands and Duinker 1983). Greater attention to theoretical rigour is consistent with the role of the EIA planning process in balancing science and politics in policy formulation and implementation (Burdge 1994).

Balancing rigour and relevance in the EIA planning process is not an easy task. Collectively the resources devoted to EIA are extensive. Each EIA can contribute to knowledge accumulation and enhanced practice. The decision-making limitations, that apply to the EIA planning process, demonstrate that the level of generality and contextual limitations will need to be tightly circumscribed. Scientific standards, with appropriate qualifications, should have a central role in impact identification and prediction. However, care should be taken to ensure that the path toward a more "scientific" EIA planning process does not lead in the direction of more technocratic decision-making that undervalues qualitative data and inhibits public involvement (d'Amore 1981). The issues that must be addressed in goal formulation and in impact and alternative interpretation, evaluation and management are primarily trans-scientific (i.e., they are concerned with questions that can be informed by but are not explained or determined by science) (Weinberg 1972; Torgerson 1980). Even for those aspects of the EIA planning process that are clearly trans-scientific, scientific standards are still of relevance. Methods, findings, interpretations and conclusions, for example, should still be explicit, substantiated and subject to verification (e.g., does it enhance practice?) and independent evaluation.

Arguably, practicality in the EIA planning process can, in part, be addressed by scrutinizing the day-to-day tasks of practitioners (Bolan 1980). Practitioners employ a range of images, categories, schema, precedents and examples (Schon 1982). The assessment of professional episodes (Bolan 1980) can facilitate our understanding of the application of the EIA planning process (Forester 1980). It can also lead to an enhanced repertoire of tools and practices (Yewlett 1984). Lessons can be acquired from both best-practice (Schon and Rein 1994; Yewlett 1984) and from practice failures (Sorenson and Auster 1989; Hall 1980). Practical knowledge and experiences must, in turn, be transmitted and exchanged (Dickerson and Montgomery 1993).

Evolving, Heuristic and Collaborative

The phenomena simplified through the EIA planning process are rarely static. They change and evolve, often in an unstable and chaotic manner (Kreiger 1981; Nicholas and Prignogne 1989). The EIA planning process must allow for both intended and unintended consequences. The problem or problem continuum will evolve as tentative solutions are formulated, in response to the identified problems and as error is reduced. Redefined solutions are required (Popper 1972; Gillingwater 1975). The resulting EIA planning process will be characterized by multiple solutions, multiple designers and diverse and dynamic environmental systems (Schon and Rein 1994; Nicholas and Prignogne 1989).

A dynamic planning environment underlines the need for creative, heuristic, flexible and open EIA planning processes and organizational structures (Hollick 1993; Michael 1989; Bolan 1980). Single solutions and single implementing agencies will be the exception rather than the rule in EIA practice. Instead, multiple overlapping and evolving EIA planning processes, involving multiple actors, will be the norm. Under such conditions, the EIA planning process, as a form of environmental management, should seek to enhance the capacity of systems for self-management coupled with strategic interventions to steer the system away from large discontinuities (Hollick 1993).

With multiple designers the EIA planning process is necessarily interpersonal, collaborative and open to all interested and affected stakeholders (Schon and Rein 1994; Parenteau 1988). Particular care must be taken to involve unrepresented and under-represented interests in the planning process (Blaug 1993). The open and interpersonal nature of the EIA planning process reinforces the importance of interpersonal and small group skills, procedures and working theories (Patton, Giffen and Patton 1989). A sensitivity to both the direct and the indirect messages transmitted through the process is also essential. Hofstadter distinguishes among the frame message (implicit in the gross structure), the outer message (symbolic patterns and structures that explain how to decode the inner message) and the inner message (what is intended to be transmitted) (Hofstadter 1980).

Risky, Uncertain and Complex

Prediction is inherent to the EIA planning process because it is largely an anticipatory form of decision-making (i.e., a type of planning). The precision of predictions varies. Accordingly, explicit consideration should be given in the EIA planning process to: variability (measurable differences in phenomena); the probability of occurrence of various environmental conditions; the probability of proposed mitigation measures operating as anticipated; and the implications of inaccurate predictions.

Risk measures the probability and severity of adverse effects (Lowrance 1976: 94). Risk assessment (RA), a related field of theory and practice to EIA, has much to teach designers of the EIA planning process. RA identifies and estimates the likelihood of adverse effects (Grima *et. al.* 1986; Whyte and Burton 1980). Other risk-related considerations of relevance to the EIA planning process include; the identification and evaluation of the importance of risks and consequences (Grima *et. al.* 1986), the perception of risk, acceptable risk levels (Lowrance 1976; Fischoff *et. al.* 1981), risk communications (Leiss 1987; Wolfe 1993) and the overall management of risk. The risk assessment and management field provides the EIA planning process with a systematic procedure for addressing chronic and acute human health and ecological risks (Leaning 1994; Stackelburg and Burmaster 1994). It also contributes an appreciation of: the limitations associated with deterministic forecasts; the need to allow for uncertainty in predictions (Carpenter 1995); the importance of addressing the implications of interrelationships among effects; the need to explicitly consider impact acceptability; and the importance of considering varying perceptions and interpretations of the importance and acceptability of risks, impacts and costs (Arquiaga *et. al.* 1992).

Uncertainty occurs when environmental conditions and impacts are indeterminate and probabilities cannot be ascertained (Carpenter 1995). Uncertainty is also inherent in the EIA planning process. It is evident in the definition of problems and opportunities (Gibson 1992b), in the determination of planning visions, ends and means (Christensen 1985; Gibson 1992b), in the delineation of the planning environment (present and future), in the making of value judgements and in the identification of related decision areas (Friend 1993). There will be uncertainties in the EIA planning process when determining the quantities of residuals, land and resources consumed, when predicting the environmental management strategies and controls that will be in place in the future, when ascertaining how controlled rates of emission will be translated into ambient environmental quality, when estimating impacts on receptors and when valuing impacts (Hyman *et. al.* 1988). Uncertainties within the EIA planning process are, moreover, interconnected and nested within one another (Gibson 1992b).

Factors contributing to uncertainty in the EIA planning process include: time and resource limitations, lack of theory, inadequate baseline data, oversimplified models, novelty of the technology, materials or setting, inherent variations in complex systems and control and replication problems (Carpenter 1995; Reckhow 1994). Uncertainties are more than gaps in knowledge. Uncertainty and ignorance in the EIA planning process could, more appropriately, be characterized "as a persistent and pervasive context for considering problems and seeking solutions" (Gibson 1992b, 158).

The negative consequences of uncertainty in the EIA planning process can be ameliorated by: publicly acknowledging and bounding areas of uncertainty, reducing tractable uncertainties with targeted research, data gathering and analysis directed toward essential questions and structured through model building and direct dialogue between scientists and environmental managers (Holling 1978), refining and applying multiple methods (Egan *et.al.* 1995), precautionary behaviour and the extensive use of peer review, monitoring, and post hoc assessment (OBrian 1994; Carpenter 1995; Canter 1993; Fischoff *et. al.* 1981). Techniques, such as uncertainty analysis (Stackelberg and Burmaster 1994), decision analysis (Reckhow 1994), bounding analysis (Saylor and McCold 1994), fuzzy set analysis (Lein 1993), scenario analysis (especially worst case scenarios) (Gibson 1992), the "no regrets" approach (Gibson 1992b) and various group decision-making procedures (Friend 1993) can further facilitate the systematic consideration of uncertainty.

The EIA planning process usually involves complex processes and systems. Complex processes and systems: generate counterintuitive, acausal behaviour; are characterized by multiple interactions and feedback and feedforward loops; involve diffused authority; and are often irreducible (Casti 1994). Surprise is inherent to complex systems. Examples of surprise generating mechanisms include: logical tangles (which lead to paradoxical conclusions); catastrophes (where a small change can lead to discontinuous shifts); chaos (deterministic randomness); incompatibility (output transcends rules); irreducibility (behaviour cannot be decomposed into parts); and emergence (self organized patterns) (Casti 1994; Nicholas and Prigogine 1989; Gleick 1987). In a complex environment, different systems will behave differently, complex behaviours will be attributable to complex causes, systems are open and interconnected and there will be multiple stages, facets, realities and solutions. Reductionism, prediction and control will be severely constrained and surprises should be expected. A flexible, precautionary approach will often be needed in EIA planning process design and application, with ample provision for evolution, change, and various combinations of reversible, irreversible, deterministic and stochastic processes. (Casti 1994; Nicolas and Prigogine 1989; Gleick 1987). Focused research, that draws upon many critical perspectives, in a systematic search for means to improve resiliency and adaptability, is essential (Gibson 1992b).

A scientific, positivistic approach will generally not be appropriate for the trans-scientific problems (complex, messy problems about which little is known) often encountered in the EIA planning process. A less analytical, more holistic, approach will be required in such cases (Miller 1993). EIA practitioners should engage in "intelligent scanning" (e.g., looking for patterns of system behaviour) when operating within chaotic and complex systems. The EIA planning process may be more successful when viewed as a succession of judicious "nudges" rather than as a step-by-step recipe (Cartwright 1991, 54). Particular care will be required in interpreting the acceptability and desirability of environmental change (Jay and Schneider 1994). Other possible measures for preparing for surprise in the EIA planning process include emphasizing diversity and flexibility, keeping options open, using experimental or pilot programs, selecting options that are reversible and that minimize the potential for catastrophic effects, and ensuring that the process is iterative and broadly participative (Gibson 1992b).

The EIA planning process should explicitly consider and address variability, risk, uncertainty and complexity in characterizing, interpreting and managing environmental change. Sources and types of risks and uncertainty should be identified and the implications of complexity, especially the potential for surprise effects, should be addressed. Addressing complexity does not necessarily mean seeking to simplify. The related concept, variety, can instead be used to measure excellence in social and natural systems (Gould 1996) and, in turn, in the management systems that seek to guide human interventions and actions. Simplistic solutions and deterministic, optimistic predictions are unlikely to be effective with environmental systems that are complex or difficult to anticipate or manage. The EIA planning process should anticipate error and surprises and prevent and minimize threats, particularly to valuable systems (Gibson

1992b). Refinements and modifications can be introduced based on the insights obtained through monitoring and post hoc assessment (Serafin, Nelson and Butler 1992). Ultimately, this means an orientation shift from *ex ante* (pre-project) analysis to adaptive environmental management (Holling 1978; Geisler 1993; Margerum and Born 1995).

Critical, Reflective and Designed

Self-conscious reflection about and in practice is essential if the design and application of the EIA planning process is to be advanced (Schon 1982). Problems and conflicts, intractable in theory, are often reframed and pragmatically resolved through frame reflection in practice (Schon and Rein 1994). Practitioners should simultaneously work within and reflect on what they are doing at varying levels of abstraction (Mills 1959; Hoftstader 1980; Schon 1982). They should be able to act from one perspective and to be aware of others (i.e., double vision). This heightened awareness provides the basis for reflective transfer (i.e., transferring patterns deduced in one situation and projecting them onto other situations, with appropriate adjustments) (Schon and Rein 1994).

Reflection in practice is critical. Both practical theorists and reflective decision-makers (Hart *et. al.* 1984) are required. Critical reflection persistently challenges and compares ideas and reality (Taylor 1980; Bolan 1980). Assumptions and underlying ideas and beliefs should be critically examined, especially with reference to inequities and practices of domination (Hanson 1995). Care must be taken to distinguish between theory in use (actual behaviour in concrete situations) and espoused theory (expressed allegiance to and overt intentions) (Argyris and Schon 1978; Bolan 1980).

Design is the creative formulation and strict evaluation of the possible forms of something, including how it is to be made (Lynch 1981, 291). The EIA planning process and design have much in common. Both are directed by an overall purpose (Lynch 1981), are guided by visions (Alexander *et. al.* 1987) and are structured by organizing principles (Rowe 1987). Each seeks to progressively and heuristically assemble positive and coherent wholes (Alexander *et. al.* 1987). They creatively explore themes and experiment with alternative arrangements (Rowe 1987).

Both iteratively move between means and ends and between analysis (decomposition into components and subproblems) and synthesis (progressively linking and combining components into overall patterns) (Alexander 1964). Renewing the EIA planning process requires continuous learning through a multitude of interactions and feedback relationships between ourselves, the world of our ideas and reality (Jantsch 1975), appreciating the often severe constraints imposed by resources and time constraints.

The EIA planning process and design also counterbalance ideas and operating constraints (Rowe 1987). They introduce refinements, adjustments and embellishments (Rowe 1987), in assessing the fit between form and context (Alexander 1964) and in evaluating potential arrangements against values, principles and criteria. Each operates at many levels in different ways (Alexander *et. al.* 1987). Both mix rational and irrational elements (Lynch 1981) in a complex, ambiguous, organic and evolving process.

There are multiple designers in the EIA planning process (Schon and Rein 1994). Communications is, therefore, critical. Both design and the EIA planning process require well defined design objectives, a thorough and thoughtful search for design flaws and the creative framing of situations to correct design flaws and to flexibly respond to a conflicting, disjointed and chaotic decision-making environment (Schon and Rein 1994).

Value Full, Ethical and Political

Values are the enduring beliefs or normative standards we use to determine what is or is not important or desirable (Baier and Rescher 1969; Enk and Hornick 1983). Our perceptions, behaviour and priorities are strongly influenced by our values (Alterman and Page 1973). The EIA planning process cannot be value free (Klosterman 1983). All theory is personal because it is infused with the experiences of the individual who wrote it (Gouldner 1970). The values of EIA practitioners are derived through both cultural and professional socialization (Alterman and Page 1973). The EIA planning process consciously facilitates the application of environmental values in public and private decision-making. Values are inevitable even in analytical, ostensibly objective, EIA activities such as data collection, analysis and prediction. Values influence data collection, model selection, the choice of assumptions and data compilation and presentation (Beattie 1995; Rein 1971; Smith 1979). Subjective values are even more prominent in problem/opportunity and need assessment, data and impact interpretation, in interpretations of impact significance and acceptability and in the evaluation of alternatives. Once it is acknowledged that values are pervasive in the EIA planning process (Beattie 1995), practitioners cannot hide behind the clock of neutrality and value-free social and natural science (Shrader-Frechette 1994; Thomas 1979). This does not preclude practitioners from avoiding bias and prejudicial assumptions (Lemons 1995) or from using more objective natural and social scientific methods in impact prediction (Hyman *et. al.* 1988). Values, moreover, can be pragmatically and empirically verified and justified (Klosterman 1983).

Consistent with the EIA objectives presented in Chapter 2, the EIA planning process should advance environmental values. Practitioners also need to make their own values explicit (Lee *et. al.* 1995) and to identify with the subjective perspectives of potentially affected individuals, groups and communities (Taylor 1980). Values in the EIA planning process need to be identified, critically evaluated and justified (Bateson 1972; Klosterman 1980). Care should be taken to identify the values of each stakeholder, principle value conflicts and potential mechanisms for conflict resolution. Although values will vary with context (Kaplan 1964) it is still necessary to identify and further environmental values that transcend situational values and value conflicts. Many, often conflicting, values (e.g., economic, social, ecological) and value sources (e.g., personal, professional, institutional, cultural) are evident in the EIA planning process. Value differences often reflect more fundamental conflicts in perspective and ideology (Kartez 1989). The debate between a biocentric and an anthropocentric world view, for example, (Beatley 1989) can be depicted as a continuum ranging from the most radical forms of deep ecology at one extreme to traditional economic expansion and utilitarianism at the other extreme (Paehlke 1989). EIA is one of many perspectives and tools of environmental management that occupy the middle ground (i.e., a duty-based form of anthropocentrism) (Beatley 1992). At a minimum the EIA planning process seeks to temper traditional technological and economic development through an increased consideration of social and ecological values in public and private decision-making. Potentially, the EIA planning process can more actively embrace ecological and social values and principles, perhaps by means of a more explicit link to the concept of sustainability (Gardner 1989; Smith 1993; Sadler and Jacobs 1990).

Ethics are the moral principles that govern human conduct. They distinguish between right and wrong (Rich 1993). The EIA planning process must address ethical issues and dilemmas. It modifies human conduct by insisting that adequate (as defined through a regulatory regime) consideration is given to environmental concerns in public and private decision-making. The rules of conduct that govern the EIA planning process are partially defined in legislation, regulations, guidelines and judicial decisions, although other sources also influence the moral basis of EIA. Examples include the individual, family, friends, employers, the social and natural sciences, professional codes of practice, institutions, governments and society at large (Marcuse 1976; Bolan 1983).

There are three kinds of moral thinking - descriptive (theories of human nature bearing on ethical questions), normative (addresses what is good and right) and metaethics (addresses logical, epistemological and semantical questions dealing with ethical or value judgments) (Patton and Sawicki 1993). In normative ethics a further distinction is drawn between teleological and deontological theory (Patton and Sawicki 1993). Teleological theory (i.e., doing good) is concerned with the comparative balance of good over bad (i.e., the goodness of outcome) (Beatley 1989; Patton and Sawicki 1993). Good actions produce good results (Hendler 1990). Deontological theories are concerned with process (Patton and Sawicki 1993). Rule deontological theory (i.e., being right), a subset of deontological theory, focuses on the rules governing the process (Howe 1992). Normative ethical principles judge the rightness or wrongness of an action (Harper and Stein 1992). EIA practitioners generally believe that they are "doing good" because they have systematically evaluated alternatives and effects prior to reaching conclusions. Opponents to a proposed action often consider it to be "wrong" because it contravenes their normative standards (e.g., fails to preserve old growth forest, waste disposal rather than waste reduction). Compounding this "good" versus "right" conundrum in the EIA planning process, are procedural versus outcome conflicts (as reflected in the distinction between substantive and procedural ethical theory), conflicts regarding the appropriate ethical principles (e.g., economic efficiency, social equity, environmental ethics), conflicting interpretations of what represents a "good" EIA planning process and conflicting views of what adjustments should be made to reflect local cultural and environmental circumstances (Beatley 1989; Harper and Stein 1992; Junker 1994). The EIA planning process, moreover, rarely involves simple "doing good or doing bad" or "doing good or doing best" tradeoffs. More frequently, all choices involve doing some good and some bad (wicked problems) (Rittel and Webber 1973) or involve either doing harm or doing worse harm (Catch 22 or Hobson's choice).

EIA, in common with other public policy instruments, seeks to balance liberty, equality and justice (McConnell 1995). The EIA planning process is also driven by an environmental and social ethic. As such it should seek to redress imbalances in the social system (Harper and Stein 1995) and to devote greater attention to the least advantaged (Rawls 1971) and to the least represented (e.g., natural environment, future generations) (McConnell 1995). It should also be conducive to a stronger moral voice in public and private decision-making (Beatley 1989) and to an enhanced spirit of community (a commutarian perspective) (Etzioni 1993).

Not surprisingly ethical debates and dilemmas can rarely be readily resolved in the EIA planning process A reasonable point of departure is the identification of ethical principles (both procedural and substantive) (Dorney 1989), inequities (Albrecht 1995) and ethical conflicts and dilemmas (Waller 1995; Boggs 1993; Lemons 1995; Klosterman 1980). Ethical decisions can be rationally justified (Klosterman 1980). To be consistent with its purpose, the EIA planning process should shift the ethical foundation of decision-making toward a greater emphasis on ecological and social priorities and principles (Birkeland 1995; Lemons 1995; Beatley 1989). Consequently, less emphasis should be placed on minimizing Type 1 errors (assertions of effects where none exist). Instead, more emphasis should be given to minimizing Type 2 errors (assertions of no effects when one exists) (Shrader-Frechette 1994; Lemons 1995). Given the complexity of problems addressed through the EIA planning process, there may be an even greater risk of Type 3 errors (solving the wrong problems). Type 3 errors occur when there is a poor understanding of the problematic situation. Such errors can be minimized through the rigorous application of problem formulation tools and procedures (George 1994).

Power is the ability of a person to know about, mobilize and then influence decision-making (Burdge 1994). Resources (rights in things) and authority (rights in persons) increase one's ability to get things done (Stitchcombe 1968). The EIA planning process is often incorrectly viewed as apolitical (i.e., independent technical advice to decision-makers) or excessively politicized (Culhane 1993). The EIA planning process is inherently political (Beattie

1995; Ortolano and Shepherd 1995; Formby 1990). It seeks to make a difference in decision-making. If it fails it is ineffective or dysfunctional (Benveniste 1989; Forester 1989).

EIA practitioners have traditionally held a measure of power, by virtue of their technical knowledge base. This power base should be tempered by an acknowledgement that expert knowledge is rarely sufficient in analysis, prediction and management (Ehrenfeld 1993). EIA practitioners should instead be "honest, effective and communicative without either losing the respect of the public or abandoning professional competence" (Ehrenfeld 1993, 154). To do this EIA practitioners should reject the false dichotomy between expert and laypersons (Liebow 1993), recognize the value of local knowledge and experience (Amir 1990) and accept the public as a legitimate partner. An almost certain recipe for ineffectiveness is to ignore the political context in which environmental decisions are made (Amy 1990). Although EIA practitioners inevitably assume a role in the political process (Howe 1980), this does not mean that they think and act politically in an appropriate or effective manner (Forester 1989).

Once it is acknowledged that the EIA planning process is political, the issue then becomes how best to integrate political considerations into the process. The EIA planning process represents a tool for furthering environmentalism as both a system of values and as an idealogy (Paehlke 1989). Current and potential actors, issues and decisions in the EIA planning process will require detailed scrutiny (Keith *et.al.* 1976). Community conflict should be a focal point in the EIA planning process because EIAs both engender and are undertaken where there is conflict (Burdge 1994).

Related fields of theory and practice can assist this effort by providing insights regarding the structure of society (Craib 1984; Campbell 1981), political and institutional systems and processes (George and Weilding 1985; Dyckman 1961), organizational and inter-organizational structures and procedures (Alexander 1993) and the role of planners (Friedmann 1987) and other advisors (Kreiger 1981) as agents of social and political change. The EIA planning process should facilitate politically effective and efficient EIA practice (Formby 1990; Ortolano 1993). It can further our understanding of political, institutional and bureaucratic roles (Hummel 1977), institutional arrangements (Smith 1993) and of political perspectives (Lyon 1990), constraints and opportunities (Forester 1989; Formby 1990). It can also identify and ameliorate systematic, institutional and communications distortions (Forester 1989; Kurian

1995; Harraway 1991), facilitate consensus building and conflict resolution (Manning *et. al.* 1990; Benveniste 1989; Forester 1989) and contribute to citizen involvement, mobilization, empowerment and community action (Rickson *et. al.* 1990; Forester 1989; Gagnon *et. al.* 1993; Craig 1990).

Pluralistic and Contingent

Context is what we take for granted (Evenden 1985). This seemingly accidental by-product of our existence is the frame of reference which makes it possible for us to understand our lives and our actions (Rochberg-Halton 1982; Etzioni 1968; Berger and Luckman 1966). Each of our perspectives of the world are dependent upon our personal experiences and is, to some degree, unique (Hanson 1995). We inhabit many small worlds and institutional spheres of existence. This part-time existence in a part-time society necessitates frequent adaptations in anticipation of and in response to different expectations (Berger and Luckman 1966).

With a plurality of actors, each with a range of personal perspectives and roles, conflicting perspectives, systems of belief and prescriptions for action (Schon and Rein 1994; Goffman 1974) are necessary and inevitable in the EIA planning process. Negative repercussions from conflicting perspectives can be offset by a greater understanding of the perspectives of others (i.e. the cognitive maps by which individuals orient themselves in the field of social action). Contextuality, in this sense, is the "picture of self in context" (Lasswell 1971; Torgerson 1980).

The complexities resulting from a plurality of perspectives are compounded by the plurality of contexts that shape and influence our actions (Hofstadter 1980). Contextual elements relevant to the EIA planning process include problem and activity type (Cartwright 1973), goals (Linder and Peters 1986), physical and cultural setting, social, economic, organizational, institutional and political structures and processes (Keith *et. al.* 1976) and historical, current and likely future actions that could affect the same environment. Contexts are rarely static. More commonly they are dynamic, evolving, relational, ambiguous and conflicting (Schon and Rein 1994; Forester 1989; Bolan 1980). With a plurality of perspectives and contexts, it is hardly surprising that there are also a proliferation of theories and practices of relevance to and generated through the EIA planning process. A single grand theory or system of theories of the EIA planning process is unlikely to emerge from the current morass of concepts, theories and practices because of the diverse array of perspectives and contexts. Multiple overlapping and conflicting theories have been the experience in related fields such as planning (Friedmann 1987) and social science (Craib 1984; Yewlett 1984). A more realistic, and arguably appropriate, view is that no single theory or model will be adequate for all contexts and perspectives (Feyerabend 1975; Etzioni 1968). Instead different models or theories of the EIA planning process will be appropriate in different situations (Pickvance 1985; Friend *et. al.* 1974; Alexander 1986; Bryson and Delbecq 1979; Bolan 1980; Mayer and Greenwood 1980). As the matching of processes and contexts proceeds, it should be possible to construct broader theory frameworks or networks (Rapoport 1990) of EIA planning processes.

Some theories of the EIA planning process will themselves be pluralistic. A pluralistic theory contains a variety of independent principles that can not be reduced to or derived from a single master principle (Wenz 1988, 313). A pluralistic theory can provide unambiguous answers to some questions, qualified answers to other questions and indicate matters to be considered for a third group of questions (Wenz 1988, 314).

A contingent approach to the EIA planning process should enhance our understanding of relevant contextual elements, interrelationships among contextual elements and interrelationships within and among potential theories and actions and contexts. A particular focus should be the "goodness of fit" within applied theories and between applied theories and the world they seek to describe or shape (Taylor 1980). Contextual interpretation is not an easy task. There will be varying interpretations (Taylor 1980), interactions will often be obscure and ambiguous, and actions and behaviours will not be fully separable from each other or from context (Feyerabend 1975; Nicholas and Prignogne 1989). An enhanced understanding of context provides a foundation for EIA planning process design and application appropriate to applicable contextual elements (i.e., the matching of strategies and context). The matching of theory and context in the EIA planning process operates at two levels 1) an initial matching of activity types and context types and 2) individual adjustments to reflect the unique characteristics of each situation (Bolan 1980; Rochberg-Halton 1982). This matching process is necessarily experimental, iterative and flexible (Evernden 1985; Goffman 1974). Due allowance must be made for the evolving nature of context and context action interrelationships (Nicholas and Prigogine

1989).

EIA planning processes should not simply passively adapt to context. Such a single loop learning approach (i.e., satisfy existing governing variables) (Argyris and Schon 1978) is inconsistent with the purpose of the EIA planning process. In seeking to positively affect the environment, the EIA planning process should challenge the governing variables and reshape the context. This double loop approach to the EIA planning process can contribute to systemic change in theories and practice (Argyris and Schon 1978). It can also advance the formulation of transcending frameworks and the identification of global ethical principles (Junker 1994). The perfect integration of process and context is clearly an impossible aim. An enhanced understanding of context and perspectives, the avoidance of serious misfits, progressively better matches, flexible adaptations to critical contextual elements and strategic interventions to shape and adjust context are more realistic objectives.

Boundary Spanning

EIA is, by definition, an interdisciplinary and interprofessional field of theory and practice (Westman 1985). The spanning and transcending of internal and external boundaries is intrinsic to the EIA planning process.

Internally the subject matter addressed by the EIA planning process can be subdivided on disciplinary (e.g., ecological, social and economic) and activity type (e.g., projects, plans, policies, programs, technologies) grounds. These EIA subfields share common objectives (e.g., a broadened decision-making base), a similar planning process (largely mirroring the rational planning model), similar analytical distinctions (e.g, magnitude, importance, scale, frequency, extent, duration, cumulative) and many of the same or similar methods (Lemons and Porter 1992) (Inter-organizational Committee 1995; Leistritz 1994). Differences among these subfields tend to stem from scope, subject matter, level of detail, institutional arrangements and time horizon distinctions (Porter 1995) (Inter-organizational Committee 1995). Adaptations in approach and methods are also required for each EIA form to reflect setting type variations. The application of the EIA planning process in third world settings requires a particular sensitivity to contextual differences (Fuggle 1990; Brown 1990; Kakonge and Imevbore 1993; Sammy and Canter 1982).

Disciplinary EIA forms are usually partially, but rarely completely, integrated within project level EIA planning processes. Links across planning levels are sometimes established through tiering and are occasionally more systematically forged through more comprehensive environmental management strategies (Orlando and Sheppard 1995).

The EIA planning process draws heavily upon the social and natural sciences, and to a lesser degree, upon other disciplines, as a knowledge base and as a source for frameworks, models and methods. The extent to which the protocols of science should be extended to the EIA planning process is, as previously noted, a source of debate. Ultimately, the issue becomes one of degree of rigour, appropriate within decision-making constraints, rather than rigour versus relevance. The EIA planning process should, and increasingly does, reflect contemporary developments in related fields of theory. The contribution of the EIA planning process to the knowledge base of these related fields has been more limited. EIA overlaps with a range of related fields of practice. Examples include environmental policy, environmental planning and management, environmental dispute resolution, public involvement, environmental, urban and regional planning, economic forecasting and risk assessment. Given the limited, and often, diminishing resources available to various forms of environmental management, there is a particular urgency to link, transcend and integrate related environmental interventions (Westman 1995).

The EIA planning process tends to be plagued by dichotomies and artificial barriers. Internal and external boundaries have too often become barriers to communications and joint problem-solving. Although differences must be appreciated the search for common objectives, unitary frameworks, enhanced communications and shared institutional arrangements are essential if efficient and effective use is to be made of the limited available resources. An especially "catholic" approach is required (i.e., broad in sympathies, taste and interests, non-sectarian, tolerant and open to different approaches) (Moudon 1992, 332). Transcending concepts, such as sustainability, can provide one means of better structuring conceptual and applied internal and external interrelationships (Htun 1989; Smith 1993; Sadler and Jacobs 1990).

Constrained and Opportunistic

The predominant focus of the EIA planning process has been the immediate decision-making requirements associated with the review and potential approval of a proposed activity. Contribution to a renewed EIA planning process is, at best, a minor secondary consideration. Despite resource and other constraints, the burden for reforming and refining the EIA planning process necessarily falls predominantly upon those most directly able to draw upon and critically reflect on experiences acquired through EIA practice (i.e., EIA practitioners). Ideally all practitioners, as environmental professionals, should participate in critical reflection, in the sharing of views and experiences and in the preparation of papers and articles directed toward enhanced understanding and practice. However, because of the constraints of practice, too much of this potential knowledge base is not subject to broader reflection and application.

Theoretical approaches to the EIA planning process, without a direct connection to practice, run the risk of "elaborate and arid formalism" and "empty verbalizations" (Mills 1959; Kaplan 1964). Numerous traps can also impede EIA planning process renewal initiatives. Examples include: reductionism (reducing the complexity of the world to a simplistic set of theoretical constructs); "brain teasers" (becoming fascinated with one, often unsolvable problem, in the course of addressing another problem); logic traps (looking for internal coherence and logical order in an illogical world); preconceptions (the blinkered acceptance of a preordained or socially constructed problem situation); excessive focus (failure to follow the implications of an initial problem beyond its immediate context); ultimate solutions (the vain pursuit of grand theoretical designs); and the mismatching of theory and context (the indiscriminate application of theories suitable to particular contextual conditions) (Craib 1984; Yewlett 1984; Rittel and Webber 1973).

Even with the best of intentions and a sensitivity to theory building traps, there will remain complex systems and unique circumstances that defy modelling and theory building efforts (Nicholas and Prignogne 1989; Feyerabend 1975). No match between process and context will be perfect. The subjective elements of the EIA planning process (e.g., values, perceptions, beliefs) will not be fully understood or fully reconcilable. Ultimately, all theory fails to fully capture the immense variety and complexity of biological and human structures and processes (Mennell 1974).

These constraints will limit but not prevent a renewal of the EIA planning process. Constraints may often prove to be more apparent than real. Efforts to bring about greater efficiencies (Cheney and Schleicher 1995) may be more conducive to renewing the EIA planning process. Process renewal initiatives should be focused by a direct connection to EIA objectives and to the resolution of practice-based problems. The role of practitioners will be pivotal. Care should be taken to avoid theory-building traps. A particular sensitivity to the role of values and context will be required. Humility and a general openness to new ideas and thoughtful criticism will be especially important.

Summary and Conclusions

Renewing the EIA planning process is both necessary and practical. The ideal planning process departs from the conventional planning process (as described in Chapter 2) by first appreciating that the EIA planning process, as designed and applied, should both contribute to the conceptual foundation of EIA (i.e., theory building) and to the realization of broader environmental purposes.

Theoretical and applied researchers, working in combination with reflective practitioners, can broaden and reinforce the EIA planning process. There should be a clear understanding of the nature, role and types of theories and theory networks to be formulated, together with the overall domain of the EIA field. The appropriate level of abstraction, the degree of rigour, the means of iteratively (deductively and inductively) linking theory and practice and the role of analytic and integrative procedures need to be determined. Each initiative needs to be directly linked to the overall purpose of EIA. A balance of rigour and relevance will be necessary. Initiatives should be specifically applied to or derived from problems and opportunities in EIA practice.

The ideal planning process is based on a greater appreciation (as compared to the conventional planning process) of the evolving, heuristic and open nature of the EIA environment and its implications for the EIA planning process. The role and implications of risk, uncertainty and complexity in the EIA planning process also is more explicitly considered. In addition, there is a greater appreciation that a consciously reflective and critical practice is required to establish a foundation for collaborative and creative EIA planning processes.

The ideal planning process broadens the perspectives evident in the conventional planning process by acknowledging that a value-full perspective, directed toward environmental values, shaped by ethical principles and sensitive to the distribution of values, value conflicts and ethical dilemmas, is required. Also appreciated, to a greater extent, is the necessity of acknowledging political implications and requirements and of addressing implementation impediments and requirements, including a recognition of the need to reduce distortion and inequities, to facilitate consensus building and conflict resolution and to further community involvement and action. The EIA planning process (again, in contrast to the conventional planning process) recognizes the need to design the process to fit and shape an evolving context and the need to span and transcend internal and external boundaries and barriers. Greater emphasis also is placed in explicitly considering constraints to and opportunities for renewing the EIA planning process.

The remaining thesis chapters reflect the priorities noted above. They also refine, extend and apply the knowledge basis established through this analysis. Cross references have been made back to this analysis where appropriate.

[1]Wicked problems have no definitive formulations, no clear rules, no 'true or false' answers (they can only be 'better or worse') and no clear test for a solution (Alexander 1986, 41).

EIA AND PLANNING THEORIES

Introduction

This second probe toward reforming the EIA planning process takes a critical look at rational planning (the model underlying, although often implicitly, most depictions of the EIA planning process) and its alternatives (Lawrence 1992). Rational planning theory, together with variations of and alternatives to rational planning, have been the subject of protracted and intensive debate in the urban and regional planning field over at least the past 35 years. EIA is arguably a form of planning[1]. The EIA planning process seeks to guide future action through the systematic consideration and management of potential environmental consequences. Although the EIA planning process has mirrored planning theory, to the extent of adopting, adapting and applying basic characterizations of rational planning theory, the implications of ongoing planning theory debates are rarely evident in EIA literature and are reflected in EIA practice to an even lesser extent (Lawrence 1992).

The roots of planning theory extend back hundreds of years and are directly and indirectly linked to a wide array of theories and concepts in planning and related fields. A large number of individuals have contributed to the evolution of planning thought. The views of these individuals have, in many instances, changed appreciably over time. The history of planning thought and practice has been more than adequately addressed by others - most notably by Friedmann (Friedmann 1987) and Boyer (Boyer 1983). The varying physical products of planning thought (i.e., urban form and spatial structure) have also been analysed and assessed in great detail by others (Hall 1988; Cooke 1983). In the interest of brevity and more centrally in the interest of furthering the renewal of the EIA planning process, this chapter focuses on the characteristics of four major normative planning theories and concepts rather than on how they were developed or by whom. In this way a focused analysis of the characteristics of planning theories and concepts provides the basis for the systematic consideration of if and in what form such theories and concepts could be integrated into the EIA planning process. Four major planning theories - rationalism, pragmatism, socio-ecological idealism (SEI) and political-economic mobilization (PEM) are identified and analysed. Each of these theories subsumes several subsets and variations. After very briefly highlighting the antecedents of each theory, general theory characteristics and theory subsets and variations are identified. Pre-planning assumptions (environment and society), planning process assumptions, planning process, available tools in support of the process and post planning assumptions (environment and society) are identified for each planning theory.

The intense debates among planning theories has resulted in a large number of ascribed strengths and limitations. Many of these strengths and limitations are overstated or only relate to a subset of each theory. Criteria to structure the analysis are identified in Table 3. These criteria represent the preferred characteristics of a planning theory. These criteria are applied to each theory drawing upon ascribed strengths and limitations. The positive and negative tendencies of each theory are then identified based on an assessment of ascribed strengths and limitations and potential theory adaptations evident from theory subsets and variations. Overlaps, interconnections and middle ground concepts between theories are also determined.

Postmodernism is a body of theory that has had a profound influence on the humanities and on the social sciences in the past ten to fifteen years. Postmodernist concepts and interpretations have become increasingly evident in planning theory literature in the past few years. The postmodernist rejection of the predictive and the prescriptive rules out postmodernism as a potential normative planning theory. Nevertheless, postmodernism offers a valuable critique of the social and natural sciences, that can be extended to the EIA planning process. An overview of the postmodernist critique has, therefore, been included. The analysis identifies major themes in the postmodernist critique and explores potential planning theory and practice implications. The chapter concludes with the identification of major EIA planning processes lessons and priorities for future initiatives.

Rationalism

Rationalism represents one of the central themes in western thinking since the Greeks identified reason as the superior human characteristic (Alexander 1994; Saul 1992). The roots of rationalism can be traced to such diverse sources as science (positivism - a philosophy of science in which only empirical knowledge is considered valid),

Table 3 - Ideal Planning Theory Characteristics

Criteria		Rationale
Visionary	•	provides an overall purpose as well as an ideal process and process outcomes
Holistic	•	broadens the basis for decision-making
Value-based	•	explicitly identifies the values that direct and shape the theory
Socially desirable	•	facilitates the realization of social ends
Ecologically appropriate	•	facilitates the realization of ecological ends
Economically sound	•	facilitates the realization of economic ends
Rigorous	•	addresses planning problems in a systematic, logical and unbiased manner (clear links to knowledge base)
Creative	•	addresses planning problems in an opportunistic and insightful manner
Flexible	•	readily adapts to changing circumstances and different contexts
Realistic	•	provides attainable solutions appreciating relevant constraints (grounded in practice)
Effective	•	achieves desired results (rapid learning)
Efficient	•	minimizes wasted efforts and resources
Integrative	•	conducive to the synthesis of perspectives and positions
Distinct role for planners	•	relative to other participants, at least in degree
Conducive to public involvement	•	facilitates public understanding, participation and empowerment
Politically astute	•	sensitive to the exercise and distribution of power and facilitate direct political action
Facilitates decision-making	•	effectively serves the need of decision-makers and the decision-making process
Facilitates implementation	•	conducive to the matching of planning intentions and outcomes

economics (utilitarianism - the greatest good for the greatest number) and sociology (functionalism - society as an organic whole) (Marshall 1994; Harper and Stein 1995b). The themes of rational calculation and control and the rational decision-maker are clearly evident in neoclassical economics, public administration, scientific management and systems theory (Dahl and Lindblom 1953; Boyer 1983; Friedmann 1987; Schon and Rein 1994).

The extension and application of rationalism in planning theory during the post war period initially took the form of comprehensive planning, also referred to as blueprint or master planning (Faludi 1970). With comprehensive planning the process was quite simple (survey, analysis and plan) and the process was wedded to the product of planning (i.e., the preparation of a plan) (Chapin 1965; Kent 1964; Branch 1966). By the 1960s the rational planning process was progressively refined with the addition of goals and alternatives, provision for explicit links to implementation and allowance for feedback loops among planning steps (Davidoff and Reiner 1963; Dror 1963; Altshuler 1965; McLoughlin 1969; Chadwick 1971). The planning process was also progressively separated from the object of planning and applied beyond physical and spatial phenomena (e.g., social, economic planning, public policy and corporate planning) (Faludi 1973).

The challenging of rational planning as the dominant paradigm began by 1960 (Lindblom 1959), intensified through the sixties and seventies, and has continued unabated to this day. The rational planning process has, however, persisted, perhaps, in part, because of the psychological reassurances it provides practitioners (Dalton 1986; Baum 1996). Many refinements and adaptations have been advanced over the years, often as a direct response to the many criticisms of the rational planning process. Examples of these refinements and adaptations are listed in Table 4. The description of rationalism that follows conforms to the rational planning process most commonly depicted in characterizations of rationalism in planning theory literature. The many refinements highlighted in Table 4 are instructive because they demonstrate the potential for rational planning to be applied selectively, to operate within constraints, to address competing interpretations of the public interest and to be adjusted for different roles and for different contextual characteristics. It is necessary to appreciate the extent of such variations in assessing the strengths and limitations ascribed to rational planning in the planning theory literature.

Proponents of rationalism tend to view planning and decision-making, without the benefit of rational

Table 4 - Rationalism - Examples of Subsets and Variations

- comprehensive (blueprint, master, traditional planning) (Chapin 1965; Kent 1964; Branch 1966)
- process planning (means leading to ends) (Davidoff and Reiner 1962; Dror 1963; Altshuler 1965; Verma 1996)
- systems planning (McLoughlin 1969; Chadwick 1971)
- ends and means variations
  - -ends only (value rationality, normative rationality) Friedmann 1973)
  - -means only (functional rationality (Mannheim 1935; Friedmann 1973; Verma 1996)
  - -ends and means (substantive rationality) (Mannheim 1936, 1940; Friedmann 1973)
- degree of change variations
  - -allocative (resource distribution among competing uses) (Friedmann 1973)
  - -innovative (institutional change / social reform) (Friedmann 1973)
- theory practice linkages
  - -scientific conjuncture (Weaver *et. al.* 1985)
  - -analytical rationality (Friedmann 1995)
  - -practical rationality / applied rationality (Friedmann 1995)
- proponent type variations
  - -public domain (Friedmann 1987; Alexander 1992)
  - -corporate (Branch 1966; Ackoff 1970)
- boundary sources
  - -cognitive limits, social differentiation (values), pluralistic conflict, structural distortion (Forester 1989)
- selective rationality / subject and context links
  - -mixed scanning (Etzioni 1967, 1986)
  - -deductive indeterminism (Popper 1972)
  - -strategic planning (Bryson and Crosby 1979; Seasons 1989; Certo and Peter 1988; Bryson 1990; Walter and Chaote 1984)
  - -contingency planning (Byson and Delbecq 1979)
- rationality types
  - -technical, economic, social, legal, ecological, political (Bartlett 1990)
  - -technical reasoning, moral reasoning, aesthetic expressive understanding (Habermas 1984)
  - -communicative (rational argumentation; consensus building) (Sager 1994; Innis 1995, 1996; Goldstein 1984, Forester 1980, 1989, 1993)

planning, as irrational, subjective, biased, dominated by economic and political interests and separated from professional and scientific knowledge and methods. Decision-making, as a consequence, tends to be unsubstantiated and inconsistent. The political system is viewed in pluralistic terms (i.e., all interests have access to power) (Appelbaum 1978). Planners are separated from the political process and society is separated from the natural environment (Slocombe 1993).

In order for the rational planning process to operate as envisioned assumptions must be made that provide the foundation for the overall process and for each step in the process. Table 5 lists assumptions attributed to the rational planning process by a range of commentators in planning theory literature. These ascribed assumptions may not be intrinsic to the rational planning process. Instead, they could, in some instances, be varied depending on the form of rational planning.

The rational planning process represents a bridge between thought and action (Faludi 1973). An appropriate future is determined through the interplay of ends (value formulation) and means (a sequence of choices) (Davidoff and Reiner 1962). The rational planning process begins with a problem, need or opportunity to be addressed (Alexander 1986). An appropriate constellation of values (the public interest) is then identified (Davidoff and Reiner 1962), although often not explicitly. These values provide a general direction for change and a means to evaluate whether and to what extent available choices serve the public interest. General values are next distilled into goals, objectives and criteria - progressively more precise measures of progress toward the public interest. All goals, objectives and criteria are not equally important. A hierarchy of goals, objectives and criteria is, therefore, established (Alexander 1986). Priorities can then be determined and tradeoffs among ends and means assessed.

After a direction for change is identified the environment must be analysed. This requires the assembly and analysis of data and the identification of opportunities for and constraints bounding potential actions (Alexander 1986). Planning is oriented to the future (i.e., anticipatory decision-making) (Davidoff and Reiner 1962). Future environmental conditions must be forecasted and modelled.

Once both ends (desired end states) and the nature of the problem has been assessed (present and future) steps can be taken be move from the problem to the solution (desired end states). This involves a progressive process of

Table 5 - Rationalism - Ascribed Planning Process Assumptions

General

- the planning process is independent of the problem and context
- adequate time, skills and resources (Forester 1984b)
- comprehensiveness (Beauregard 1980)

Goals (problems, goals, objectives)

- a well defined problem (susceptible to analysis and diagnosis) (Forester 1984a)
- complex problems can be separated into smaller problems
- people have preferences and act in accordance with them (Davidoff and Reiner 1962; Alexander 1986)
- there is a unitary public interest; value consensus is possible (Appelbaum 1978; Harper and Stein 1992; Beauregard 1980; Westhues 1985)
- the planner is value neutral (Alexander 1986) and the planner is the agent who must assess what the public interest is (Friedmann 1987; Morrone 1992)
- objectives can be identified and articulated; possible to know in what direction improvement lies

Information

- cognitive processes are the only legitimate modes of understanding (Baum 1977)
- supremacy of technical knowledge (Appelbaum 1978)
- full baseline information (Forester 1984a); all actors have inferior knowledge to planners (Sager 1994)

Forecasting and Modelling

- theoretical inclusiveness (all variables incorporated into system) (Appelbaum 1978)
- well defined action space (all relevant variables) (Appelbaum 1978)
- probability of occurrence of conditions can be predicted based on available data; certainty of environment (Alexander 1986; Appelbaum 1978)

Plan Generation

- well defined alternatives; all alternatives examined (Westhues 1985)
- freedom from constraints on alternatives (all relevant alternatives; best alternative can be identified) (Appelbaum 1978)

Evaluation

- well defined outcomes space; all important ways of solving the problem and consequences (Van Houton 1989)
- values are transitive; they can be ranked from most to least important (Alexander 1986)
- outcomes can be projected and their explicit utilities assessed by goal-related objectives (criteria)

Implementation

- planning can control the environment rather than the reverse (Beauregard 1980)
- no conflict between action and power (Sager 1994)
- full approval will be obtained
- control and/or coordination of all interests and actions
- possible to monitor all key variables and make appropriate adaptations

Interrelationships

- facts and values can be separated
- ends and means can be separated (Davidoff and Reiner 1962; Alexander 1986)
- independence of probabilities and utilities (what is expected is unaffected by what is desired) (Alexander 1986)
- independence of analysis and evaluation (Appelbaum 1978)

generating and evaluating alternative courses of action within the solution space. This serial process entails a sequences of choices (generic problem solutions, strategies, courses of action) (Alexander 1986; Davidoff and Reiner 1962), culminating in the identification and refinement of a preferred plan. Each step in this sequence is undertaken at a greater level of detail. This alternative and plan evaluation procedure requires evaluation against objectives (intended outcomes) and the assessment of potential impacts (unintended outcomes) (Alexander 1986).

Following plan selection and refinement the plan is implemented (Hudson 1979). Implementation necessitates obtaining approvals, organizational coordination, control and stimulation, the monitoring of outcomes (both intended and unintended) and adaptations to the plan on the basis of monitoring results. Depictions of the rational planning process generally provide for interactions among process steps (scanning forward and feedback loops). Provision is also generally made for public and agency involvement in the process, usually focused prior to major decision points.

Many methods are available to support the rational planning process. Social and natural science tools are especially relevant for data collection and analysis and for the forecasting of future environmental conditions (Briassoulis 1989). Many methods are also available for alternative and plan generation and evaluation (VanGundy 1988; McAllister 1980; Lichfield 1996). Although methods are available, goal setting and implementation tend to be undertaken in a less structured manner. In the case of implementation the assumption tends to be made that once the plan is approved implementation occurs through normal administrative procedures.

With the rational planning process in place it is assumed that planning and decision-making will be informed (by scientific and technical analysis), reasoned, efficient, comprehensive, certain and controlled (Caldwell 1991; Burton and Murphy 1980). It is further assumed that all interests will continue to have access to power (political pluralism), planning will remain a neutral mode of state intervention (Yiftachel 1989; Forester 1989) and planners will operate as objective, apolitical experts (Appelbaum 1978; Forester 1989). The outcome of rational planning beyond decision-making is anticipated to be a greater realization of human potential (Faludi 1973) and a higher degree of technical and scientific control (in the public interest) of the economic, social and natural environments (Leiss 1974).

Table 6 lists strengths and limitations ascribed to rationalism and potentially equally applicable to the EIA planning process. As previously noted it is necessary, in reviewing ascribed strengths and limitations, to be wary of

Table 6 - Rationalism - Ascribed Strengths and Limitations

Criteria	Ascribed Strengths	Ascribed Limitations
Visionary	-an ideal (rationality) - a tool; can be directed to realize any vision (Faludi 1986)	-goals tend to be broad and open to competing interpretations -neglects purpose (i.e., blind reason) (Saul 1992) -ignores subject and object of planning (Beauregard 1987); content and contextless (Healey, McDougall and Thomas 1982) -simply reproduces society in a more efficient form (Thomas 1979) -mistakes management methods for solutions (Saul 1992)
Holistic	-comprehensive / holistic (Briassoulis 1989) -striving for comprehensiveness is still valuable (Benveniste 1989) -broadened consideration of alternatives (Boggs 1991; Caldwell 1991) -long range perspective (Caldwell 1991)	-assumption that scientific and technical methods the only true method of obtaining knowledge (Baum 1977; Appelbaum 1978) -absence of substance (Scott and Roweis 1977) -ahistorical (Boyer 1983; Bolan 1967) -failure to provide for extra-rational (Friedmann 1973) -divides rather than unifies (Saul 1992)
Value-based	-alternative values can be addressed by substantive rationality (Van Houton 1989); goals can be object of deliberate choice (Faludi 1982b) -can address distributive justice (Faludi 1989)	-assumption of unitary public interest inappropriate (Baum 1977; Friedmann and Hudson 1974; Thomas 1982) -complete objectivity impossible; failure to recognize the subjective nature of planning (Webber 1978; Klosterman 1978, 1980, 1983) -insufficient consideration of perceptions and values (Ozbekhan 1969; Appelbaum 1978; Saul 1992) -fails to appreciate the inseparability of reason and emotion (Damasio 1994; Saul 1992) -no methods for rationally determining ends (Sager 1994) -no rationality of ends only means (Harper and Stein 1995) -failure to appreciate value conflicts (Westhues 1985; Sager 1994; Thomas 1982) -ignores the weak and the poor (Campbell and Fainstein 1996)
Socially desirable	-broadened consideration of social effects (Boggs 1991; Caldwell 1991) -can incorporate social concerns (Faludi 1982b); can advance any social purpose (Faludi 1986; Keating 1978) -can address ethical and redistributive issues (Faludi 1978; 1982a)	-lack of a social ethic; neglect of human side of planning (Friedmann and Hudson 1974; Mitzberg 1994) -narrow conceptual of human potential; abstraction of society; inadequate consideration of experienced world (Baum 1977) -overreliance on scientific and technical knowledge may be especially inappropriate in certain settings (e.g., third world) (Appiah-Opuku 1994) -failure to consider inequities in power distribution (Goodman 1971); weak on the disenfranchised; cannot cope with broadening of political and economic concerns (Healey, McDougall and Thomas 1982) -ideological mystification (Beauregard 1980) -mechanistic; opposite of humanistic -exercise of power unmoderated by ethical structure (Saul 1992)
Ecologically appropriate	-broadened consideration of ecological effects (Boggs 1991; Caldwell 1991) -can advance ecological concerns (Keating 1978)	-domination of nature by natural thought processes (Boyer 1983) -lack of an ecological ethic -environment can be undermined if used to mask negative changes (Amy 1990) -inadequate consideration of environmental uncertainty and risk (Briassoulis 1989)
Economically sound	-broadened consideration of economic effects -can advance economic concerns (Keating 1978)	-historically ignores costs (Briassoulis 1989); cost requirements too onerous (Hudson 1979) -serves interests of middle and upper class (Beauregard 1980); pluralist assumption means domination by elites (Klosterman 1985)

Table 6 - Rationalism - Ascribed Strengths and Limitations

Criteria	Ascribed Strengths	Ascribed Limitations
Rigorous	-logical, systematic and consistent (Caldwell 1991; Alexander 1986) -unbiased (Caldwell 1991) -integrates scientific and technical knowledge	-reductionist - by ignoring the specific, the concrete and the substantive -bias - primacy of technical knowledge -mixes knowledge and interest assumptions (Klosterman 1985)
Creative	-can be creative with the controlled suspension of rational planning (Faludi 1973, 1982a)	-focus on rational over extra-rational and synergistic group processes inhibits creativity and the imagination (Friedmann 1973, 1987; Saul 1992)
Flexible	-adaptable to many different contexts; many variations (Hudson 1979) -flexible in search for optimum solutions (Sager 1994)	-tendency to be inflexible - one best way (Mitzberg 1994) -difficulty with complex, wicked, imprecise and open-ended problems (Braybrooke and Lindblom 1963; Rittel and Webber 1973) -not adapted to open systems with multiple variables (Braybrooke and Lindblom 1963); not well suited to turbulent environments (Friedmann and Hudson 1974) -not adapted to uncertainty (Webber 1968, 1969; Friend and Jessop 1969, 1974) and failure (Lindblom 1959) -many planning problems not suited to comprehensive technical problems (Benveniste 1989); most public problems (Beauregard 1980) -often poorly matched to context (Mitzberg 1994)
Realistic	-aid to make logical and systematic choices (Alexander 1986) can be supplemented by substantive criteria (Faludi 1989) -can take into account capacity limits with strategic analysis (Faludi 1973)	-fails to consider resource limits (Lindblom 1965); comprehensiveness impossible (Simon 1946; Westhues 1985) ; fails to appreciate intelligence limits (Friedmann and Hudson 1974; Hudson 1979; King 1974; Braybrooke and Lindblom 1963) -assumes no stopping rule; assumes rigorous analytical capability and scientific knowledge always available -artificially separates ends and means (Alexander 1986) -failure to appreciate predictability limits; poor handling of uncertainty Friedmann and Hudson 1974) -failure to appreciate control limits (Thomas 1982); assumes equilibrium conditions that can be controlled (Friedmann 1973) -discounts role of class interests (Thomas 1982; Campbell and Fainstein 1996)
Effective	-reduces superficial and irresponsible decisionmaking (Faludi 1978) -learns from past actions (Caldwell 1991)	-trite; says nothing that is not obvious -indeterminate abstraction (Scott and Roweis 1977) -record often poor or not clear (Mitzberg 1994)
Efficient	-simple and adaptable (Hudson 1979)	-bias toward efficiency (Beauregard 1978) -bias toward quantitative measures of efficiency -stress on comprehensiveness inhibits efficiency -denigrates practical common sense (Saul 1992)
Integrative	-systems perspective is synthetic (Benveniste 1989) -substantive rationality is synthesis (Van Houten 1989) -a range of theory-based perspectives can be drawn upon in the course of rational argumentation (Harvey 1996)	-emphasis on analysis over synthesis; breaks large problems into smaller problems (Baum 1977)
Distinct Role for Planners	-clearly defined role; technical advisor (Briassoulis 1989) -gives legitimacy to planners (Benveniste 1989)	-negative political role - mystification and rationalization of status quo (Beauregard 1980) -misleading role; not apolitical (Beauregard 1980)

Table 6 - Rationalism - Ascribed Strengths and Limitations

Criteria	Ascribed Strengths	Ascribed Limitations
Conducive to Public Involvement	-communicates reasons behind decision (Faludi 1973) -more open, honest and informed debate -basics of process simple and readily understandable (Hudson 1979)	-technical bias inhibits understanding and involvement (Krieger 1981; Sager 1994); fosters elitism; control by experts (Saul 1992) -tendency to be top down and autocratic (Boyer 1983); requires centralization of power and authority (Briassoulis 1989; Hudson 1989) -limited role for public (knowledge from planning expert); separates planning from those being planned for (Grabow and Heskin 1979) -one way communications only (Sager 1994)
Politically Astute	-provides politicians with needed information and advice -does not duplicate or conflict with role of politicians	-ignores politics (Beauregard 1980); political context viewed as threat rather than as opportunity; by ignoring power assures own powerlessness (Forrester 1989; Benveniste 1989) -not how decisions made; fails to recognize bureaucratic power, political elites, economic power and structural limitations (Friedmann and Hudson 1974; Klosterman 1985) -reflects and reinforces existing distribution of power (Benveniste 1989) -can be used to mask political purposes; depoliticizes planning (Hall 1988) -fallacious political assumption - one best way (Gregory 1989)
Facilitates Decision-making	-enhanced rationality in policy and decision-making (Bartlett 1990) -communicates reasons behind decision-making -extension of rationalism into organizations	-technical bias inhibits understanding -failure to appreciate the group nature of decision-making -failure to appreciate the importance of interjurisdictional cooperation (Briassoulis 1989) -limited relevance of unitary actor in decision-making (Gregory 1989)
Facilitates Implementation	-piecemeal rather than revolutionary change -provides necessary justification	-fails to recognize extent of bureaucratic and economic power -failure to appreciate personal alienation in bureaucracy (Baum 1977) -failure to recognize constraints on decision-making (Klosterman 1985) -assumes rather than seeks implementation (Lindblom 1979; Grabow and Heskin 1973) -poor record of successful implementation (Mitzberg 1994) -inability to supply rational implementation means (King 1974)

hyperbole and to be cognizant of both underlying assumptions and potential process variations. The ascribed strengths are valid to the extent that the rational planning process, in its most basic form, can contribute to more logical and informed decision-making. Various forms of knowledge can be incorporated into the process, the interplay of ends and means can be progressively and systematically explored and ample provision can be made for public and political involvement in the process. There is nothing intrinsic to the process that precludes the explicit consideration of social and environmental equity concerns, conflicting perspectives of the public interest and limits stemming from error, uncertainty and lack of control. The rational planning process can potentially be designed and adapted to suit a variety of problem and context types. It can also be adapted to reflect knowledge and resource constraints.

There is a propensity to move beyond the rational planning process, in its most basic form, to make the process more comprehensive, rigorous and efficient. As the rational planning process is increasingly formalized and structured it becomes progressively less suited to an increased range of planning situations. Precise and highly structured versions of the rational planning process are, at most, only suited to situations characterized by a low degree of complexity, a precisely defined decision environment, a small number of alternatives, a narrow range of decision criteria and a short lead time. Unfortunately, the tendency has been to apply highly structured and elaborate rational planning models to complex planning problems within turbulent planning environments. In such cases, the limitations attributed to rationalism, as listed in Table 6, tend to be especially prominent. This represents an important lesson that can be applied directly to the EIA planning process.

The negative tendencies listed in Table 6 can be partially offset by a careful design of the planning process to suit the problem and context characteristics. A concerted effort can also be made to reduce negative tendencies. Notwithstanding such efforts, some negative tendencies of the rational planning process will remain and may indeed be intrinsic to rationalism. The rational planning process is especially problematic in situations characterized by a highly turbulent environment, complex, open-ended problems and severe planning process constraints. Issues related to the political role of planning, structural inequities and implementation also require more than process adaptations. Stressing the need for better links to context characteristics, the integration of social and ecological limits and principles, distortion free communications and greater attention to inequities and barriers to implementation is a reasonable first step. Yet, to move beyond an appreciation of the problem and a general statement of principles, current conditions must be critically analysed, visions for alternative futures must be formulated and specific methods must be developed, refined and applied. This requires the perspectives, insights and tools characteristic of other planning theories.

Pragmatism

Pragmatism, as a normative planning theory, starts from the premise that knowledge-based experiences should guide planning action. This theme of practical knowledge acquired through experience in planning has many antecedents. The philosophy of pragmatism, for example, ***suggests a plurality of shifting truths grounded in concrete experiences and language*** (Marshall 1994, 414). With pragmatism meaning is based on subjective interpretations, knowledge is developed through practical trial and error, choices are made on the basis of utility, and experiences and experimentation continually reconstruct beliefs (Johnston 1983). Other related philosophical perspectives include existentialism (where the emphasis is on immediate experiences and individuals as autonomous moral agents), empiricism (focus on collection of facts and observations), phenomenology (the direct, subjective experience of phenomena as consciously experienced, free of unexamined preconceptions and presuppositions), classical liberalism (human beings guided by enlightened self interest, rationality and free choice with a minimal level of state intervention), functionalism (in the sense of society as a stable, organic whole) and pluralism (political power distributed among competing interest groups) (Johnston 1983; Marshall 1994; Flew 1979). Collectively these philosophical underpinnings suggest that: knowledge is subjective and is obtained through direct concrete experience; practicality is the best guide for action; individuals are rational and are guided by enlightened self interest; society is stable with political power distributed among competing interests; and a limited level of state intervention is needed.

Early expressions of pragmatism in planning and public administration were largely reactions to the rational planning ideal (e.g., decision-makers satisfice rather than optimize, constrained or bounded rationality) and tended to be based on empirical studies (Simon 1946; Meyerson and Banfield 1955). The most influential and fully developed approach to pragmatic planning has been incrementalism (Lindblom 1959, 1965, 1979; Braybrooke and Lindblom 1963; Hirschman and Lindblom 1962). Under incrementalism policy-making is a process of partisan mutual adjustment. Incrementalist planning has been the subject of intense debate and discussion over the past thirty five years. As is evident from Table 7, numerous forms of incrementalism have been identified. Several variations of incrementalism have also been formulated, largely to make incrementalism more purposeful and effective. Parallel but related approaches, that fall within the general umbrella of pragmatism, include empirical studies, analyses of implementation and theory-in-action. More recently, efforts have been made to provide a more integrated view of the relationship between pragmatism and planning (Blanco 1994; Verma 1996).

The description of pragmatism that follows is largely based on incrementalism, as the most completely developed and most influential form of pragmatism in planning, although general themes that apply to other forms of pragmatism have also been identified.

The various forms of pragmatism start from an appreciation of the limits of human knowledge and most especially expert knowledge. Much of the environment is beyond our capacity to know or control (Lindblom 1979). Pragmatism looks to consequences rather than causes (Verma 1996). Theories are socially constructed (Bolan 1980). What we know we learn in practice. The low level of reliance placed on theory is derived from the view that knowledge is derived in action (Schon 1982).

Society, from a pragmatic perspective, is atomistic (individuals maximizing own ends), fragmented and pluralistic (a balancing of competing interests all with access to power). A multiplicity of values, integrated with facts, are assumed (Verma 1996). The political, social and economic environments are interconnected, complex, uncertain, unstable and difficult to understand (Braybrooke and Lindblom 1963; Lindblom 1979). The environment controls decision-making to a far greater degree than decision-making controls the environment.

The task of government is not to solve problems but instead to alter the standard by which policy success or failure is judged over time (Gregory 1989). Policy and decision-making is fragmented (Hirschman and Lindblom 1962). Each situation, encountered in policy-making, is unique and uncertain (Schon 1982). Decision-makers avoid

Table 7 - Pragmatism - Examples of Subsets and Variations

- incrementalism (satisficing, empiricism, social reform, liberal political critique) (Friedmann and Hudson 1974; Friedmann 1987; Lindblom 1959, 1968, 1979; Simon 1946; Weaver *et.al.* 1985; Goodin 1982)

  -subject (economic, risk payoff, demand management, politics, planning) (Cooke 1983)
  -complexity (simple, disjointed, strategic) (Lindblom 1979)
  -direction of change (incremental - forward, decrementalism / debureaucratization) (Hebbert 1982; Hearn 1982)

- incrementalism - directed toward a purpose or vision and learning-based (purposive incrementalism, effective planning, urban design as a growing whole) (Benveniste 1989; Mann and Weirs 1973; Alexander 1964; Alexander *et. al.* 1987; Sorenson and Auster 1989)
- incrementalism - linked to critical and communications theory (neo-pragmatism, dialogical incrementalism, critical pragmatism, practical communications) (Sager 1994; Forester 1989; Innis 1995; Harper and Stein 1992; Healey 1992)
- incrementalism within a multi-organizational setting in an uncertain environment (strategic choice) (Friend, 1983; Friend and Hunter 1970; Friend and Hinkling 1987; Friend, Power and Yewlett 1974; Alexander 1994)
- empirical studies (city planning, economic planning, national planning) (Friedmann and Hudson 1974; Friedmann 1995; Forester 1993)
- implementation studies and analyses (Pressman and Wildavsky 1973; Healey *et. al.* 1983; Healey 1992; Alexander 1985)
- theories-in-action (reflection-in-action or practice, frame reflection, learning from practice stories) (Bolan 1980; Schon 1982, 1983, 1987; Schon and Rein 1994; Kreiger 1981; Forester 1989, 1993)

uncertainty and adverse consequences. Satisfactory (satisficing) rather than optimum solutions are sought. Policy-making is a negotiation and bargaining process involving a plurality of competing interests and values. A coherent set of goals is lacking. What is done depends on what can be done (i.e., politics as the art of the possible). Change takes the form of partisan mutual adjustment and the overall policy/decision-making process is best described as disjointed incrementalism (Gregory 1989; Boggs 1991; Weaver *et.al.* 1985).

Planning, under pragmatism, is incomplete, partisan, collective and episodic (Bolan 1980). Planning and planners are especially ineffective where they fail to recognize human limitations and differences, the intersubjective nature of meaning, the necessity of operating within resource constraints and the limited degree to which the environment and society can be predicted or controlled. The gulf between planning as it is practised and planning as synoptic planners would like it to be tends to result in a considerable discrepancy between espoused theories and theories-in-use (Bolan 1980).

The pragmatic planning process differs significantly from the rational planning process. Under rationalism planning is clearly distinguishable from decision-making and from the planning environment. Rational planning guides decision-making and shapes, through decision-making, the environment (i.e., the predominant direction of influence is outward from planning). Under pragmatism planning overlaps and merges with decision-making. Decision-making, in turn, overlaps and merges with environment or context. With pragmatic planning the primary direction of influence is inward (i.e., environment shaping decision-making and decision-making controlling planning). The same basic activities take place within the rational and pragmatic planning processes. However, pragmatic planning activities overlap, are bounded, occur simultaneously and are interactive to a far greater degree than with rational planning as conventionally depicted. Distinguishing features of the pragmatic planning process are presented in Table 8.

Methods conducive to pragmatism include empirical studies (consistent with the focus on practical, experienced-based, knowledge), communications and conflict resolution techniques (reflective of the view of policy-making as decentralized bargaining), scoping procedures (given the highly bounded nature of the process) and market and other forms of inducements (in recognition of the limited control role for planning and the high degree of resistance

Table 8 - Pragmatism - Planning Process Characteristics

Goals
- focus on consequences of present state of problem (VanGundy 1988)
- no coherent set of transcending goals (Gregory 1989)
- policymaking is remedial; away from ills rather than toward objectives (Hirschman and Lindblom 1962)
- broad and vaguely defined goals; necessary with multiple conflicting parties - ensures all interested parties can impute own goals
- *posterior* rationality - discovery of interests as interpretation of action rather than as an *apriori* position (March 1979)

Information
- incomplete information - baseline conditions, values, alternatives and consequences (March 1982)
- analysis drastically limited (Lindblom 1959)
- only variables, values and consequences of interest to policy-makers will be considered
- analysis simplified through omission (Braybrooke and Lindblom 1963)
- constraints automatically incorporated
- reconstructive treatment of data; facts systematically reconstructed as new ones are discovered (Braybrooke and Lindblom 1963)

Forecasting and Modelling
- short term forecasting
- only marginal changes considered
- analysis undertaken in a serial manner

Plan Generation
- only a small number and a limited range of alternatives considered (Gregory 1989; Alexander 1986)
- only alternatives known or expected to be different from others incrementally or from present state of problem (VanGundy 1988)

Evaluation
- alternatives ranked by degree of change (VanGundy 1988)
- conflicts resolved by stating how much of one value is worth sacrificing to achieve an increment of another (VanGundy 1988)
- successive or serial limited comparisons; marginal comparison of options (Lindblom 1959; Braybrooke and Lindblom 1963)
- options identified and evaluated against aspiration levels rather than predetermined goals (Alexander 1986)
- evaluation a process of decentralized bargaining among plural interests (Hudson 1979)
- test of a good policy agreement (Lindblom 1959; Sager 1995a)
- social fragmentation of analysis and evaluation at large number of points in society (Braybrooke and Lindblom 1963)
- outcome a product of the process rather than the result of a value maximizing choice

Implementation
- decisions decentralized to many small actors; each with substantial autonomy (Lindblom 1979)
- implementation a process of decentralized bargaining; competitive pluralistic politics; partisan mutual adjustment (Boggs 1991; Weaver et.al. 1985)
- negotiability of roles (Healey, McDougall and Thomas 1982)
- selective intervention at critical points (Lindblom 1979)
- trial and error intervention; experimentation with what and what does not work (Gregory 1989; Bolan 1980)

Interactions
- goals and information - goals conditioned by information; can't separate facts and values
- information and forecasting - overlap of information collection, analysis and forecasting - marginal, recursive, serial analysis
- forecasting and plan generation - alternatives constrained by available forecasted data
- plan generation and evaluation - trial and error analysis; emphasis on experimentation
- evaluation and implementation - intertwining of planning and politics; emphasis on testing and experimentation with means
- goals and plan generation - ends chosen appropriate to available and nearby ends; ends and means chosen simultaneously; intertwining of ends and means
- goals and evaluation - ends compared against consequences
- goals and implementation - only objectives that are possible and acceptable are selected
- analysis and plan generation - intertwining of evaluation and empirical analysis
- analysis and evaluation - less time analysing and more times experimenting
- analysis and implementation - monitoring effects of small changes so other small changes can be made (King 1974)
- plan generation and implementation - only consider alternatives that are likely to be implemented

to change).

Decision-making and the overall planning decision-making environment are not seem as appreciably different after planning as compared with before planning - the environment remains turbulent, society continues to be atomistic, knowledge is still highly bounded and planning and decision-making are intertwined, partisan, fragmented and partial. The principal difference is that there is a much better fit between planning and decision-making and, in turn, between planning and the environment. As a consequence planning is more practical, selective, communicative, reflective, creative and effective.

Table 9 lists strengths and limitations attributed to pragmatism. Not all the assessments are valid, especially in view of variations of pragmatism that address several of the potential weaknesses associated with incrementalism. Major valid strengths of pragmatism include the recognition that planning and decision-making are bounded, partisan and collective, the appreciation that the planning environment is often ambiguous, complex and difficult to predict or control and the emphasis placed on the need for creativity, flexibility, communicative skills and experience-based knowledge in planning.

The assertion that pragmatic planning is simply descriptive and reinforces existing practices is not entirely valid. A pragmatic approach can enhance prevailing practice by drawing upon the lessons and insights of planning experiences. Planning approaches, founded upon a basic misunderstanding of decision-making and the environmental context, are more likely to be ineffective than a pragmatic planning approach because with the former there are basic misfits among process, object and context. A flexible, iterative, pragmatic planning approach may also be more suited to large, complex, new problems because of the need for flexibility and experimentation.

Some of the ascribed limitations of pragmatic planning can be diminished through the application of variations of pragmatism. Effective planning or purposive planning, for example, can facilitate links with broader visions and purposes. Urban design as a growing whole (Alexander *et. al.* 1987) provides an interesting model of incremental decision-making process guided by an emerging holistic vision. Methods for application in pragmatic planning can be formulated and refined by drawing upon communications and critical theory (neopragmatism, practical communications,

Table 9 - Pragmatism - Ascribed Strengths and Limitations

Criteria	Ascribed Strengths	Ascribed Limitations
Visionary	-potential to work incrementally toward a vision	-lacks vision; justification of prevailing practice -isolated from purpose; no basis for saying moving in right direction (Faludi 1973) -says little regarding what improvements (Forrester 1989) -limited choices considered (Sager 1994)
Holistic	-recognizes that practically impossible to reach consensus regarding clear and specific objectives	-atomistic image of society undermines potential for long range holistic image of future society (Faludi 1973) -not suitable for new problems or problems requiring major interventions -limited range of ends and means considered (Sager 1994)
Value-based	-recognizes value of non-rational, experiential knowledge (Baum 1977) -integrates facts and values (Verma 1996) -recognizes value of human intentions and psychology (Verma 1996)	-isolated from values -pragmatic without principles (Forester 1981) -lacks safeguards for relevant values
Socially desirable	-recognizes need to attach greater importance to understanding human existence (interaction, intersubjective) -looks toward consequences rather than causes (Verma 1996)	-self perpetuating; pro-inertia and anti-innovation (King 1974; Faludi 1973) -socially dangerous (Healey, McDougall and Thomas 1982) -fails to appreciate divisions in community (e.g., class, ethnicity) -no protection from opportunism (Forester 1981)
Ecologically appropriate	-recognizes that ecological problems do not lend themselves to solutions that are politically, socially or morally authoritative -can adjust to address ecological issues (Lindblom 1973)	-gambles with nature (Briassoulis 1989) -limited vision of environmental problems (Appiah-Opuku 1994) -blind to threshold or sleeper effects -does not address cumulative effects (Appiah-Opuku 1994) -environmental crises handled individually and separate from context (Appiah-Opuku 1994; Edmunds 1981) -environment only addressed when a crisis (Briassoulis 1989)
Economically sound	-recognizes that economic choices tend to be made incrementally (Lindblom 1977)	-reflects interests of most powerful (Faludi 1973)
Rigorous	-recognizes that policymaking is essentially non-scientific; solutions not scientific conclusive -rejects the search for ultimate foundations (Verma 1996)	-argument that an abandonment of theory (Alexander 1984; Healey, McDougall and Thomas 1982) -theory-in-use mostly descriptive (Beauregard 1995)
Creative	-creates new organizational capabilities; staff motivation (demonstrated successes - small wins) -looks for new ideas as proceeds (Behn 1989) -small wins and mistakes facilitates learning -innovation, creativity and learning emerges from practice rather than from contemplation (Behn 1988)	-neglects basic social innovations -problems addressed through outmoded means (Briassoulis 1989)
Flexible	-flexible and autonomous; fast moving sequence of small changes (VanGundy 1988) -recognizes that policy process a continuous process of adjustment (VanGundy 1988; Sager 1994)	-not suited to new problems (Briassoulis 1989; Sager 1994) -a rigid social system is not flexible (Sager 1994)

Table 9 - Pragmatism - Ascribed Strengths and Limitations

Criteria	Ascribed Strengths	Ascribed Limitations
Realistic	-recognizes limits of intellectual capacity; information overload (Lindblom 1977) -recognize limits in ability to manipulate variables; must find points of critical intervention (Lindblom 1965) -realistic description of real life planning; approaches the complexities of practice (Verma 1996); recognizes the special difficulties faced by planners (Blanco 1996) -recognizes information availability, prediction and resource limits -recognizes the artificial separation of ends and means -action oriented -recognizes the political nature of planning (Gregory 1989) -appreciates ambiguity in professional episodes	-ignores necessity of focused, strategic decision-making for major structural changes (Michael 1973)
Effective	-action potential (Hudson 1979) -reduces risks -increases likelihood of satisfactory outcome (Lindblom 1965) -seizes reconstructive opportunities latent in multiple and fluid values -less sunk costs -value of small wins (Behn 1988)	-descriptive rather than prescriptive orientation (VanGundy 1988) -recipe for failure; offers little to practitioners (Alexander 1984) -absence of method (Gregory 1989) -does not deal with crisis situations -lack of specific guidelines regarding comparing choices incrementally (Van Gundy 1988)
Efficient	-makes the most of available knowledge; rules out remote, imponderable, intangible and poorly understood -inquiry only undertaken when its desirability is established (Verma 1996)	-decision-making a structure of veto powers that makes even incremental decisions difficult and insufficient -adds complexity (Beauregard 1995)
Integrative	-coordination facilitated if don't innovate too rapidly (Benveniste 1989) -rapidly analyse and reintegrate (Lindblom 1977)	-disjointed, uncoordinated and piecemeal (Briassoulis 1989)
Distinct Role for Planners	-imbeds planning knowledge in what planners do (Schon 1982)	-limited influence of planning (Hall 1988) -says little regarding what planners should do and how might do it (Forester 1989)
Conducive of Public Involvement	-recognizes importance of language and communications -recognizes that planning a collective activity; emphasis on communications (Sager 1994)	-leaves open question - who decides what level of acceptance (Briassoulis 1989) -role of citizen participation unclear (Briassoulis 1989) -conceptualization of communications is too narrow (Sager 1994)

Table 9 - Pragmatism - Ascribed Strengths and Limitations

Criteria	Ascribed Strengths	Ascribed Limitations
Politically Astute	-recognizes that politicians are naturally sceptical of change -recognizes that democracies subject to conflicting demands -recognizes that politically difficult to agree on what problems are or how they should be eradicated -recognizes the political fallacy of one best way (Gregory 1989) -recognizes difficulties in achieving ideological consensus -recognizes that planning is a collective activity; depends on transaction; limited relevance of unitary actor (Benveniste 1989; Gregory 1989) -recognizes that political system largely works through bargaining and compromise (Briassoulis 1989; Behn 1988)	-fails to recognize that access to power is not evenly distributed; reflects interests of most powerful Faludi 1973; Etzioni 1967; Forester 1989) -although conflict acknowledged power is not addressed as a problem (Sager 1994) -limited view of power and organizational politics (Forester 1989)
Facilitates Decision-making	-recognizes greater importance of language and communications in professional episodes -opens door to informal processes (Benveniste 1989) -reduces information processing demands on problem solvers (VanGundy 1988) -ensures complexity and uncertainty considered in decision environment (VanGundy 1988) -recognizes need for justification and legitimization (Gregory 1989)	-insufficient information for decisions
Facilitates Implementation	-recognizes that vagueness in goals necessary with a plurality of interests and participants -a rapid series of small changes can more speedily accomplish drastic alterations to status quo -facilitates implementation because levers of power remain with politicians rather than being turned over to technicians -does not rock boat, stir antagonisms; attracts allies and proponents; lowers resistance (Lindblom 1979)	-inhibits implementation of major changes (Sager 1994) -if decisions are not adequately justified implementation could be inhibited

critical pragmatism), through the analysis of empirical planning studies, implementation studies and theory-in-action analyses, and by reference to strategic choice (planning in uncertainty) analyses.

Some of the limitations attributed to pragmatism are valid and profound. These negative tendencies can be ameliorated but cannot be completely eliminated. Even with adjustments and refinements an underlying vision and set of social, ecological and economic principles is lacking from pragmatism. Pragmatism, if not handled with great sensitivity, can reinforce inertia and social inequities, justify ineffective practice, inhibit integration and public involvement and fail to provide an adequate response to crises and cumulative effects. The basis for bounding decisions requires clarification, the role of planners needs elaboration and the methods of pragmatic planning need refinement. A partial solution for these negative tendencies may well lie in the more systematic analysis of positive and negative planning experiences. Important lessons and insights for addressing these concerns can also be obtained from other planning theories.

Socio-Ecological Idealism (SEI)

SEI, as a normative planning theory, assumes that utopian images have the persuasive power to transform human action. The antecedents of SEI are many and diverse. Several of these antecedents are shared with other planning theories. In common with rationalism SEI focuses on planning as it should be and envisions society as an organic whole (functionalism). It shares with pragmatism the central role of subjective knowledge (phenomenology) and the existential image of individuals as free moral agents (Johnston 1983). Other important antecedents to SEI as a planning theory include: humanism (concern with human welfare, dignity and interests coupled with optimism regarding human possibilities and achievements) (Flew 1979; Sager 1994; Marshall 1994; Edwards 1981); utopianism (belief in the ability to establish a perfect, harmonious society) (Flew 1979; Kateb 1963); evolutionism (belief in the progressive improvement of human society) (Marshall 1994); social Darwinism (the characterization of the development and structure of human society in terms of evolutionary forces that shape the non-human biological environment) (Flew 1979; King 1974); environmentalism (belief in the protection of the natural environment;

encompasses a new scientific paradigm, a constellation of ideas and a political ideology) (Paehlke 1989); ecology (the study of the interactions that determine the territorial distribution and abundance of organisms) and human ecology (the study of the relationships among individuals, social groups and the social environment) (Marshall 1994).

These diverse strands have been drawn together into a loose grouping of planning perspectives and concepts, a pluralistic theory, that collectively envisions an harmonious integration of human needs and aspirations and the natural and built environments, achieved through the persuasive power of idealistic images. In common with pragmatism, SEI is very much a reaction against the deficiencies of rationalism. Considerable tension exists within this theory, most notably between humanism and environmentalism (Leiss 1974; Ehrenfeld 1978; Everden 1985; Livingston 1981).

The earliest forms of SEI in planning tended to view the design of the built environment as the determining factor in the realization of an ideal future. The planning process was a simple one (survey, analysis, plan) and the planner's role was pre-eminent (planner as master designer). By the early 1970s, physical determinism had been largely replaced with the view that the physical environment is only one among several factors that constrain and provide opportunities for human behaviour (Michaelson 1970). The planning process was increasingly depicted as a dialogue (transactive planning) (Friedmann 1973), where the planner's processed knowledge was integrated with the experiential knowledge of other participants. This humanistic perspective in planning was reflected in a stress on interpersonal relations (Friedmann 1973), a more organic and less mechanistic and hierarchical image of organizations (organizational development)(Argris and Schon 1978; French and Bell 1978) and the application of a learning metaphor to societal guidance (Schon 1971; Michael 1973). Woven through these themes was a partially formulated image of a society evolving into a higher plane (Jantsch 1975; 1980; Ferguson 1980), although it was often unclear whether this transformation was an inevitable outcome of an historical process (a form of historicism) or the product of the proactive efforts of humanistic social change agents.

The humanistic orientation of the 1970s in SEI has since been counterbalanced by the perspectives and values of environmentalism. SEI was broadened to address relationships among the human, built and natural environments (Bookchin 1982; Robertson 1978; Grabow and Heskin 1973) and to integrate natural environmental values and ethics (Wenz 1988; Morrone 1992; MacDonald 1991). To this were added a greater appreciation of the social value of traditional urban form (neo-traditionalism) (Jacobs 1961; Christoridas 1994; Kunster 1994; Alexander *et.al.* 1987; Sewell 1993), utopian images of a holistic balance among the human, the built and the natural environments (organicism) (Hill 1992; Lynch 1981), the extension of adaptive planning to environmental management (Holling 1978), and an increased emphasis on environmental concerns and an ecological perspective (an ecosystem approach) in design (McHarg 1969; Hough 1984, 1990; Spirl 1984; planning and management (Baldwin 1985; Dorney 1987; Royal Commission on the Future of Toronto's Waterfront 1992).

The humanistic perspective has also persisted, although it has been expressed in different forms. Examples include collaborative and participatory planning (Briassoulis 1989; Julian 1994), the fostering of a sense of neighbourhood and community (commutarianism) (Etzioni 1993; Sennett 1974, 1990; Cochran 1994); the stress placed on a deeper understanding of values, ethics and the public interest (Rawls 1971, 1985; Udy 1990; Klosterman 1978, 1980, 1983; Howe 1990; Wachs 1985; Udy 1980), and the integration of critical theory with a transactive planning style (Sager 1994).

As is evident from the above, SEI has proceeded along many different paths, often with only the loosest of affiliations. These diverse strands have been partially drawn together in recent years under the general umbrella of sustainability. The concept of sustainability adds an economic perspective to the mix and the more explicit consideration of future generational implications. Current planning literature is now increasingly replete with principles for and examples of sustainable neighbourhoods, communities and regions (Beatley 1995a; Kellas 1992; Maclaren 1996; Jacobs 1993; Gurstein and Curry 1993; Perks and Vliet 1993; Macburnie 1992). The relationship of the EIA planning process and sustainability is explored in detail in Chapters 5 and 6. By viewing sustainability as the latest expression of SEI, a context is established for a critical appreciation of the strengths and limitations of sustainability as a catalyst for the renewal of the EIA planning process.

Subsets and variations of SEI are highlighted in Table 10. The description of SEI that follows largely focuses on the humanistic forms of SEI - transactive planning, organizational development, learning adaptive planning, societal guidance - subsets largely formulated during the 1970s and early 1980s. These forms of SEI are the most fully and

Table 10 - SEI - Examples of Subsets and Variations

- social
  - -learning - adaptive, transactive (interpersonal relations) (Schon 1971; Michael 1973; Friedmann 1973, 1987)
  - -organizational development (Argyris and Schon 1978; French and Bell 1978)
  - -societal guidance (Mannheim 1935; Etzioni 1968; Dunn 1971; Friedmann 1987; Bookchin 1982; Robertson 1978)
  - -evolutionism (Jantsch 1975; 1980; Ferguson 1980; Hampden Turner 1970)
  - -participatory and collaborative planning / voluntarism (Briassoulis 1989; Fainstein and Fainstein 1996; Julian 1994)
  - -commutarianism (active communities reinvigorating the moral and social order) (Etzioni 1993, 1995; Sennett 1974, 1990; Cochran 1994)
  - -social values and ethics (Rawls 1971; Klosterman 1978, 1980, 1983; Howe 1990; Udy 1990; Wach 1985; Hendler 1995)
  - -critical transactive (Sager 1994; Habermas 1984)

- ecological
  - -ecological systems (self organizing) (Slocombe 1993; Hollick 1993)
  - -adaptive management (Holling 1978; McLain and Lee 1996)
  - -environmentalism (Paehlke 1989; Sandbach 1980; Paehlke and Torgerson 1990)
  - -environmental values and ethics (Wenz 1988; Morrone 1992; Macdonald 1991; Beatley 1989)

- social / ecological/ economic
  - -radical planning (Grabow and Heskin 1973; Friedmann 1995)
  - -sustainability (Milbraith 1989; Robinson *et. al.* 1990)
  - -bioregionalism (Diffenderfer and Birch 1994)

- social - ecological design and management
  - -urban and regional utopias (Fishman 1982; Hall 1988; Barnett 1986)
  - -neo-traditionalism (Jacobs 1961; Christoforidis 1994; Kunster 1993; Sewell 1993; Alexander *et. al.* 1987)
  - -ecotopia / organicism (Hill 1992; Hall 1988; Lynch 1981)
  - -environmental design (Hough 1984, 1990; McHarg 1969; Spirn 1984)
  - -ecosystem approach (Royal Commission on the Future of Toronto's Waterfront 1992)
  - -environmental planning and management (Baldwin 1985; Dorney 1987)
  - -sustainable neighbourhoods, communities and regions (Beatley 1995; Kellas 1992; Jacobs 1991; Gurstein and Curry 1993; Perks and Vliet 1993; MacBurnie 1992)

coherently developed. They have also been subject to the most intense scrutiny. The remaining variations and subsets of SEI have tended to be formulated and applied in isolation and are only recently being tentatively brought together in the quest for sustainability in planning.

From an SEI perspective, planning problems are complex and interconnected (Ackoff 1974) and the planning environment is turbulent and incoherent (Emery 1967; Emery and Trist 1965, 1967; Friedmann 1976). Conventional planning and decision-making are considered ineffective because of a failure to appreciate problem and contextual characteristics, the insufficient consideration of human potential and interpersonal dialogue, and static, closed and hierarchical bureaucratic structures and systems. These obstacles are considered resolvable because of untapped human potential. If people are recognized as self conscious and responsible, if dialogue is acknowledged as pivotal to knowledge construction (Harper and Stein 1992; Sager 1994) and if social learning is viewed as a community and societal imperative (Friedmann and Hudson 1974), the transformation of society and relationships among the human, built and natural environments, are considered both realistic and likely.

The SEI planning process is not based on the abstract ordering of planning activities. Planning is instead an interpersonal and social process, characterized by multiple, feedback relationships (Jantsch 1975), continuous and successive adaptation, social learning and experimentation (Friedmann 1976; Grabow and Heskin 1973; McClain and Lee 1996). Synthesis, innovation, boundary spanning and the management of error and uncertainty are stressed (Michael 1973, 1989; Briassoulis 1989; Friedmann 1976). Knowledge and action are integrated, reflection takes place in action and the process is adjusted on a situation-specific basis (Friedmann 1973, 1976; Harper and Stein 1992). Human and ecological ethics guide and shape the process (Grabow and Heskin 1973).

For individuals, personal development under SEI, takes the form of enhanced self consciousness, knowledge, esteem and tolerance (Hampden Turner 1970; Ferguson 1980; Hudson 1979; Jantsch 1975). Interpersonal relations are structured through informal and symbiotic (Michael 1973) dialogue and a mutual learning process that weds expert and experiential knowledge (Appiah-Opuku 1994; Harper and Stein 1992; Friedmann and Hudson 1974; Friedmann 1995).

Groups and organizations, with a SEI approach, are small, informal, cooperative and self organizing, guiding and actualizing (Jantsch 1975; Ferguson 1980; Friedmann and Hudson 1974). They have an homogeneous, organic, cellular structure with permeable boundaries, interdependent and redundant parts and a low degree of task differentiation and specialization (French and Bell 1978). Lateral and diagonal coordination, communications and learning are stressed (Michael 1989; Friedmann and Hudson 1974). Government structures parallel other organizations with local, decentralized decision-making assemblies, a small number of hierarchical levels, bottom-up participation, decentred planning and a system-wide emphasis on learning (Hudson 1979; Schon 1971; Grabow and Heskin 1973; Friedmann 1993).

The learning metaphor is extended to the societal level under SEI (Daneke 1983; Jantsch 1975, 1980; Friedmann 1973). Society is to be transformed - a paradigm shift (Dunn 1971; Ferguson 1980).The emergent culture would be open, ecological, humane, communal and harmonious (Robertson 1978) A symbiotic and evolving relationship (co-evolution) would exist between the natural and social environments (Grabow and Heskin 1973; Jantsch 1975, 1980).

A SEI planning approach posits decentred planning and a symbiotic, mutual learning relationship between planners and clients (Friedmann 1973, 1993; Michael 1989). Planning takes place in face-to-face transactions (transactive planning) between the planner and the affected populations, adjusted on a situation-specific basis (Alexander 1994; Friedmann 1973, 1987). Personal experiential and processed forms of knowledge are exchanged and merged in these transactions (Friedmann 1973). Prominent planning roles include subjective participant, trainer, facilitator, process organizer, consultant and mediator. The planner contributes concepts, analysis, processed knowledge, analogies and search priorities. The resulting planning process is enabling, liberating, reforming and demystifying (Friedmann 1973). To assume these roles the planner must be skilled in creative problem-solving, interpersonal relations, consensus building and conflict resolution (Briassoulis 1989; Appiah-Opuku 1994).

Table 11 lists strengths and limitations attributed to SEI. The strengths ascribed to SEI are largely valid. SEI represents a useful counterbalance to both rationalism and pragmatism. SEI, in contrast to rationalism, stresses synthesis over analysis, flexibility and creativity over consistency and control, subjectivity over objectivity and planning as a collective, socio-political activity rather than planning as a unitary activity designed and managed by an independent

Table 11 Socio-ecological Idealism - Ascribed Strengths and Limitations

Criteria	Ascribed Strengths	Ascribed Limitations
Visionary	-provides overall vision of future society including planning process (Friedmann 1987; Sager 1994)	-weak on intermediate steps (Briassoulis 1989)
Holistic	-holistic image of society and interrelationships among human, built and natural environments	-wicked problems elude solution -incomplete consideration of political and economic obstacles and specific means
Value-based	-value full and subjective -humanistic values (Friedmann and Hudson 1974) -based on social and ecological ethics (Grabow and Heskin 1973)	-limited consideration of major value conflicts (Briassoulis 1989)
Socially desirable	-recognition of human potential and limits -recognizes dynamic social process -ethics - humane, value full, people centred	-weak on equity issues (King 1974) -uncritical of the excesses of state intervention and the infringement of individual rights (Frohnen 1996; Kautz 1996)
Ecologically appropriate	-stress on symbiotic relationship between social and natural environments -consideration of environmental ethics	-emphasis on consensus not always conducive to the realization of environmental goals (Briassoulis 1989) -ecological concerns only addressed at a high level of abstraction
Economically sound	-recognition of the need for resource conservation and the desirability of fostering local economic potential	-weak on economic inequities and structural problems (Sager 1995; Friedmann and Hudson 1974) -lacks an explicit economic agenda (Paehlke 1989) -ignores class relations and economic organization (Sandbach 1980)
Rigorous	-recognition of the value of intuitive knowledge and of the need to integrate personal experiential knowledge with processed knowledge (Friedmann 1987)	-loose analogies; largely normative; not evaluated in practice; moralizing -questionable evolutionary views -lacks macro social theory
Creative	-recognition of human potential and limits -emphasis on innovation (Friedmann 1993)	-methods to foster creativity not well developed; largely at level of abstract principles
Flexible	-emphasis on experimentation and flexibility (McLain and Lee 1996) -takes advantage of surprise as a tool for learning (McLain and Lee 1996) -provides opportunities to explore "what if" scenarios (McLain and Lee 1996)	-transactive, "face-to-face" planning not well suited for large scale and long term projects where ultimate clients, stakeholders and beneficiaries are not available (Alexander 1994) -methods to ensure flexibility and to overcome resistance to change not well developed
Realistic	-transactive planning style a reasonable and appropriate foundation for multi-stakeholders planning -many aspects of approach essential with complex interconnected problems and a turbulent decision-making environment	-abstract; poorly defined; superficial; not clear how dialogue is to be enhanced (Faludi 1975) -impractical; questionable learning model for society; behavioural utopianism (Bolan 1967) -assumption that all problems can be addressed by small groups not realistic in view of advanced technologies (Alexander 1986) -weak on specific techniques (King 1974) -insufficient consideration of human limitations
Effective	-potential for ameliorating many of the obstacles to effectiveness associated with rational planning -reduces distances among planners, public and politicians; could enhance effectiveness	-offers little to address specific problems (Alexander 1984) -weak on means of cognitive restructuring -potential effectiveness unclear; at too abstract a level

Table 11 Socio-ecological Idealism - Ascribed Strengths and Limitations

Criteria	Ascribed Strengths	Ascribed Limitations
Efficient	-learning model may enhance efficiency -flexible and interactive approach is more likely to identify major problem areas and to avoid significant sunk costs -facilitates rapid knowledge accumulation (McLain and Lee 1996)	-continuous adaptation may lead to inefficient resource use (Briassoulis 1989) -efficiency unknown; largely untested and methods not well developed
Integrative	-emphasis on synthesis	-weak on conflict resolution (Friedmann and Hudson 1974)
Distinct Role for Planners	- a range of roles defined for planners -challenges planners to define roles rather than hide behind professional expertise (Healey, McDougall and Thomas 1982)	-weak on leadership role (Friedmann and Hudson 1974) -not clear if planners have the necessary skills
Conducive of Public Involvement	-recognizes that planning and decision-making too important to be left to experts; challenges dominant role of professionalism and expertise (Healey, McDougall and Thomas 1982) -emphasis on dialogue; creating shared understanding (McLain and Lee 1996) -narrows distance between planners and public; each have something to contribute	-public participation marginal unless inequities addressed (Tauxe 1995) -decision making by minute political groups verges on anarchy; broader issues will not receive sufficient treatment (Hall 1988)
Politically Astute	-working model for political struggle (ethnic, gender, environment) -emphasis on need for collective action (Healey, McDougall and Thomas 1982) -narrows gap between planner and politician; recognizes the political nature of planning	-fails to recognize limits to which can reach consensus -weak on power; voluntary asceticism (Paehlke 1989; Sager 1995; Scott and Roweis 1977) -although states political weak on specific methods (Friedmann 1993)
Facilitates Decision-making	-model for integrating views and perspectives of a range of stakeholders -recognizes the importance of dialogue and consensus building in decision-making	-weak on resistance to change -communications methods not well developed -value and technique changes useless unless techniques properly used (Amy 1990)
Facilitates Implementation	-recognizes that planning is unlikely to be implemented if planner distanced from decision makers	-unwillingness to deal with graduations -weak on implementation issues; largely at a philosophical level -weak on institutional structures and approaches needed to support experimentally-driven management (McLain and Lee 1996)

expert. In contrast to pragmatism, SEI focuses on the integrative role of planning, appreciates human potential, sees the creative, conflict-resolving potential of dialogue and recognizes the need for planning to be guided by images of a better future and to be shaped by human and ecological ethics. SEI is especially insightful in appreciating the limits of expertise and objective knowledge while offering constructive roles for planners in working with politicians and the public on complex problems in turbulent and uncertain environments.

Many of the limitations attributed to SEI are not intrinsic to the theory. It is, for example, possible to simplify the language and to strip away some of the loose analogies and metaphors. Images, such as a learning society and evolutionary transformation, although intriguing conceptually, provide little concrete direction for change. They also lack a means of gauging if and to what extent positive change is occurring. A more modest and more realistic approach would be to focus on specific (perhaps sustainability-based) visions, objectives, principles and methods (see Chapter 5). Subsets and variations of SEI, formulated over the past two decades, offer more specific images and methods, although specific interim steps between the ideals and the current reality require further elaboration and refinement. Relationships among the human, built and natural environment, both as they are and as they should, have been refined. Much more thought has been devoted to social and environmental values and ethics and to methods of integrating values and ethics into planning and decision-making. Specific techniques have been developed and refined for fostering, distortion-free dialogue, for facilitating stakeholder participation and for reconciling conflicting perspectives and interests.

Much work remains to link and integrate the disparate strands of SEI. Such integrative and ameliorative efforts will only partially offset the more profound difficulties associated with SEI. SEI will remain politically naive and largely lacking an economic perspective. SEI has an insufficient appreciation of resistance to change and structurally based inequities. It fails to adequately reconcile its commitment to decentralization and decentred planning with its desire for holistic regional, international and global perspectives and planning. How coordination is to occur and how a holistic perspective to be maintained if decision-making is to reside largely at the lowest level, remain ill defined. The resolution of the more fundamental limitations associated with SEI requires the tools and perspectives of other planning theories.

Political-Economic Mobilization (PEM)

PEI is another pluralist, normative planning theory. Central to PEM is direct political action, informed by a critique of historical and current economic structure and systems.

The roots of PEM are partially shared with the other three planning theories. PEM, in common with rationalism, assumes that we are rational beings. However, with PEM, rationality is expressed as a dialogical thought process (contradictions appear and disappear into a new synthesis), embedded in history and practice (Flew 1979). Thus an irrational society can be transformed into a rational society once it is informed by an understanding of historical and current contradictions and inequities. In common with pragmatism, PEM stresses the unity of theory and action (praxis) and the importance of direct subjective experience (phenomenology). PEM shares with SEI a concern with human welfare and dignity (humanism), a desire to establish a better society (utopianism) and a concern with the historical transformation of society (evolutionism). A distinction is drawn by some PEM theorists between a materialist perspective (matter is primary and the mind is the highest product of matter) and an idealist perspective (evident in both rationalism and SEI) where matter is a product of the mind (Flew 1979).

There are many additional antecedents to PEM. Advocacy, the earliest expression of PEM in planning, drew upon pluralism (political power distributed among competing interest groups), historical concerns with the poor and disenfranchised (left liberalism and pluralism), social reform planning and legal adversarial procedures. Advocacy planning has been largely transcended in PEM by neomarxist planning theory. Neomarxist planning has, in turn, been supplemented by social justice theories, population group (gender, race, ethnicity) theories and critiques and radical and social anarchists perspectives. It has also been partly counterbalanced by more libertarian perspectives. Major intellectual antecedents to these successors of advocacy planning include: Marxism or classical Marxism (the body of doctrine originally formulated by Marx and Engel) (Flew 1979); neomarxism (any social theory that draws upon Marxism but adds modifications and refinements largely by introducing elements from other theories) (Marshall 1994); critical theory (a subset of neomarxist theory - themes commonly incorporated into planning theory include society more complex than class, ecology, alienation, interrelationships crises, the pervasiveness of systemically distorted communications, utopia as an ideal speech situation and the unity of facts and values) (Marshall 1994; Habermas 1984; Forester 1980); hermeneutics (science of interpretation; must understand whole to understand parts) (Marshall 1994); radical philosophy (importance of relevance; the point is not to interpret the world but to change it) (Flew 1979); theories of justice and human rights (a central moral standard in social life; a wide variety of principles are available, the most prominent in planning theory are those formulated by John Rawls) (Marshall 1994; Rawls 1972; Harper and Stein 1992); social anarchism (an ordered society of small units without central government; the natural state of people living together harmoniously, often expressed as communalism, direct action, workers' control and decentralization) (Marshall 1994; Friedmann 1987); feminism (seeks equality of sexes and the extension of the rights of women; encompasses feminist perspective, critique and direct action) (Marshall 1994); sociology of race (seeks equality of races; themes of particular relevance to planning theory include racial belief systems, the extent and nature of racial discrimination and disadvantage, the politics of race, the impact of state policies on racial minorities and the distribution, concentration and segregation of racial minorities) (Marshall 1994, 435); and libertarianism (an anti-state ideology that places an especially high value on individual liberty; it advocates the maximization of individual rights, the minimization of government and a free-market economy) (Marshall 1994); in planning theory it stresses liberty as a counterbalance to equity, a scepticism of government intervention and selective interventions to foster market conditions) (e.g., community economic development).

Subsets and variations of PEM are highlighted in Table 12. Although they share many values and perspectives they have not been drawn together into a coherent whole. Nevertheless, collectively, they do represent a pluralistic planning theory that could potentially take the form of a loosely knit series of affiliations. The description of PEM that follows largely focuses on neomarxist planning theory. Neomarxist planning theory has dominated PEM theory, and arguably planning theory literature, for the past fifteen to twenty years. It has been subjected to considerable refinement and scrutiny. Advocacy theory, although still a subset of PEM, has been largely transcended, in part, because of a critique of its underlying assumptions (e.g., pluralism, failure to address structural inequities) and, in part, because of limited funding support for the practice of advocacy planning (Forrester 1989; Checkoway 1994; Clavel 1994; Mazziotti 1982). The remaining elements of PEM have been less fully developed and have been subjected to less

Table 12 - PEM - Examples of Subsets and Variations

- critique (equity and social justice)
  - -neomarxist (academic Marxists) (Harvey 1985; Paris 1982; Cenzatti 1987; Burton and Murphy 1980)
    - -role and structure of nation state (Burton and Murphy 1980)
    - -working class structure for equality and liberation (Burton and Murphy 1980)
  - -critical (Habermas 1984; Alexander 1984; Forester 1980, 1981, 1989, 1993; Kemp 1982; Friedmann 1987)
  - -justice (social, environmental) (Rawls 1972; Forester 1980, Wenz 1988)
  - -by population group
    - -gender (Fainstein 1992; Liggett 1992; Friedmann 1992)
    - -race (Mier 1994; Hoch 1993; Cordova 1994)
    - -disabled (Muller 1982)
    - -ethnicity (Sandercock 1995; Tauxe 1995)
  - -social anarchist (decentralization, self empowerment, workers' control) (Friedmann 1987)
  - -composite perspectives (e.g., ecofeminism, ecomarxism, ecosocialism) (Birkeland 1995)

- critique (liberty) (libertarianism, neoconservatism, public choice theory) (Harper and Stein 1992; Hague 1991; Hoch 1992; Sorenson and Day 1981)

- action (equity / social justice)
  - -within state
    - -social / environmental planning (Davidoff 1965)
    - -equity planning (downtown development and housing, national urban policy) (Forester 1989; Harper and Stein 1992; Kromholtz 1982; Kromholtz and Forester 1990; Metzger 1996)
    - -redistributive / progressive planning (Forester 1989)
    - -structural / radical / ideological planning (Fainstein and Fainstein 1978, 1982; Peattie 1994; Forester 1980)
    - -by population group (e.g., affirmative action)
    - -guerillas in the bureaucracy
    - -socialism
  - -external to state
    - -traditional advocacy (radical liberal) (project, neighbourhood, community, suburban, metropolitan, social services) (Weaver *et. al.* 1985; Rothblatt 1978; Davidoff, Davidoff, and Gold 1970; Clavel 1994)
    - -oppositional planning (advisory groups, lobby groups, radical political parties) (Boardman 1992; Clavel 1980)
    - -progressive / radical advocacy (Krumholz 1982; Peattie 1994) (environment, gender, race, ethnicity) (Yiftachel 1989; Fainstein 1992; Friedmann 1992b; Leggett 1992; Mier 1994; Hoch 1993; Muller 1982; Sandercock 1995; Clavel 1994; Fainstein and Fainstein 1985; Hartman 1978)
    - -community development and power / social urban and environment movements (Peattie 1994; Castells 1972,1977; Fainstein and Fainstein 1985; Agger 1979; Heskin 1991; Beauregard 1995; Pickvance 1985; Harper and Stein 1992; Brown and Masterson 1994; Piven and Cloward 1978, 1979; Morris 1996)
  - -social anarchism (decentralization, self empowerment, worker control) (Friedmann 1987, 1993; Harper and Stein 1992)
  - -coalitions and combinations (Marris 1982; Hudson 1979; Friedmann 1987) (feminism, ideological, environmental movements, socialism)

- action (liberty) (Pollack 1996)
  - -state-sponsored (community economic development, decrementalism, neoconservatism) (Crowe 1988)
  - -non-state sponsored - lobby groups, advisory groups, political parties (Sager 1995a)

intense analysis and reflection.

According to PEM, society, historically and currently, is based on the capitalist principles of private property and market exchange (Harvey 1985; Friedmann 1987). Labour is exchanged for wages, capitalists engage in entrepreneurial functions for profit, and the surplus, above what is required to satisfy basic human and social needs, is unevenly distributed (Harvey 1985, 1989). Inequities in the distribution of the surplus are structural and class-based with the interests of capital dominating those of labour (Friedmann 1987; Boggs 1991). The differences between capitalists and working classes are rooted in social and economic history and are irreconcilable (Harvey 1985; Cenzatti 1987). Class inequities are reflected in urban form and land use allocation (i.e., class domination of space) (Harvey 1989a). The relationship between haves and have nots is dynamic, non-linear and unstable. Contradictions in class relations are continuously being redefined, although the role of labour is invariably defensive (Cenzatti 1987). This instability leads to an inevitable series of crises (Harvey 1989a).

The state props up the capitalist enterprise and mediates class conflicts (Klosterman 1985; Boyer 1983; Healey, McDougall and Thomas 1982; Beauregard 1978; Harvey 1985). The private appropriation of the surplus is legitimized, goods and services are provided to groups whose political support is needed by the state and politician and civil servants and administrators are recruited from the ruling class (Cenzatti 1987; Sandbach 1980; Beauregard 1978). Policy is directed by technical elites that justify and reproduce the technical order that produced them (Boggs 1991). Urban planning is a local manifestation of the general role of state in advanced capitalism (Harvey 1985; Kiernan 1982). Mainstream planning theory (any of the other three planning theories) reinforces this subservient role through an economic, physical and conservative bias, a high level of abstraction and an unwillingness to theorize on the dynamics of capitalist society.

Planning practice legitimizes the capitalist state (Yiftachel 1989; Klosterman 1985; Bergman and Sarbib 1980; Fainstein and Fainstein 1978) by; managing the contradictions of capitalism manifested in urban form and development (Fainstein and Fainstein 1978); seeking a smooth and balanced growth; alleviating market imperfections; ensuring private market availability; reducing uncertainty (Klosterman 1985; Harvey, 1973, 1978, 1985; Fainstein and Fainstein 1978; Cenzatti 1987; Yiftachel 1989); mitigating the most blatant excesses of capitalism; mediating conflicts among different fractions of capital; regulating the processes and pressures of dominated classes (Boyer 1983; Harvey 1978; Cenzatti 1987); containing civic strive by internalizing conflict through repression, co-option, integration, justification and rationalization (Harvey 1978, 1985; Cenzatti 1987; Castells 1977); depoliticizing the role of the state; and mystifying the effects of capitalism and state interventions (Benveniste 1989; Agger 1979; Boyer 1983; Fainstein and Fainstein 1978).

PEM planning theory assumes a unity of theory and practice (praxis) (Friedmann 1987). Knowledge is acquired through practice (Beauregard 1980) and is embedded in history (Flew 1979). Planning is seen as intrinsically political and distributional (Kiernan 1982). Theories and methods are congruent with client values and goals (Briassoulis 1989). True understanding can only be obtained by an investigation of the economic organization of society (Sandbach 1980). Once informed, through a critique of the historical and current organization of society and the role of the state, any interventions to offset inequities must be guided by the appreciation of the central importance of social and distributive justice. Redistribution is seen as an ethical imperative (Kiernan 1982).

The PEM planning process has both a critical and an action component. The critical component takes the form of a dialectical and critical thought process, but a thought process unified with the substance or object of planning. Contradictions are recursively identified and reconciled (i.e., thesis, antithesis and synthesis)(originally suggested by Hegel) (Marshall 1994). Analysis and criticism can serve to raise our own consciousness, provide political direction and sensitize planners (Bergman and Sarbib 1980; Burton and Murphy 1980; Beauregard 1980; Baum 1977; Friedman, Kossy and Regan 1980). PEM is not a normative planning theory if it stops with critique either because any form of action is considered co-option or because action is considered unnecessary with the inevitable collapse of the capitalist state. Action can take a variety of forms as highlighted in Table 13. The collective consequence of actions, such as those cited in Table 13, is the primacy of social justice as a guiding principle (Hoch 1993), the redistribution of resources from elites to the working class and poor, and political and economic control by workers and the local community (Hoch 1993; Krumholz 1994; Sandbach 1980).

Table 14 lists strengths and limitations attributed to PEM. Many of the ascribed strengths are valid. PEM recognizes the essential unity of theory and practice, process and object, and explanation and prescription. The view

Table 13 - PEM - Possible Progressive Planning Actions and Roles

- facilitate change (Kraushaar and Gardels 1982)
- fracture ties between state and constituencies (Burton and Murphy 1980)
- build relationships between producers and consumers of facilities and services (Friedman, Kossy and Regan 1980)
- be a watchdog, a whistle blower, a monitor of communications flow and a guerrilla in the bureaucracy (Beauregard 1978)
- encourage the substitution of equity for efficiency concerns (Beauregard 1978)
- make creative use of technical expertise in support of social justice (Beauregard 1978)
- support plural plans
- support greater use of planning, especially national planning (Fainstein and Fainstein 1978)
- support the greater use of cooperatives and state enterprises (Fainstein and Fainstein 1978)
- support the appropriate use of technology
- support actions that lead to more open and democratic decision-making
- support more assistance for the poor and disadvantaged (Fainstein and Fainstein 1978)
- support assistance to working class, poor and disadvantaged to participate in decision-making
- support progressive programs and network communications (Fainstein and Fainstein 1978)
- support improved services and facilities, especially for the working class, the poor and disadvantaged
- support organization of public workers
- undertake defensive strategies against decision-making that works against the interests of the working class, the poor and the disadvantaged (McDougall 1978)
- oppose the dismantling of the state (McDougall 1978)
- oppose the further redistribution of resources and power to local elites
- support actions that will lead to more open public decision-making
- support positive (for the working class, the poor and the disadvantaged) state actions
- support any actions that result in a redistribution of power and resources from local elites (Krumholtz 1982, 1994)
- support affirmative action / positive discrimination (Kiernan 1982)
- support any planning alliances that will alleviate social and economic disparities (Kiernan 1982)
- oppose any private proposals that are against the interests of the working class, the poor and the disadvantaged
- support improved services and facilities for the working class, the poor and the disadvantaged
- support workplace democracy and worker control (Sandbach 1980)
- encourage economic development under the control of local workers and the local community (Sandbach 1980)
- encourage community organization (Friedman, Kossy and Regan 1980)
- support community action and control (Sandbach 1980; Friedman, Kossy and Regan 1980)
- support the decentralization and decentring of decision-making (Friedmann 1987)

Table 14 - Political Economic Mobilization - Ascribed Strengths and Limitations

Criteria	Ascribed Strengths	Ascribed Limitations
Visionary	-provides an alternative to long term structural relationships that lead to injustice (Beauregard 1995)	-more of a protection against repression than a substitute; largely negative; critique rather than a vision of future (Brooks 1993; Sager 1995)
Holistic	-dispels myth that planning is comprehensive -systematic analysis of capitalist society including role of state and planning within state -concerned with substantive issues	-simplified view of society; overemphasizes class -insufficient consideration of social and ecological aspects of society -deterministic (Saul 1992)
Value-based	-recognizes values; integrates facts and values -dispels myth that planning is value neutral and rational; recognizes that planning is a moral activity (Heskin 1980; Davidoff 1965) -clear set of values (e.g., distributive justice)	-if cannot be normative; no values advanced (Hall 1988) -impacts on liberty of greater state intervention not considered
Socially desirable	-broadens social basis of decision-making (Briassoulis 1989) -identifies problems of urbanization in capitalist societies (Harvey 1985) -focus on distributive justice; challenges existing institutions (Clavel 1994) -elaborates alternatives for the working class -rationally justifies social needs, questions existing social practices, recognizes historical social processes and emphasizes quality of life	-insufficient consideration of bureaucratic arrogance; subjugation of individual -preoccupation with ideologies rather than expanding choices of poor -when insists on an impossible standard, the outcome may not be socially desirable -dangers of suppression of individual liberty
Ecologically appropriate	-questions environmental practices recognizes that can't be both pro-environment and pro-development (Briassoulis 1989)	-low level of environmental quality in centralized planning countries (Hubbell and Selden 1994) -when insists on an impossible standard, the outcome may not be environmentally desirable (Briassoulis 1989)
Economically sound	-recognizes limits of market -recognizes that the levers of power are economic	-role of market oversimplified and viewed in entirely negative manner; ignores positive market role and entrepreneurial skills
Rigorous	-unity of theory and practice -explanatory power (Healey, McDougall and Thomas 1982) -emphasizes pursuit of knowledge (Benveniste 1989) -opens up new areas of inquiry (Cenzatti 1987) -uncovers implicit assumptions and world views within planning	-tends to be highly descriptive; weak on prescriptions (Healey, McDougall and Thomas 1982) -not required to make underlying assumptions or complex world view explicit (Cenzatti 1987) -universality of concepts not empirically demonstrated (McDougall 1978); acceptance a matter of faith (Alexander 1984) -failure to critically evaluate state interventions directed toward social objectives -arbitrary choice of categories (McDougall 1978) -inadequate evaluation of planning failures; uncritical of radical practices -inadequate consideration of lessons learned (or not learned) from socialist experiments -verbally incoherent and epistemologically confused (Reade 1982)
Creative	-opens up area of study (e.g., role of state, urban sociology)	-tendency toward dogmatism and arbitrary categories can inhibit creative solutions; collectivist perspective may inhibit individual creativity

Table 14 - Political Economic Mobilization - Ascribed Strengths and Limitations

Criteria	Ascribed Strengths	Ascribed Limitations
Flexible	-critique and actions can be adjusted to a wide range of situations	-tendency toward dogmatism and arbitrary categories can inhibit flexible solutions -post factum; explains phenomena in progress; inadequate to explain emergent phenomena (Cenzatti 1987)
Realistic	-helps reveal underlying interests in contemporary planning (Klosterman 1985) -helps understand why people act the way they do (Benveniste 1989) -recognizes limits of present -recognizes the central role of conflict in planning -recognizes limits to professional competence	-not realistic regarding the replacement of market; at best steer and guide (Lindblom 1977; Klosterman 1985) -oversimplifies society (Sandercock 1995) -failure to recognize human motivations, potential and limitations -failure to recognize resource limits -assertions deduced from axioms; largely untested (Reade 1982)
Effective	-catalyst for action (Benveniste 1989) -alters resource allocation	-no alternative forms of restructuring (Cenzatti 1987) -problems in moving from negative to positive -failure to explain knowledge contradictions (Forester 1984a)
Efficient	-focuses resource use in areas where can do most good socially	self-defeating; cooption; keeps political and economic structure in place that oppresses (Goodman 1971) -failure to acknowledge bureaucratic inefficiency
Integrative	-unity of theory, practice, process, substance and history	-denies possibility of a solution that accommodates all parties (Briassoulis 1989)
Distinct Role for Planners	-broad range of critique and action roles for progressive planners	-no practice role for planners if any action viewed as legitimizing the existing order (Klosterman 1985; Cenzatti 1987) -historicism - if predetermined path planned change meaningless (Popper 1986) -no expertise; difficult to justify as separate profession -largely critique; not proactive (Brooks 1993) -no differentiation from politicians
Conducive of Public Involvement	-stimulates community involvement; bottom-up perspective (Benveniste 1989) -identifies structural, organizational and political barriers that distort citizen involvement; corrects systemic misinformation (Forester 1989) -emphasis on emancipatory practice (Sager 1995) -challenges existing power relations (Harper and Stein 1992; King 1974)	-false democracy; self selected spokespersons -often jargonistic and remote from interests espouse -danger that public involvement will be discounted if public perspectives do not coincide with ideological pre-conceptions
Politically Astute	-politicizes planning; recognizes political nature of planning -addresses issue of planning for whom (Benveniste 1989) -recognizes that planners often lack real power -recognizes the danger of manipulation by planners and politicians	-fails to recognize the depth of power relations; not successful in forming constituencies around issues -naive view that planners can significantly alter urban political discourse without altering the organizational structure of planning (Brooks 1990)
Facilitates Decision-making	-recognizes that planners often lack understanding how decisions are made	-abstract ideological critique not likely to have much political influence -no accommodation of other perspectives; likely to inhibit decision-making effectiveness
Facilitates Implementation	-translates plight into problem	-no mechanism for bringing about radical transformation (Klosterman 1985)

of planning, as a dialectical process of contradiction and reconciliation (embedded in practice and history), is especially insightful. PEM planning theory provides an effective critique of prevailing planning theory, the economic structural underpinnings of society, the role of the state, and planning practice as a political activity integral to broader state interventions. PEM advances the role of equity and social justice in planning and draws attention to the, usually implicit, distributional assumptions and implications of contemporary planning practice.

The limitations ascribed to PEM are not entirely valid. It is an overstatement to suggest that PEM is not normative, lacks a vision for the future and offers little in the way of mechanisms for change or roles for planning practitioners. Each of these concerns does require additional attention. Other PEM subsets and variations can also offset potential negative tendencies. They can provide a broadened perspective of existing and potential societal structures and interactions, contribute additional social and ecological visions and values, offer frameworks for identifying and alleviating communications distortions and provide a greater understanding of social and environmental justice and of the interconnections among social, economic and ecological perspectives and interests. Additional insights can be added from feminist theory and from analyses of planning from the perspectives of ethnic and racial minorities and the disabled. Composite perspectives and strategies offer the potential to draw the various components of PEM closer together. They also provide a basis for links with other planning and related theories and practices.

Largely undeveloped, as yet, is a libertarian planning theory. Libertarian planning is not necessarily an oxymoron. There is a role, albeit limited, for planning (both through the public and the private sectors) in a society that stresses individual rights and voluntary interactions (Pollack 1996). Planning theory could help define that role. The selective application of libertarian principles could also help to counterbalance the undemocratic excesses of government and the negative tendencies of the mainstream planning theories.

PEM, even with the refinements noted above, is not an entirely satisfactory normative planning theory. Reference will need to made to other planning theories to provide further social and ecological visions and values, to ensure a more profound understanding of planning and decision-making and to formulate, justify and implement empirical analyses and practical action strategies.

Overlaps, Interconnections and Middle Ground Concepts

The characteristics of the four planning theories described above are not mutually exclusive. They share several characteristics. There are important linkages among theories. Where significant differences exist between theories, intermediate concepts are evident between the extremes. The identification of these overlaps, interconnections and middle ground concepts is necessary if the EIA planning process is to effectively draw upon combinations of elements from the four theories.

Table 15 highlights major overlaps, interconnections and middle ground concepts between pairs of planning theories. As highlighted in Table 15, the tendency has been to view the theories as mutually exclusive and competing. An overview of the overlaps between pairs of theories indicates many shared characteristics. This suggests the potential for, at least, a partial integration of planning theories. In considering the interconnections between theories it is clear the theories are often complementary. One theory may, for example, broaden the conceptual foundation of another theory, offset key deficiencies, provide tools for grounding and implementing that theory, make it possible to address a wider range of problem and context types and provide a mechanism of transcending traditional dichotomies. In each case the theories are mutually supportive. Many middle ground concepts have been formulated. These concepts further suggest the potential for a partial integration of planning theories.

Although, the overlaps, interconnections and middle ground concepts suggest a considerable potential for the integration of elements of the four planning theories, important value and ideological-based differences remain. Arguably these differences are less intrinsic to the theories than reflective of the inevitable value and ideological differences that exist across society. Why then is it necessary to persist with competing yet partial, overlapping and interconnected planning theories? Why instead cannot the debate among competing perspectives and interests be encompassed within composite theories? Others have identified the need for such metatheories (also referred to as paradigms or multi-levelled doctrines) (Marris 1982; Friedmann and Weaver 1977) but metatheories have yet to be

Table 15 - Examples of Overlaps, Interconnections and Middle Ground Concepts

Overlaps	Interconnections	Middle Ground Concepts
	Rationalism and Pragmatism	
• rationalism and pragmatism are both rational; the difference is one of degree • both are scientific - inductive and deductive • both lack a clear sense of purpose • both take the rational planning process as a point of departure • both assume that decisionmakers are rational • both assume a pluralist society	• pragmatism informs rationalism with lessons from experience • pragmatism is a means to ground rationalism • rationalism and pragmatism are complementary; counterbalance what is and what could be • rationalism disciplines pragmatism (justification) • rationalism within EIAs but accumulation of project-related EIAs is an incremental process (pragmatism) • pragmatic search process but rational evaluation process • complementary - inductive (pragmatism) and deductive (rationalism); reasoning and analysis • pragmatism provides a critique of some of the negative tendencies of rationalism • rationalism provides a critique of some of the negative tendencies of pragmatism	• design rationality - reflection in practice (Schon and Rein 1994) • mixed scanning as a strategy for moving between rationalism and pragmatism • practical rationality; planning as attention shaping, practical, communicative action (Forester 1984b) • pragmatic rationality; inquiry meaningful if makes a difference; truth cannot be separated from contexts or methodology for verifying (Verma 1996) • contingency approach - bounding of rationalism by external constraints (Christensen 1985; Alexander 1984) • a positive theory of planning; empirical testing of rationalism and pragmatism (Friedmann 1973; Westhues 1985) • strategic planning - adjusts rationalism to problem and context characteristics • strategic choice - rationalism constrained by multi-organization setting and uncertainty (Yewlett 1985; Friend 1983) • adaptive environmental assessment - more selective and flexible than rationalism (Holling 1978)
	Rationalism and Socio-Ecological Idealism SEI)	
• both assume consensus possible • both stress human potential • both are idealistic • both assume a pluralist society	• SEI adds social and ecological ethic to rationalism (Boggs 1991; Caldwell 1991; Dorney 1987) • SEI tempers the emphasis by rationalism on technical and scientific knowledge; blends processed and experiential knowledge • rationalism provides a means of testing and justifying SEI • SEI broadens and directs rationalism • rationalism within a social and ecological context • SEI provides a critique of rationalism • SEI counterbalances reason with humanistic (Saul 1992) and ecological perspectives	• EIA, SIA, social and environmental planning combine and integrate social and environmental values into rationalism • ecological rationalism (Bartlett 1986, 1990) • ecosystem approach; adds ecological concepts and methods to traditional scientific methods (Slocombe 1993) • functional and ecological rationalism; actions consistent with an ecological ideal (Sager 1994) • achieving the comprehensive ideal by consensus building; public interest is jointly discovered and willed; a group choice that integrates experiential knowledge and facilitates coordination and political support (Innes 1996) • scientific adaptive management (McLean and Lee 1996)

Table 15 - Examples of Overlaps, Interconnections and Middle Ground Concepts

Rationalism and Political Economic Mobilization (PEM)

Overlaps	Interconnections	Middle Ground Concepts
• both seek ideal planning and decisionmaking • both rational in the sense of systematic analysis	• rationalism as a tool for the realization of PEM ideals (justification) • PEM adds to rationalism - critical analysis, ends and stronger theory to practice connections (praxis) • PEM a critique of misuse of rationalism • rationalism as a means of testing the assumptions and assertions of PEM • what is rational depends on social and material circumstances; latter addressed by PEM (Harvey 1985) • counterbalancing - rational action without domination and mastery (Sennett 1990) • rationality within a political - economic context	• advocacy as interim step from rationalism to PEM • advocacy planning as a form of bounded, communicative rationality (Sager 1994) • critical theory or critical rationalism- broadens concept of rationalism to address communications distortions and to consider structural inequities (Faludi 1989) • neopluralism and reformist Marxism; reformist (PEM) activity within the constraints of the capitalist state (rationalism) (Yiftachel 1989) • mixed market system (consumer sovereignty, public enterprise, planner sovereignty, private enterprise) blends elements of rationalism and PEM (Lindblom 1977) • social rationalism - rationalism with social justice (Harvey 1973)

Pragmatism and Socio-ecological Idealism (SEI)

Overlaps	Interconnections	Middle Ground Concepts
• both recognize the dynamic nature of environment and the need for flexibility • both emphasize experimentation • both recognize that planning is a collective endeavour • both recognize importance of experiential and subjective knowledge (Friedmann 1995) • both emphasize dialogue (Sager 1994) • both stress learning	• pragmatism could represent a means to achieve SEI in small steps • SEI can add purpose and social and ecological ethics to pragmatism; a vision to strive for • pragmatism informs SEI; a means to ground SEI • SEI and pragmatism complementary; what is and what could be • pragmatism identifies obstacles to the achievement of SEI • project-related EIA incrementalism within a social and ecological context	• dialogical incrementalism - combines elements of incrementalism and transactive planning (Sager 1994) • management by grouping along - incremental learning steps toward a social end (Behn 1988) • learning based on experience • coalition building incrementalism

Table 15 - Examples of Overlaps, Interconnections and Middle Ground Concepts

Pragmatism and Political Economic Mobilization (PEM)

Overlaps	Interconnections	Middle Ground Concepts
• both seek to explain reality but at different scales • both see planning and decisionmaking as political • both recognize that conflict is central to planning and decisionmaking • both focus on direct action	• pragmatism could represent a means to achieve PEM in small steps • pragmatism informs PEM • pragmatism is a means to ground PEM • pragmatism identifies obstacles to the achievement of PEM • pragmatism provides to PEM a sounder understanding of organizational dynamics • PEM provides to pragmatism a political economic critique and a political economic vision • PEM provides a critique of pragmatism	• critical pragmatism; pragmatism informed by PEM critique (Forester 1993); criticism with vision

Socio-ecological Idealism (SEI) and Political Economic Mobilization (PEM)

Overlaps	Interconnections	Middle Ground Concepts
• both visionary • the combination of SEI and PEM provide more complete images of historical and current conditions as well as potential futures • both long term • both have optimistic image of human potential • both characterize limits in current society • both stress need for fundamental change • both emphasize bottom-up planning and participation • both stress need for a change in consciousness	• PEM adds a political and economic dimension to SEI; potential for integration of visions • PEM and SEI complementary; conflict based and consensus based group and societal dynamics • complementary - explanatory of present (PEM) and model for future (PEM and SEI) • complementary - evolutionary and structural transformation (Friedmann 1987) • PEM identifies obstacles to the achievement of SEI ends • SEI (adaptive management) balancing PEM (bounded political conflict) directed toward sustainability	• SIA in middle ground when focuses on distributional impacts (Dale and Lane 1994) • environmentalism, environmental and social advocacy and progressivism in middle ground (Paelkhe 1989); SEI ends and PEM means • feminist theory - different perspective on ecological, social, political and economic elements; informs SEI and PEM • social and environmental movements combine SEI vision with PEM critique (Brown, Masterson-Allen 1994) • radical planning: contains elements of SEI and PEM (Friedmann 1987; 1992a) • negotiation promotes bounded conflict

formulated. A proposal to construct meta-theories does not imply that conflicting perspectives and interests are all resolvable. Such conflicts have not been resolved in society. It is not realistic to suggest that they can be reconciled within a planning theory or metatheory. Planners will and should take and justify value-based positions. Adaptations will also be necessary to suit local contextual conditions. The construction of metatheories, appreciating that competing metatheories are likely and perhaps necessary, will elevate the planning theory discussion beyond the hyperbole endemic to historical and current debates among partial, overlapping theories - none of which adequately deepen the conceptual base of planning or sufficiently inform planning practice.

Postmodernism

Postmodernism has been identified as a major challenge to planning theory and practice (Milroy 1991; Harper and Stein 1992; Harvey 1989; Hoch 1992; Beauregard 1991). The meaning of postmodernism is contentious and far from certain (Milroy 1991; Harvey 1989b). Postmodernism has been variously identified as: a reform of modernism to compensate for the failures of modernism (Hoch 1992; Milroy 1991); a new stage, epoch or generic social condition relative to modern culture and capitalism (Marshall 1994; Milroy 1991; Hoch 1992); a new way of understanding that rejects enlightened ways (Hoch 1992); and a new creative style or body of theory or method (Milroy 1991; Marshall 1994).

It is not appropriate or necessary to reconcile these conflicting perspectives regarding the meaning of postmodernism if generally recognized themes associated with postmodernism can be identified, interpreted and their implications for planning (and, by extension, the EIA planning process) assessed. Ironically the ambiguity and multiple meanings associated with the concept postmodernism mirror the postmodernist perspective.

Postmodernism identifies two major myths that have legitimized scientific activities (including social sciences) and planning - 1) the myth of liberty (progress through science and technology) and 2) the myth of truth (objective knowledge) (Marshall 1994; Harper and Stein 1992). Liberty has been undermined by the crimes of science in the twentieth century and truth has been rendered incredible by sceptical thoughts of historians and philosophers of science

(Marshall 1994, 406).

The postmodernist challenge of modernist truth begins with the rejection of the distance of the observed from the observer. The same challenge applies to the separation of the planner from the subject of planning and from the constituency ostensibly served by the planner. Independence or objectivity is replaced by ironic commentary (Beauregard 1991; Hoch 1992).

Postmodernism is anti-essentialism (disputes the belief that science can provide definitive truth and complete explanations) and anti-foundationalism (challenges the assertion that fundamental underlying truths exist and can be identified) (Beauregard 1991; Milroy 1991; Harper and Stein 1992; Marshall 1994). The essential or universal, as a basis of truth, is rejected (Beauregard 1991; Milroy 1991; Harper and Stein 1992). Causality (i.e., cause and effect reasoning) is rejected on the grounds that claims and justifications are too unstable (Harper and Stein 1995; Sandercock 1995; Milroy 1991). Universal truth and single causality are replaced with a plurality of relative truths and meanings (Sandercock 1995; Harper and Stein 1995).

A plurality of truths and meanings stem from a plurality of differences in society (i.e., multiple ambiguous cultures) (Dalton 1993; Milroy 1991; Harper and Stein 1995; Beauregard 1991). Familiar dualisms (e.g., subjective - objective) are deconstructed in favour of multiple differences. Single discourses and narratives are replaced by multiple discourses or narratives (Hoch 1992; Beauregard 1991). A single or universal meaning for a concept is replaced with multiple meanings (Harper and Stein 1995). Interpretations of meanings are incomplete, fragmented and contingent (Beauregard 1991). Knowledge is ambiguous (Beauregard 1991; Harper and Stein 1995). Increased knowledge reveals differences rather than setting direction (Beauregard 1991).

With multiple meanings and an ambiguous, partial and contingent knowledge base, analysis is necessarily incomplete and is locally determined (Beauregard 1991). Consensus is impossible. There are only multiple, diverse, ambiguous and incommensurable languages and narratives (Milroy 1991; Beauregard 1991; Harper and Stein 1995). The notion of language mirroring the world is repudiated (Harper and Stein 1995). The future can neither be anticipated nor controlled (Dalton 1993; Beauregard 1991).

Postmodernism rejects the liberating effect of modernist science and planning (Hoch 1995). With postmodernism there is a deep distrust of theory and a rejection of technical analysis (Beauregard 1991). Planning is depicted as intellectually oppressive (Beauregard 1991). Conventional norms of judgement are interpreted as reinforcing power relationships (Hoch 1995). The inevitable outcome of planning is seen as the perverse exercise of power (Hoch 1995). Planners are seen as benefiting from and spreading the power of control in the name of doing good for others (Beauregard 1991).

Postmodernism is deconstructive (Milroy 1991; Sandercock 1995). It is not a substitute for modernism (Hoch 1992). Neither is it a normative planning theory (Dalton 1992; Hoch 1993). The challenge of truth suggests it is not possible to plan. Planning is consequently caught in an abyss of indeterminacy (Beauregard 1991, 1995). Planning becomes confused and incoherent (Harper and Stein 1995). Legitimate reasons cannot be provided (Harper and Stein 1995). Planners become paralysed, helpless and passive (Beauregard 1995; Sandercock 1995; Hoch 1995; Harper and Stein 1995). The challenge of liberty asserts that planning should not be undertaken. Consensus is impossible (Hoch 1992). Planning, in any form, is perverse and repressive (Hoch 1992; Harper and Stein 1992). Lacking in legitimacy planning is impotent (Harper and Stein 1995).

The consequences of accepting the postmodernist proposition that planning is neither possible nor desirable are unacceptable. The absence of planning would mean the exacerbation of alienation, a lack of social continuity and the magnification of global social, economic and ecological crises (Harper and Stein 1995; Dalton 1992). Our ability to address problems in a just and humane way would be severely undermined, guidance to the public sector would be lacking and political oppression would be intensified (Harper and Stein 1995; Beauregard 1991; Harvey 1996; Campbell and Fainstein 1996).

If much of the postmodernist critique is valid, but the full acceptance of the tenets of postmodernism are unacceptance, contemporary planning risks being suspended between modernism and postmodernism (Beauregard 1989, 1991). The only escape from this conundrum is to treat postmodernism as a warning rather than as an alternative to planning (Hoch 1992). Postmodernism offers many important lessons and insights for planning. Postmodernism can have an exciting and liberating influence on planning (Sandercock 1995).

Postmodernism highlights the limits of science and positivism, the rigidity of methodology, the dangers of planning arrogance and the impossibility of absolute and objective truth, values and knowledge (Sandercock 1995; Milroy 1991; Beauregard 1991; Harper and Stein 1995). Planning is best seen as conveying logically supported positions rather than as conveying absolute truth (Milroy 1991). By confirming the unity of subject and object, postmodernism illustrates the impossibility of conducting planning without a sound understanding of the objects of planning and a commitment to plan with rather than for all parties interested and potentially affected by the planning initiative. Understanding the perspectives, needs and desires of each party is crucial.

Postmodernism points to the immense variability in meanings, perspectives, identities, experiences and methods of knowing in contemporary society (Dalton 1993; Schon 1983; Beauregard 1991; Sandercock 1991). It demonstrates the ambiguity of meaning, the ubiquity of uncertainty and complexity and the limits and distortions of knowledge (Beauregard 1991; Sandercock 1995; Milroy 1991). Planners must be especially sensitive to differences (e.g., culture, class, ethnicity, race, gender) and to the implications of differences for dialogue, reasoning and communications in planning (Sandercock 1995). Language and communications are central to planning (Forester 1996). The planning process is best envisioned as a dialogue rather as an analytical procedure (Sandercock 1995). The written product of planning (the plan) is better understood as a narrative, created through imaginative acts, than as a master plan (Beauregard 1991). Yet postmodernism demonstrates that language is far from being a smooth conduit for communications (Milroy 1991). Thus planning, as a communications process, must be undertaken with a high degree of sensitivity to the plurality of meanings and perspectives, to the inevitability of ambiguity and distortion and to the presence of complexity and uncertainty.

The postmodernist assertion that science and planning undermine liberty reinforces the political nature of planning, the danger of ideological distortions and the potential for ostensibly beneficial planning initiatives having perverse political consequences (Harper and Stein 1995; Sandercock 1995). Planners must guard against such tendencies. They should also encourage multiple views on empowerment (Harper and Stein 1995).

The basic message is that modernist planning must be reshaped to incorporate the lessons and insights of postmodernism. A delicate balancing act is required. Knowledge is still helpful but must be tempered by an appreciation of the limits of knowledge (Beauregard 1991). Plurality must be respected but communications and dialogue in planning remain possible and necessary (Harper and Stein 1995). Minimizing communications distortion is even more important (Harper and Stein 1995). Consensus is still possible but only if provision is made for multiple communities, styles and values (Campbell and Fainstein 1996; Milroy 1991; Harper and Stein 1995; Harvey 1989b, 1996). Although individual liberty is at risk, and requires protection, people will continue to improve their lives, progress is still possible and planning can assume a positive role in the realization of a more open and moral community (Beauregard 1991; Etzioni 1993).

Lessons for the EIA Planning Process

Having highlighted debates in urban and regional planning regarding rational planning and its alternatives, the question then becomes what can be drawn from this debate of value to the renewal of the EIA planning process? Consideration is first given to whether the four theories can simply be taken as they are and applied in different contexts (i.e., a contingent approach). Lessons for the EIA planning process from each planning theory, from theory overlaps, interconnections and middle ground concepts and from postmodernism are then identified. Finally, priorities for future planning and EIA planning process theory building efforts are identified.

The possibility of applying each planning theory in different situations seems to offer initial promise. Rational planning, in its more formalized manifestations, appears more suited to conditions characterized by strongly centralized decision-making, clearly defined and agreed-upon objectives, simple problems, stable environmental conditions, efficient institutions and data integration facilities and a high degree of analytical capability and scientific knowledge (Dale and Lane 1994; Appiah-Opuku 1994; Braybrooke and Lindblom 1963). Pragmatism appears more appropriate when decision-making is dispersed, problems are complex, information and resources are limited, the environment is stable and the pace of change is slow (Benveniste 1989; Braybrooke and Lindblom 1963). SEI seems best suited to situations characterized by complex, interdependent problems, turbulent change, participatory democratic institutions, weakly centralized decision-making, a consensus regarding environmental and social values and a requirement for innovative and creative planning and decision-making (Dale and Lane 1994; Briassoulis 1989; Appiah-Opuku 1994).

PEM seems particularly appropriate when social and environmental equity and justice issues are paramount, when traditional planning and market forces are clearly failing to address community needs, when interests are divergent and conflicting and when planning and decision-making are highly politicized but sufficiently open to address fundamental questions of economic structure and the distribution of resources and power.

The problem with simply identifying which theory suits which contextual characteristics is two fold - 1) none of the theories is complete and 2) environmental conditions rarely fall within simple categories and often change rapidly. Rationalism, notwithstanding its many variations, is weakly linked to problems and context, provides an incomplete image of humanity (i.e., absence of feelings and emotions) (Damasio 1994), lacks a clear value and ethical foundation, is often inflexible and arbitrary and tends to be politically ineffective. Pragmatism also lacks a broader sense of purpose. In addition, it can reinforce inertia and social equities, justify ineffective practice, inhibit integration and public involvement and fail to provide an adequate response to crises and cumulative effects. SEI has a clearer sense of purpose although more concrete direction for change (i.e., the middle ground between the contemporary and the ideal) is required. Other ways in which SEI fails as a self-sufficient theory include insufficiently developed skills and methods, the absence of an economic perspective, political naivete, and a failure to adequately appreciate resistance to change, fundamental value conflicts and structurally based inequities. PEM is incomplete as a normative planning theory because of a simplistic view of contemporary society, a weakly developed and incomplete image of the desired future, a divisive perspective that is likely to inhibit integration and implementation and a failure to provide adequate methods and practical strategies for action.

In view of the above, a more appropriate course of action is to incorporate elements and lessons from all four planning theories, both alone and in combination. Inasmuch as rationalism is central to the EIA planning process, the characteristics, subsets and variations of rationalism, together with measures to ameliorate negative tendencies, is a logical point of departure. Complementary elements of the other three planning theories, overlaps, interconnections and middle ground concepts, and insights from postmodernism are then successively addressed.

The subsets and variations of rationalism point to the need in the EIA planning process to address ends and means, degree of change and proponent type variations. They also illustrate the importance of identifying boundary sources, of working within boundaries, of a selective approach to rationality, of explicit links to problem and context characteristics and, perhaps most importantly, of appreciating that rationality takes many forms.

The ascribed planning process assumptions (Table 5) all apply to the EIA planning process. In the case of the EIA planning process such assumptions are rarely made explicit. EIA practice would benefit from the explicit identification of planning process assumptions and from the careful deliberation of the implications of such assumptions.

The rational planning process and the EIA planning process are very similar. Thus the debate surrounding rationalism is largely applicable to the EIA planning process. Nevertheless, there are some noteworthy differences. The EIA planning process, for example, tends to move directly to criteria identification, although a cursory consideration of need, in a quantitative sense, is usually included (see, for example, Figure 5 in Chapter 2).. Rational planning theory begins with the assessment of problems, needs and opportunities. Broad goals and then more precise objectives are formulated before criteria are identified. By proceeding directly with criteria identification the EIA planning process is likely to suffer from a limited appreciation of potential needs and opportunities. Also, problem characteristics may not be adequately considered, the EIA planning process may not be designed to properly match problem and context characteristics and criteria may not fit within broader goals and objectives. These activities will be especially important as SEA becomes more widespread. Also of relevance to the EIA planning process, and to SEA in particular, is the attention devoted in the rational planning process to plan synthesis and refinement. It is not simply a case of refining the characteristics of a preferred alternative and then undertaking a more detailed evaluation. Refinement may entail the formulation of subsidiary plans that require a separate formulation, review and approval process (i.e., staged approval), within the context of the broader plan. Lessons derived from such secondary planning efforts are likely to have direct application for tiering and for class assessment procedures in EIA (addressed more fully in Chapter 6). Given the limited experience with tiering in Canada, and the increasing prominence of SEA, significant pitfalls could be avoided by EIA practitioners if they were to learn from the experiences of planning.

The analysis of the ascribed strengths and limitations of rationalism is largely applicable to the EIA planning process. EIA, although implicitly, has tended to accept the rational planning model uncritically. A careful consideration of ascribed strengths and limitations would be particularly instructive for EIA planning process theorists and practitioners. Of particular note are the need to link the process to problem and contextual characteristics, the dangers associated with artificial assumptions regarding comprehensiveness, a unitary public interest, objectivity, predictability, control and independence from politics, the importance of a broader vision, values, value conflicts and ethics, the need to enhance flexibility and responsiveness, autocratic tendencies and the need for greater attention to barriers to implementation.

Drawing upon the other planning theories can also enhance the EIA planning process. In the writer's EIA experience, consistent with pragmatism, the EIA planning process rarely begins within precisely defined criteria and alternatives. Instances where such precision is forced often fail. Instead, there is a general and often simultaneous exploration of ends and means. Pragmatism also comes to the fore in the screening and scoping of data, alternatives and impacts. This exploratory process generally takes place in a series of iterations, with each successive iteration broadening the scope of public and agency involvement. However, at the end of each iteration, consistent with rationalism, the criteria are systematically applied to the alternatives for screening and comparative evaluation purposes. In this way ends and means are addressed in a consistent manner. This procedure is also necessary to substantiate conclusions for decision-making and approval purposes. This suggests that the search and preliminary analysis process, for both ends and means, requires the flexibility and interactive approach inherent to pragmatism but the detailed analysis, decision-making and approval process requires the rigour and systematic justification offered by rationalism.

Rational justification is necessary but far from sufficient for the review and approval stages of the EIA planning process. The EIA review and approval stages, in practice, more closely approximate pragmatism (i.e., decision-making decentralized to many small actors each with substantial autonomy in combination with bargaining processes among competing interests). Thus pragmatism can offer important insights to the EIA planning process regarding the administrative, consultative and political dimensions of decision-making and implementation. Other potential contributions from pragmatism to the EIA planning process include the need for a highly interactive planning process if issues are to be creatively and flexibly addressed, decision-making processes in a multi-organizational setting, the value of empirical studies and theories-in-action and the importance of undistorted, practical communications.

SEI can add further insights and perspectives to an EIA planning process that combines elements of both rationalism and pragmatism. SEI sees planning as an interpersonal and social process, characterized by multiple feedback relationships, continuous and successive adaptation, social learning and experimentation. This interpersonal, collaborative view of planning complements the views of planning as an analytical procedure (rationalism) and planning as an administrative-political mutual adjustment process (pragmatism). All three perspectives are valid and reflect EIA practice. SEI further supplements rationalism and pragmatism by demonstrating the importance of a social-ecological vision of a desired future, the need for a sound social and ecological value and ethical foundation, the importance of allowing for the error and uncertainty that result from a turbulent planning environment, the value of small, informal and cooperative group and organizational structures as a means of facilitating creative problem-solving, and the necessity of a marriage of personal experiential and processed knowledge.

PEM adds a political and economic dimension to the mix. The critical component of PEM can provide important insights regarding the distribution of resources and power in society. The action component of PEM offers an array of methods for offsetting social, economic and environmental inequities. PEM theory is instructive to the EIA planning process in the emphasis placed upon the unity of theory and practice (praxis), in the stress placed on distributional effects by population group (appreciating the perspectives of each) and in the perspective of planning (and, by extension, EIA) as a dialectical and critical thought and action process where contradictions are recursively identified and reconciled. PEM also demonstrates the moral and political nature of the EIA planning process, reinforces the need for clear principles of social and environmental justice and highlights the central role of conflict and the exercise of power in planning and decision-making. Although not well developed PEM illustrates that planning and the EIA planning process often involve an uneasy balancing of equity and liberty.

Major lessons for the EIA planning process, evident from the consideration of overlaps, interconnections and middle ground concepts, include the need to recognize the overlaps and interconnections among theories, the range of middle ground concepts that may facilitate greater planning theory integration, the potential for constructing composite or metatheories, and the importance of appreciating and addressing value and interest differences that will not be fully reconcilable.

The lessons and insights of postmodernism can greatly enhance the EIA planning process. Of particular note are the limits of science and positivism, the multiplicity and ambiguity of meanings, perspectives and experiences, the ubiquity of uncertainty and complexity, the need for sensitivity to differences, the critical need for and difficulty of reducing distortion in language and communications, the oppressive tendencies of planning and the need for multiple views on empowerment.

In reviewing the planning theory debate it is evident that there remains much unfinished business, all of which would be instructive for the EIA planning process. Frequently, for example, planning theory literature alludes to philosophical, social and, more recently ecological theory, that represent precursors to the major planning theories (Kreiger 1974). As is evident from the brief highlights contained in this chapter, many of the planning theory debates echo debates that have previously occurred in philosophy and social theory. What is less evident is whether important elements of those debates have not been fully reflected in planning theory literature. A potentially fertile source of further planning and EIA planning process theory building would be additional forays into these fields.

A recurrent theme in planning theory is the need to address and integrate values and ethics more systematically. Values and ethics are examples of theories for planning (Hendler 1995). The integration of such considerations can contribute to a clear moral purpose for planning (Sandercock and Forsyth 1992), perhaps in the form of a commutarian perspective (Etzioni 1993, 1995). Social and environmental planning responsibilities and limits can also be specified with greater precision (Beauregard 1990). Inasmuch as an important objective of the EIA planning process is to integrate social and environmental concerns into decision-making (see Chapter 2), the treatment of values and ethics in planning theory is likely to be directly relevant to the EIA planning process.

Both planning and the EIA planning process are plagued by often false dichotomies. Prominent examples include; objective-subjective, explanatory-normative, analysis-synthesis, reason-emotion (Damasio 1994) and process-substance. The need to explore and transcend these dichotomies is identified in neomarxist planning theory and in postmodernism. It is also evident from the overview of planning theory overlaps, interconnections and middle ground concepts. A multi-polar perspective may be more appropriate in the quest to move beyond these dichotomies (Chermeyeff and Tzonis 1971; Sandercock and Forsyth 1992). Initiatives, in bridging and transcending dichotomies, will be central to future planning and EIA planning process theory building.

Reference is made, earlier in this chapter, to the formulation of metatheories. Metatheories could eventually provide a new theoretical core for both planning theory and the EIA planning process. A metatheory could, for example, include a knowledge base (philosophical theories, social theories, social change theories), a cognitive base (ways of understanding, imagining and achieving the future) (Bolan 1967, 1973, 1974), a range of environmental perspectives (social, ecological, economic), normative and substantive planning theory combinations, planning actions (process, product, roles, methods), levels of integration (personal, group, organizational, societal and environment) and planning practice directions (implementation strategies, empirical analyses, institutional arrangements). Competing metatheories could be envisioned, differentiated on the basis of varying world views and interests. This chapter represents an interim step toward metatheory formulation. It is noteworthy that each of the elements of an ideal EIA planning process (as described in Chapter 3) are encompassed with the planning theories, when viewed collectively, addressed by this chapter.

Much has been said in Chapter 3 and again in this chapter about a contingent approach to designing and adapting planning processes. Further efforts to refine a contingent approach, in the design of both institutional arrangements and the planning process, are likely to be highly informative for planning and the EIA planning process. Although tidy fits between process and context are unlikely clear misfits will be more readily apparent.

Much of planning theory remains highly abstract. Little of normative planning theory is derived from or grounded in practice. Pragmatism does provide a refreshing contrast, most notably such innovations as theory-in-action, critical pragmatism and effective planning (Benveniste 1989; Sager 1994; Schon and Rein 1994). These approaches still remain somewhat descriptive and atheoretical. More refinements and in-depth case studies are needed to identify patterns of positive and negative planning experiences that have the potential for integration into broader normative planning theories (Briassoulis 1989). Frameworks and procedures for conducting and interpreting such empirical analyses are likely to be of value to both planning and the EIA planning process.

Summary and Conclusions

An overview of major urban and regional planning theories, and their implications, for the EIA planning process, is presented. Four major planning theories, together with associated subsets and variations, are analysed - rationalism, pragmatism, socio-ecological idealism (SEI) and political economic mobilization (PEM). Overlaps, interconnections and middle ground concepts between theories are determined. The planning theory implications of postmodernism are identified and overall EIA planning process implications are assessed.

Each of the planning theories offers important lessons and insights for the EIA planning process. The debates about and the subsets of rationalism (a conceptual parallel to the EIA planning process) are especially instructive. Much can also be learned from the other three major planning theories. Although each theory is more suited to certain contextual conditions, none of the theories is complete; environmental conditions rarely fall within standardized categories and the simple matching of theory and context will often be confounded by rapidly changing conditions. The partial nature of the four planning theories and the complex and transitory nature of context demonstrate that overlaps, interconnections and middle ground concepts must be assessed - an integrative procedure that could eventually culminate in the formulation of competing metatheories.

Many additional lessons for the EIA planning process can be drawn from postmodernism, particularly with reference to the treatment of uncertainty, ambiguity and the multiplicity of meanings, perspectives and experiences. Other priorities for future planning theory and EIA planning process enhancement include; the greater integration of values and ethics, the replacement of dichotomies with multi-polar perspectives, refinements to contingent planning approaches and more pragmatic approaches to planning process reform and refinement.

Endnotes

[1]The assertion that EIA is a form of planning is certainly subject to varying interpretations. To assess whether EIA is a form of planning it is first necessary to define planning. Unfortunately, there is far from a consensus in planning theory regarding how planning should be defined or its essential properties. Recurrent themes are, however, instructive.

Planning is, for example, generally assumed to be a formal (i.e., intended, deliberate, structured, non-routine, explicit, systematic) endeavour (Sager 1994; Benveniste 1989; Alexander 1986; Gillingwater 1975). It is usually depicted as anticipatory (i.e., predictive, projective, premeditated, preventative, future-oriented) (Campbell and Fainstein 1996; Branch 1966; Hodge 1991; Healey *et. al.* 1982; Forester 1989; Sager 1994; Benveniste 1989; Glasson 1974) and is commonly described as a process (Healey *et. al.* 1982; Rich 1993; Friedmann 1987; Davidoff and Reiner 1973; Faludi 1978; Alexander 1986; Blanco 1995). There is less of a consensus concerning the nature of the planning process. One school of thought sees the process as comprised of specific activities (Healey *et. al.* 1982), arranged in a particular sequence (Davidoff and Reiner 1962; Glasson 1974; Gillingwater 1975; Alexander 1986; Hodge 1991), but with ample provision for interaction among activities and stages (i.e., a continuous, iterative and cyclical process) (Gillingwater 1975). For others the planning process is variously described, as the product of administrative-bureaucratic interactions, as an interpersonal, consensus-building endeavour directed toward social and ecological ideals or as a political-economic transformation resulting from the interplay among conflicting interests. These conflicting perspectives provide the basis for the major distinctions drawn in this chapter.

There is a greater level of agreement that planning bridges knowledge (both technical and scientific) and action (Friedmann 1987; Alexander 1986; Faludi 1973). Action is variously depicted as decision-making (Campbell and Fainstein 1996; Sager 1994), as policy-making (Sager 1994; Forester 1989), as implementation (Sager 1994; Benveniste 1989), as societal guidance (Friedmann 1987) and as social transformation (Friedmann 1987). Planning, as a formal anticipatory process, shapes (also described as guides, manages, designs, controls, determines) present and future actions with consequences (both intended and unintended) for the built, social, economic and natural environments (Benveniste 1989; Forester 1989; Hodge 1991; Alexander 1986; Davidoff and Reiner 1962; Kreiger 1981; Friedmann 1987; Blanco 1995; Campbell and Fainstein 1996). Although greater emphasis tends to be placed on public sector planning (Friedmann 1987; Healey *et. al.* 1982), it is also acknowledged that planning is undertaken by private organizations (Benveniste 1989). Examples of other characteristics commonly attributed to planning include: normative (Hodge 1991; Benveniste 1991); comprehensive or multi-objective (Hodge 1991; Benveniste 1989);

reasoned (not necessarily rational) (Blanco 1995; Friedmann 1973; Faludi 1973); collective (also described as collaborative and coordinative) (Branch 1966; Glasson 1974); communicative (focus on dialogue, argumentation and the provision of advice) (Forrester 1989; Healey 1996; Kreiger 1981); democratic (emphasis on consultation, participation and consensus building) (Blanco 1995; Healey 1996; Forrester 1989; Benveniste 1989); political (Healey *et. al.* 1982; Gillingwater 1975; Forrester 1989); heuristic (Friedmann 1987); adaptive (Branch 1966; Benveniste 1989); and focused or strategic (Alexander 1986).

The characteristics of planning, as described above, are generally evident in EIA. EIA is a formal endeavour (an action-forcing requirement). It is also anticipatory (prior to approval and implementation), is a process (the EIA planning process is the subject of this thesis), bridges knowledge and action (a recurrent theme throughout the thesis - see, for example, Chapter 3) and is undertaken by both the public and private sectors. All of the planning characteristics identified can be attributed to EIA. If a case is to be made that EIA is not planning, it can only be on the basis that EIA is reactive rather than anticipatory (the process only begins after a proponent identifies the possibility of a proposal that could be subject to EIA requirements), and/ or that EIA is not integrated in the proposal planning process (i.e., a procedural requirement that has little influence on the scope or content of project planning) and/or that EIA is too narrow in its orientation (i.e., limited to the enhancement of capital projects). In the case of the latter, EIA could be viewed as a method in support of planning rather than a form of planning. Although EIA sometimes displays these characteristics they are not, in the writer's experience, inherent to the field and may also be evident in more conventional forms of planning (e.g., preconceptions about outputs, varying levels of integration of social and economic variables, excessively narrow focus). EIA is, or at least should be, anticipatory in the sense that it precedes final decisions and implementation. Although there may be preconceptions about outputs, need and alternatives are usually considered. EIA can substantially modify and, in some instances, reshape a proposal planning process. Integration within the proposal planning process is certainly an intention although not always a reality. EIA is increasing applied to more than capital projects and even with an EIA for a capital project, need and non-structural alternatives are usually considered.

EIA, in common with planning, often falls short of the ideal. Arguments against EIA, as a form of planning, tend to focus on selective perceptions of EIA practice. Such perceptions will, of course, vary. However, there is nothing inherent to EIA, as a field of theory and practice, that precludes it from encompassing all the characteristics of planning. Thus, although there may be some debate regarding whether EIA always constitutes a form of planning in practice, nevertheless, that should be the aim. Although the assertion is made here that EIA is (or at least should be) a form of planning, regardless of the position taken, EIA can learn much from planning theory and practice. It is, moreover, the EIA planning process (i.e., how knowledge and action can be bridged in EIA practice) that is the focus of this thesis rather than whether EIA is or is not a form of planning.

SUSTAINABILITY AND THE EIA PLANNING PROCESS

Introduction

This chapter is the third and final probe toward the reform of the EIA planning process. The analysis of the origins and meaning of sustainability, the sustainability framework and the framework for integrating sustainability and the EIA planning process are an elaboration and refinement of a previously published article by the writer (Lawrence 1997a).

The relationship between sustainability and the EIA planning process is explored from two perspectives 1) sustainability as a means of reforming the EIA planning process and 2) EIA as an instrument for the realization of sustainability. With respect to the first perspective, the EIA planning process has historically been criticized as a largely administrative-legal procedure of only peripheral value to the environmental movement. Such criticisms, although overstated, have some validity. At times it seems that the EIA planning process has lacked a clear sense of purpose, an ethical foundation, a mechanism for establishing priorities and assessing choices and a means of linking EIA to other environmental management instruments. The integration of the sustainability concept into the EIA planning process offers the potential for ameliorating those limitations. With regard to the second perspective, the EIA planning process is potentially an important instrument for furthering sustainability in public and private decision-making (World Commission on Environment and Development [WCED] 1987; United Nations [UN] 1992). It is a potential that has largely not been realized. According to a recent survey of practitioners EIA places development on a sustainable basis - always (4%), often (11%), sometimes (34%), seldom (41%) and never (7%) (Sadler 1995). Also of note, in a recent survey of EA administrators in Canada, only those in PEI felt that the benefits of sustainability are readily apparent (Doyle and Sadler 1996).

The concept of sustainability can only help in the reform of the EIA planning process once a sustainability perspective is intrinsic to the process. Similarly the integration of sustainability and EIA is essential if EIA is to facilitate sustainability. The issue then is how a sustainability perspective is to be integrated into the EIA planning process. The integration of sustainability and the EIA planning process must begin with a clear understanding of the concept, depicted within an overall framework (Shearman 1990, 7). The suggested framework begins with the WCED definition of sustainable development. Issues arising from the WCED definition are then identified as a basis for a refined definition. Residual issues, unresolved by the refined definition, provide the foundation for the remaining elements of the framework. The balance of the framework encompasses such considerations as sustainability forms, ends for sustainability, means to achieve sustainability, the contexts that shape sustainability interventions and strategies and frameworks for integration. In each case characteristics are described and critically assessed, examples are provided, issues, dilemmas and constraints are noted and EIA planning process implications are identified.

The integration of sustainability and the EIA planning process is approached at three levels - the conceptual (general frameworks for synthesis), the regulatory (redefining the intent and scope of EIA requirements) and the applied (integrating sustainability into each EIA planning process activity). Conceptual integration is addressed with a framework that depicts links between sustainability and impact assessment. Regulatory and applied integration are addressed in Chapter 6 within the context of the redesign of the EIA planning process.

Origins of Sustainability

The term "sustainable development" first came to prominence in the World Conservation Strategy published by the World Conservation Union in 1980 (IUCN 1980; Reid 1995). It received even greater attention as a result of the Bruntland Report (Our Common Future) (WCED 1987) and the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992 (UN 1992).

The broad appeal of the sustainability concept has generally been attributed to a shift in perspective regarding continuing environmental degradation and the international development agenda (e.g., poverty) (Sunderlin 1995). Increasingly global and interregional environmental problems, such as exploding population levels, the loss of biological diversity, climate warming, ozone depletion and overburdened ecosystems, have come to the fore in environmental theory and practice. Human-related environmental intrusions have also increased as resources have diminished (Reid 1995). Disparities in the distribution of development, as reflected in the interrelated problems of poverty, hunger, ill health and illiteracy, are increasingly evident. However, the more fundamental shift in orientation has been the appreciation that these environmental, economic and social stresses are interdependent (Smith 1993), transcend jurisdictional boundaries and purely technical solutions, and collectively pose a genuine threat to current and future generations. If current resource consumption patterns cannot be sustained (Goodland 1993) and conventional solutions are ineffective, what is required is a more holistic world view and a concomitant shift in development forms and institutional arrangements. Sustainable development, or simply sustainability, represents a paradigm shift in orientation. Parallel and related concepts such as eco-development, qualitative growth, bioregionalism[1], ecosystem planning (Tamminga 1996), the symbiosis of the human and natural environments, stewardship (Hietkamp 1996), and the harmonization of social, economic and environmental objectives share a similar perspective.

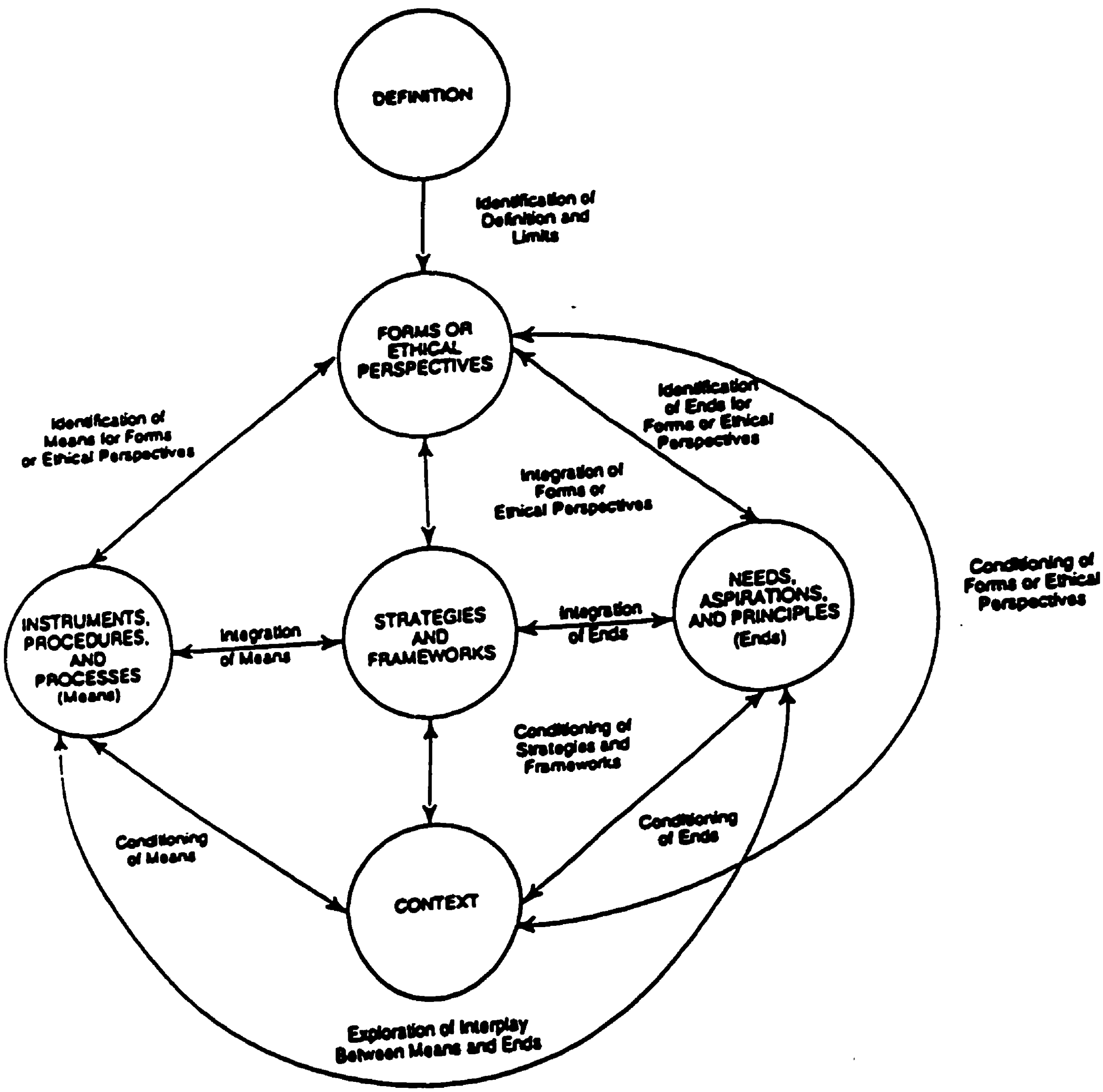
Sustainability Framework

Figure 7 is a conceptual representation of sustainability. The point of departure is a definition of sustainability. Sustainability forms or ethical perspectives (ecological, social, economic) are then identified. Distinctions are next drawn among sustainability ends (current and future needs, aspirations, principles, imperatives and priorities) and means (instruments, procedures and processes). Ends and means are, in turn, integrated into strategies and adjusted to contextual conditions. The various elements of sustainability are highly interrelated. The nature of those interconnections must be appreciated in order to design and adapt sustainability instruments, such as the EIA planning process.

Defining Sustainability

The most commonly cited definition of sustainable development comes from the World Commission on the Environment and Development. It defines sustainable development as meeting the needs of current generations without compromising the ability of future generations to meet their own needs (WCED 1987). This definition succinctly conveys a long term future orientation (Smith 1993) and acknowledges an ethical inter-generational obligation to the satisfaction of human needs. Sustainable development implies a dynamic balance between maintenance (sustainability)

Figure 7 - Sustainability



(Lawrence 1997a)

and transformation (development) (Robinson *et.al.* 1990), both directed toward human needs.

The WCED definition provides an incomplete representation of the sustainability concept. The term development, with its apparent emphasis on physical projects, activities, and technologies, implies too narrow a range of instruments for advancing sustainability and is, arguably, an oxymoron (McDonald 1996). It also implies that sustainability and development go hand in hand (Therivel *et. al.* 1992, 124). The term sustainability is less confining. Any characterization of sustainability should encompass the different sustainability forms - economic, social and ecological (Goodland 1994; Shearman 1990), reflect the dynamic nature of sustainability (consistent with evolving ecological, social and economic processes and conditions and appreciating that what is sustainable at one time may not be sustainable over a period of time) (Niu, Lu and Khan 1993; Therivel *et. al.* 1992) and acknowledge that sustainability will vary by context (Shearman 1990) and will take many forms (i.e., a pluralistic model of sustainability) (Robinson *et. al.* 1990). The concept should also consider aspirations (e.g., increasing human welfare over time) (Lichfield 1996), address the spatial dimension (i.e., not compromise the needs of one geographic area to meet the needs of another) (Niu, Lu and Khan 1993) and include the needs of other species (Milbraith 1989; Junker 1994). Interdependencies among sustainability forms are especially critical. Human social and economic activities must, for example, operate within ecological limits (i.e., living within our ecological means) (Sadler 1990a). Given this fundamental interdependency arguably natural capital (Goodland 1994) [2] should be maintained and we should strive for a symbiotic relationship with other species (Peacock 1995).

Sustainability should not be viewed simply as a maintenance function. Sustainability should progressively reduce and eliminate unsustainable activities as well as enhance the sustainable (Goodland 1994) attributes of human and natural systems. Biodiversity objectives and criteria can help structure such efforts with regard to natural systems (Tamminga 1996). The rebuilding, restoration and regeneration of natural systems through action at the site and local ecosystem level and the stipulation that a local population not degrade its natural resource base will be particularly important (Tamminga 1995, 1996; Therivel *et.al.* 1992)[3].

Sustainability initiatives will inevitably have normative ethical (e.g., redistributive) and socio-political objectives and repercussions (Sunderlin 1995; O'Riordon 1988). For sustainability to be more than a noble set of needs and aspirations, sustainability objectives will need to be translated into operational criteria (Brooks 1992) and safe minimum standards (Sadler 1995). Obstacles to sustainability will need to be identified. Sustainability instruments will have to be integrated into coherent strategies, with defined roles for each stakeholder. In selecting and applying sustainability instruments it will be necessary to differentiate between material or quantitative growth and qualitative development (i.e., the realization of potential) (Goodland 1994).

Reconstructing the WCED definition of sustainable development in response to these deficiencies begins with the use of the term sustainability rather than sustainable development. Sustainability is, in turn, defined as *meeting the ecological, social and economic needs and aspirations of human and other species such that:*

- *the future is not compromised for the present (the temporal dimension);*
- *geographic area(s) are not compromised for other geographic area(s) (the spatial dimension);*
- *human needs and aspirations are met within biological limits and natural capital is maintained and enhanced;*
- *a proactive effort is made to maintain and enhance the sustainable and to eliminate the unsustainable;*
- *sustainability is recognized as a dynamic concept, that will take many forms and will, in part, be derived from and adjusted to contextual factors; and*
- *normative / ethical, socio-political, and decision-making objectives, instruments and interdependencies are considered.*

Redefining sustainability, although necessary, is far from sufficient. Many unresolved issues, dilemmas and conflicts remain. The term sustainability, however defined, is sufficiently broad that there will inevitably be conflicting interpretations (Sunderlin 1995). More specific guidance for action is needed (Hoole and Milne 1995). Without such guidance there is the risk that sustainability could become little more than rhetoric (a substitute for action), a pretext (to disguise ulterior motives) or an excuse (to load on to sustainability initiatives desires of limited relevance to sustainability) (Goodland 1994; Gow 1992; Therivel *et. al.* 1992). Confronted with a complex array of interconnected needs, aspirations, instruments and interactions, sustainability initiatives could simply collapse because of an inability to determine where to begin (Hoole and Milne 1995). Initiatives can also be undermined by conflicting perspectives (e.g., anthropocentric versus biocentric, growth as problem versus growth as the solution) and conflicting interests and idealogies (Sunderlin 1995; Shearman 1990).

In addition, numerous issues and impediments to application must be addressed (Krober 1992). What, for example, differentiates the sustainable from the unsustainable and over what time span is sustainability achieved (Shearman 1990)? How are biological limits defined? Who is decide what is and is not sustainable (Robinson *et. al.* 1990)? What is the basis for distinguishing between the universal aspects of sustainability and those aspects that will vary depending on contextual factors? How are priorities to be established, uncertainty to be managed (Brooks 1992), conflicts to be addressed and systems to be monitored?

Given the above full closure on the sustainability concept may be neither possible nor practical (Shrader-Frechette and McCoy 1994). Sustainability, broadly defined, does provide an overarching goal and frame of reference or moral principle (Sadler and Jacobs 1990; Reid 1990). Moreover, the very act of questioning what is and is not sustainable is worthwhile (Beatley 1995b). However, if the potential for the previously cited dilemmas and dangers is to be minimized, sustainability definitions must be extended by means of conceptual frameworks that facilitate understanding (Shearman 1990). The better understood the concept, especially its inherent dynamic tensions, the more guidance is provided. Also required are systematic evaluations of applied local examples (both positive and negative) and a general sensitivity to the sustainability implications of public and private environmental interventions.

The EIA planning process needs to encompass each element of this sustainability definition. It should also be sensitive to the unresolved issues, dilemmas and conflicts that are likely to inhibit further refinements to the definition and characterization of the sustainability concept.

Forms or Ethical Perspectives

Sustainability takes three different but interdependent forms or ethical perspectives. A sustainable society, natural environment and built environment should, for example, be ecologically sound, economically viable and socially just (Milbraith 1989; Shearman 1990; Richardson 1996).

Realizing sustainability will, to some degree, involve balancing and integrating these overlapping and interdependent values (Sadler 1990a) or systems (Barbier 1987). We should, therefore, strive to reduce our ecological footprint while satisfying the economic, social and cultural needs of society (Rees 1995a). Proposed actions should only be considered if there is a contribution to one sustainability form without a significant violation of others (Rees 1995a).

More than a balancing of values is required. Critical interdependencies will require especially close scrutiny. Ecological systems, for example, represent both the enabling condition for and a constraint to (i.e., carrying capacity) the realization of social and economic objectives (Milbraith 1989; Rees 1995; Foy 1990). Certain forms of social change (e.g., empowerment, human resource development, economic equity) are conducive to the reduction of environmental degradation (Goodland 1994; Boyce 1995; Hessing 1993; Brooks 1992). The realization of economic potential (not simply material growth) can also facilitate social and environmental sustainability initiatives (Meadows, Meadows and Randers 1992).

Conflicting perspectives and positions, both within and among sustainability forms, will inevitably lead to varying interpretations of what represents an appropriate balance of economic growth, environmental protection and social justice values (Campbell 1996). Conflicting views regarding ecological systems (e.g., deep ecology versus shallow ecology, biocentric versus anthropocentric world view) (Lemons and Saboski 1994; Jacobs 1994) and the role of economic growth (e.g., growth as the problem versus growth as solution) (Carley and Christie 1993) will influence preferences regarding goals and priorities. Conflicting political economic perspectives and interpretations regarding the role of government (e.g., command and control planning versus free markets with minimal government controls) and concerning the need for and extent of interventions required to address social equity (Gartner and Roseland 1989; Starr 1996) can further exacerbate conflict. In addition, there will be conflicts regarding the choice of instruments and with reference to temporal (present generation versus future generation) and spatial (which regions are to be focus of sustainability interventions) (Niu, Lu and Khan 1993) priorities.

To some extent these conflicts can be transcended with sustainability as a unifying theme (Berke 1995). If and as sustainability is accepted as an appropriate constellation of values the potential is enhanced to extend the moral community (Etzioni 1993) toward a more civic, environmentally responsible, society (Beatley 1995b; Dansereau 1975). Conflicts can also be partially ameliorated as trade-off rules are formulated (Brooks 1992), by addressing linguistic differences and with the judicious application of conflict resolution, technological improvements, growth management and the formulation of specific, farsighted designs that promote sustainable cities and bioregional visions (Carley and Christie 1993; Campbell 1996), skills and techniques. Despite such efforts significant conflicts will remain regarding the appropriate mix of sustainability forms and initiatives [4]. A plurality of values can and must be encompassed within sustainability perspectives if all significant stakeholders are to participate in the process. However, the price of consensus should not be the sacrifice of minimum requirements and targets.

These overlapping and interdependent sustainability forms point to the need, in the EIA planning process, to explicitly address interconnections among ecological, social and economic values and systems. Also necessary is an appreciation of the likelihood of conflicting perspectives and positions, and of the need to address interdependencies and conflicts, with sustainability as both a unifying theme and as a threshold of acceptability.

Needs, Aspirations and Principles (Ends)

Sustainability encompasses a wide array of needs and aspirations. Ecological needs generally concern the maintenance of biosphere structure and function (Rees 1990a). Commonly cited essential human needs include food, shelter, clothing, water, sanitation, health and energy. They also include physical security from the threats of humans and nature, social stability in human relationships and a continuum of human survival, physical security and social security (Starr 1996). Human aspirations, consistent with sustainability, can include enhanced quality of life (e.g., non-material needs), self-reliance, economic activities (e.g., jobs, efficient businesses), the physical environment (e.g., accessible recreation) and institutional structures (e.g., human rights and freedoms, access to information).

Broad principles can be applied in assessing if and to what extent various actions might advance the cause of sustainability. Examples of such principles are highlighted in Table 16.

Needs, aspirations and principles provide a general direction for sustainability initiatives. However, they lack the precision necessary to select means to evaluate progress toward sustainability goals. What is required are more

Table 16 - Examples of Sustainability Principles

- approach problems from a sustainability systems perspective (Gardner 1989); define mutually supportive sustainability goals and objectives
- respect the natural world and value people (Reid 1995)
- take a long term perspective of human activities and environmental conditions; strive to live off the interest and do not discount the future; ensuring no aggregate net loss in resource stocks or ecological diversity is especially important (Sadler 1996)
- strive to span jurisdictional, disciplinary, professional and stakeholder boundaries
- rectify environmental damage at source as a priority (McDonald 1996)
- ensure that values and value differences, including the inherent value of the natural environment, are made explicit
- stay within source and sink constraints (e.g., resource use / harvest within regenerative capacity, pollution / waste output within assimilative capacity) (Sadler 1996)
- keep options open to extent possible (Robinson *et. al.* 1990)
- be sensitive to the ecological and health risk consequences of being wrong; this means erring on the side of caution, even when there is a lack of full scientific certainty, when there are threats of serious or irreversible environmental damage (the precautionary principle) (UN 1992)
- ensure that the means to achieve sustainability ends are themselves sustainable (Sadler 1995a)
- design approaches to suit the context; includes placing proposals within the context of community needs and aspirations (Shoemaker 1994)
- ensure a full accounting of social and environmental costs
- employ an 'anticipate and prevent" rather than a "react and cure" approach (Sadler 1996; McDonald 1996; Ochsner and Chess 1996)
- those responsible for adverse environmental effects are responsible for necessary remedial actions and for paying the costs of action (polluter pay principle)
- view global environmental management as the shared responsibility of all

(adapted from Lawrence 1997a)

specific objectives or sustainability imperatives. Tables 17 and 18 list sustainability imperatives. Table 17 distinguishes among science and technology, environmental intervention and institutional arrangement human activities and among ecological, social and economic environments. Table 18 identifies imperatives that emerge from the interplay among activities and environments. Imperatives, in turn, need to be translated into operational rules that can be applied in public and private decision-making (Lichfield 1996).

There is a risk that lists of sustainability ends, even those contained in such prominent documents as Agenda 21 (United Nations 1992), will fail to provide an adequate basis for action. Although a failure to act is, in part, a reflection of a lack of commitment on the part of key parties, lengthy lists of sustainability objectives can also be daunting, especially in the face of limited resources and other pressing needs and demands. What could be helpful is the construction of a plurality of visions of sustainable and unsustainable societies and environments (Spain 1995; Milbraith 1989; Meadows, Meadows and Randers 1992), supplemented by applied local sustainability examples.

Sustainability ends should be structured (e.g., a hierarchy of objectives and priorities, short term versus long term) (Sadler 1990), linked (e.g., complementary, conflicting, key interdependencies) (Robinson *et. al.* 1990) and placed within frameworks [5]. The identification of thresholds (e.g., carrying capacity), minimum standards, essential features and functions and irreversible processes will help to both refine objectives and to establish priorities. The refinement of objectives will also involve the establishment and use of sustainability indicators, applied within sustainability reporting frameworks that clearly illustrate progress toward or away from sustainability (Maclaren 1996). This task is likely to be a difficult one, especially with regard to human well-being because of different interests and disciplinary perspectives (Hodge *et. al.* 1995).

Sustainability ends, as with sustainability forms, will not always be complementary. To some degree conflicting sustainability ends mirror broader conflicts in society. While appreciating the limits to which conflicting perspectives and interests can be reconciled, the explicit identification, structuring and refinement of sustainability ends can still provide a guide for action and the criteria necessary to evaluate the efficiency and effectiveness of sustainability instruments and strategies.

Table 17 - Examples of Human Activity and Environmental Imperatives

Science and Technology

- knowledge generation and enhancement
- environmentally appropriate and benign technologies
- sustainable technologies
- technology diffusion to poor and vulnerable
- knowledge from technology failures
- scientific and technical coordination

Ecological

- reduced environmental degradation
- maintenance of environmental assets
- conservation of species and habitat
- maintenance of ecosystems (functions and processes)
- monitoring of key biological assets and processes
- maintenance of biological and genetic diversity
- reduction of toxic substances
- extension of the ecological boundary; increased natural capital

Environmental Intervention

- resource conservation and efficient use
- substitutes for non-renewable resources
- sustainable renewable resource use
- waste recovery and minimization
- provision of urban infrastructure, services and shelter
- reduction of health risk
- reduction of environmental pollution and hazards
- equitable resource use

Social

- satisfaction of basic human needs
- potential to meet human aspirations
- management of population growth, distribution and mobility
- elimination of exploitation of most vulnerable
- greater self-reliance and determination
- resolution of conflicts
- greater social equity and justice
- enhanced community and cultural development
- sustainable human settlements and community facilities

Institutional Arrangements

- stronger international conventions and agreements
- transcended boundaries (spatial, mandate, sector)
- sustainability into politics and administration
- cooperation among people, states and actions
- open political and administrative systems
- adaptive political and administrative systems
- environmental dispute resolution
- improvement of environmental signals and response times
- improvement of enforcement
- decentralization of decision-making

Economic

- economic system supportive of sustainability
- efficient and environmentally sound goods and service production
- reduction of unnecessary consumption
- open economic system
- freedom from economic coercion
- adequate financial resources for developing countries
- efficient energy and material use

(Lawrence 1997a)

Table 18 - Examples of Interactional Imperatives

Economic - Ecologic • merged environment and economy in decision-making • economic costs that reflect costs of ecosystem maintenance • ecological over economic when carrying capacity threatened • reduced economic consumption of natural capital	**Environmental Intervention - Institutional Arrangements** • EIA requirements for environmental interventions • environmental standards to regulate environmental interventions • strengthened role for resource management agencies	**Institutional Arrangements - Economic Environment** • economically sustainable policies, programs and budgets • cooperative and open economic system among states • accounting systems that measure full costs of natural resource use and environmental degradation
Economic - Social • integrated social and economic concerns in decision-making • more equitable economic development • investment in human capital	**Science / Technologies / Ecological Environment** • technologies to relieve pressures on ecological limits • assessment of risks of new technologies • control of biotechnology risks • technologies to facilitate conservation and biodiversity maintenance	**Institutional Arrangements - Social Environment** • enhanced public participation in international decisions • local democracy and empowerment • participation of women, youth and indigenous peoples in environmental management • public access to administrative and judicial procedures • public access to information and technical expertise • defined liabilities and compensation for victims • respect for human rights in institutional arrangements
Social - Ecologic • societal carrying capacity based on ecological carrying capacity • integrated social and ecological concerns in decision-making • demographic development in harmony with ecosystem production • equitable distribution of consequences of environmental policies	**Science / Technologies - Economic Environment** • assessment of economic impacts of technologies • technologies that facilitate economic stability • technologies that increase efficiency and productivity	**Environmental Intervention - Ecologic Environment** • ecologically sensible development • development within biosphere and natural system limits • waste discharge at rate ecosystems can absorb and degrade • harvest rates of renewable resources within regenerative capacities of natural systems • sustainable re-development when eco-region overcommitted
Science / Technologies - Environmental Intervention • technologies that conserve resources and provide substitutes for non-renewable resources • technologies that reduce pollution • technologies that reduce waste and increase reuse • technologies that facilitate knowledge dissemination	**Science / Technologies - Social Environment** • assessment of social effects of technologies • assessment of distributional effects of technologies • technologies that facilitate social sustainability • transfer of environmentally sound technologies to developing countries	**Environmental Intervention - Economic Environment** • assessment of economic implications of development • efficient resource use • assessment of economic distributional effects
Science / Technologies - Institutional Arrangements • use of EIA and other forms of technology evaluation • policy support for environmentally sound technologies • controls for environmentally unsound technologies • monitoring and control of hazardous chemicals and wastes	**Institutional Arrangements - Ecological Environment** • adequate environmental requirements • management of commons (oceans, space, antarctic) • climatic change and biological diversity strategies • strengthened environmental liability requirements • reinforcement of roles of environmental protection agencies	**Environmental Intervention - Social Environment** • consideration of current and future generational needs • greater access of poor to resources to live sustainably • assessment of health and social implications of development • minimization of cultural disruption and social instability from development • social participation in interventions

(Lawrence 1997a)

Extending these distinctions into EIA practice will entail incorporating, structuring and refining sustainability ends within EIA objectives and evaluation criteria. Consideration of interdependencies and conflicts among objectives and criteria will also be necessary if an effective agenda for action is to be provided.

Instruments, Procedures and Processes (Means)

The range of instruments potentially available for realizing sustainability ends is extensive. It encompasses the actions of a diverse array of stakeholders (public sector, corporate sector, non-government organizations, professions and institutions, citizens) as highlighted in Table 19.

There are many instruments available to government. This suggests that the public sector can be a catalyst in facilitating sustainability initiatives. Clear government commitments are essential to the realization of sustainability ends (Therivel *et. al.* 1992). In an era of dwindling public resources and, at best, mixed reactions to government interventions, government's role in sustainability initiatives will necessarily be more strategic.

Rigid hierarchical organizational and institutional arrangements for sustainability are likely to be less effective and more strongly resisted than multi-stakeholder, open, flexible, action-oriented networks and learning cells that foster self-development, communications, experimentation and learning (Carley and Christie 1993; Sadler 1990a; Resendiz Nunez 1992). Behavioural and structural solutions that foster cooperative choices are also more likely to reduce conflict and uncertainty and to improve environmental equity and diversity (Crance and Draper 1996). Sustainability has a greater opportunity to emerge progressively and incrementally along multiple paths than as a consequence of the implementation of a grand plan (Sadler 1990a).

The integration of sustainability into public and private decision-making is a boundary spanning activity - an attribute of theory-building identified in Chapter 3. Consequently, mechanisms for joint planning, knowledge-sharing, communications and participation within and among stakeholders are especially important in furthering sustainability objectives (Therivel *et. al.* 1992). Both vertical (top down and bottom up) (e.g., international, national, interregional) and horizontal (e.g., inter-agency, public-private, inside-out [6]) linkages will need to be established and enhanced

Table 19 - Examples of Sustainability Instruments

Stakeholder	Instruments
Public Sector	• goals, objectives and strategies (e.g., conservation strategies, national sustainability strategies) • legal instruments (e.g., laws, standards, EIA, law enforcement) • policies, programs, plans (e.g., green plans, fiscal and trade policy, sustainability land use) (Diamond and Noonan 1996) • institutional arrangements, services and facilities (e.g., education, training) • research and documentation (e.g., state of the environment reports) • information systems (e.g., environmental indicators and data bases) • accounting systems (e.g., full cost accounting) • human resources development systems • taxes, funding and subsidies • intergovernmental and international agreements • demonstration projects (e.g., biosphere reserves)
Corporate Sector	• sustainability objectives and performance standards • corporate environmental management (e.g., departments and systems) • auditing and monitoring procedures • external reporting and expanded stakeholders • full cost pricing • technology development (e.g., energy, environmentally sound) • policy integration and harmonization (IISD 1992)
Professions and Institutions	• codes of practice • college and university research and research centres • sustainability courses and programs and interdisciplinary analyses • leadership role by academic, professional and industry associations
Public	• participation in multi-stakeholders efforts • environmental and other interest groups • advocacy and direct citizen action • community development and co-management • consumption and lifestyle choices
Multi-stakeholder	• national and regional round tables • advisory committees, task forces and commissions • workshops, forums and expositions • technology cooperation and capacity building • trust partnerships

(Lawrence 1997a)

(Slocombe 1992; McDonald 1996; Gibbs, Longhurst and Braithwaite 1996). Particular care will need to be taken to ensure instruments are mutually supportive. Interdisciplinary integration, through education and research, may be a crucial prerequisite to such institutional change. Interdisciplinary science and education can help to produce a better understanding of problems and, in turn, enhance the potential for better institutions, policy and implementation through intersectoral coordination and integration (Slocombe 1992).

Many issues will need to be confronted in the course of selecting and applying sustainability initiatives. What, for example, is the appropriate mix of top-down and bottom-up initiatives? How should regulatory and private market measures be combined? Level of detail is likely to be an especially thorny issue given the need to counterbalance a holistic perspective with a detailed understanding of complex regional and local relationships (Armitage 1995). The role of science in furthering sustainability is also problematic. While offering many insights and contributions, traditional science can inhibit sustainability because of a positivistic and intra-disciplinary perspective, an overstatement of the authority of science, an under weighing of local knowledge and ecological perspectives and a tendency to artificially separate facts and values (Carley and Christie 1993) [7].

The obstacles to the selection and use of sustainability instruments are considerable. The problems are complex (Brooks 1992), available resources are limited and the areas of uncertainty are substantial. Other inhibiting factors include the fragmentation of disciplines, sectors and institutions (e.g., narrow mandates) (Kennett 1990; Berke 1995), entrenched economic interests (Reid 1995), geographic and cultural barriers (Grant 1994), a propensity to externalize costs, self interest, mistrust and varying perceptions (Crance and Draper 1996; Kennett 1990) and the somewhat tarnished reputation of planning, especially central planning, as an instrument for change (Carley and Christie 1993). Sustainability is also inhibited by naive beliefs, especially those premised upon the assumption that technology, science and economic growth can readily rectify ecological and social imbalances and inequities (Reid 1995) [8].

The EIA planning process can be a catalyst for sustainability (Duffy 1992). Sustainability criteria can be incorporated into project and program evaluation (Duffy 1992). The EIA planning process can facilitate the establishment of environmental data bases and the implementation of environmental management programs (Duffy 1992). It can also represent a means of instituting public forums for addressing tradeoffs (Gardner 1989) and a mechanism for enhancing environmental awareness and knowledge (Duffy 1993). At a broader level the EIA planning process can help bridge science and environmental and resource management (Smith 1993).

The EIA planning process is only one of several public policy instruments with the potential to facilitate sustainability. The EIA planning process, by itself, cannot maintain sustainability (Doyle and Sadler 1996). Other, closely affiliated, instruments include: national sustainability plans, green plans and conservation strategies; regional and land use planning; environmental planning; integrated environmental and resource management; environmental policy and program development, and environmental quality control (Bouwer 1994; Gardner 1989; Conacher 1994 / 1995; Sadler 1994; Richardson 1996; McDonald 1996). The EIA planning process can both contribute to and draw upon these related fields in the broader quest for sustainability. The primary contribution of the EIA planning process is likely to be in the provision of site-specific data for ensuring environmentally sound projects (Manning 1990) and in opening up public and private planning and decision-making processes. Related public policy instruments can enhance the EIA planning process through the provision of data (e.g., sustainability indicators, land suitability mapping, state-of-the environment reporting) (Beatley 1995b; Rees 1995a) and by establishing a public policy framework (e.g., conservation and environmental management plans, ecologically-based planning, water and airshed management and pollution control) (Berke 1994; Grant 1994). Project level EIA and SEA should also be tiered and integrated within broader social, economic and environmental goals and instruments directed toward sustainability (See Chapter 4) (Sadler 1995; Therivel *et.al.* 1992); with an explicit effort to clarify and test these goals.

Context

Sustainability ends and means will vary depending on regional and local ecological, economic, social and cultural conditions (Brooks 1992; Delacourt 1990; Shearman 1990). Contextual characteristics establish the constraints to and opportunities available for human activities. Environmental limits are reflected in the ecological carrying capacity (i.e., the maximum population that can be sustained indefinitely in a given habitat without permanently damaging the ecosystem) (Rees 1990a, 1990b) and in the regenerative capability of natural systems and resources (Sadler and Jacobs 1990). Sustainability potential will be influenced by the area's resource base, social - cultural organization, institutional development and the economy. What is practical and appropriate will also be affected by historical experiences, political will and the general state of technological development and knowledge accumulation.

Collectively, such factors represent both absolute limits and areas of vulnerability. A sound understanding of context is essential if the thresholds and pressure points that should be the focus of sustainability initiatives are to be identified.

What is sustainable in one country, time period and development stage will not necessarily be sustainable in another (Krober 1992). The context must be characterized (Resendiz-Nunez 1992) and sustainability initiatives must be tailored to the particular needs and capacities of each setting (Shearman 1990), especially when transferring resources and organizational capacities (Shearman 1990). Respect for cultural diversity is critical (Delacourt 1990). Particular consideration needs to be given to interactions with external systems because what is sustainable in isolation may be unsustainable when subject to strong interactions with external systems over which there is no control (Brooks 1992).

The EIA planning process should be directed toward sustainability ends but in a manner sensitive to contextual factors. This entails confronting the often troublesome issue of what should be guided by global criteria and what should be determined on the basis of local criteria (Krober 1992). Arguably sustainability should be viewed as a universal, non-negotiable concept (i.e., the goal is constant). However, sustainability can be pursued along many paths in different settings, sectors and development stages (Goodland 1994).

Strategies and Frameworks

Sustainability strategies and frameworks are necessary to address interconnections within and among sustainability forms (Hoole and Milne 1993; Barbier 1987), goals (Niu, Lu and Khan 1993), and instruments (Armitage 1995; Sadler 1990a) and to make contextual adjustments. Strategies should also encompass mechanisms for stakeholder involvement and should identify priorities (i.e., critical objectives and essential means). Components and interconnections essential to system sustainability should be identified. It will be necessary to differentiate sustainable from unsustainable activities, identify vulnerable system components and determine components requiring short term enhancement for system survival [9]. System "triggers or leverage points" should receive particular attention. In this way irrevocable changes may be avoided and efficient and effective interventions can be formulated and implemented.

Despite offering worthwhile insights, sustainability frameworks and strategies, to this point, tend to be highly conceptual. Extending from conceptual frameworks to pragmatic, integrated, strategies (in the face of conflicting values, interests and perspectives, disciplinary, sectoral and institutional barriers and significant knowledge and resource limitations and uncertainties) represents an enormous task.

The refinement and grounding of sustainability frameworks and strategies can greatly benefit the EIA planning process. Reforms to the EIA planning process, directed toward sustainability ends can, in turn, make a substantive contribution to broader sustainability initiatives. Sustainability strategies and frameworks can facilitate a more systematic approach in the EIA planning process to the consideration of interdependencies among sustainability forms and help to integrate the EIA planning process within broader environmental management frameworks (Smith 1993). Other potential benefits to the EIA planning process include: the mutually supportive generation and use of environmental data (e.g., sustainability indicators); greater attention to the interrelationships among goals (e.g., needs), environmental, social and economic systems (e.g., carrying capacity) and instruments (e.g., management systems, organizational and institutional arrangements) (Armitage 1995; Berke 1995; Carley and Christie 1993); and planning process and organizational design innovations to encompass a multiplicity of ends, instruments and stakeholders, adjusted to contextual variables, but directed by sustainability values.

Integrating Sustainability and EIA

As a potential sustainability instrument, the EIA planning process should be independent, systematic and comprehensive (WCED 1987; UN 1992). It should encompass the social, natural and economic spheres. It should be undertaken in an integrative manner within an ecological framework (Gardner 1989). It should give practical support to the values of social equity, human worth and ecological health (Reid 1995). Large scale (e.g., national and global) and long term (e.g., future generational) effects on social, natural and economic systems should be addressed.

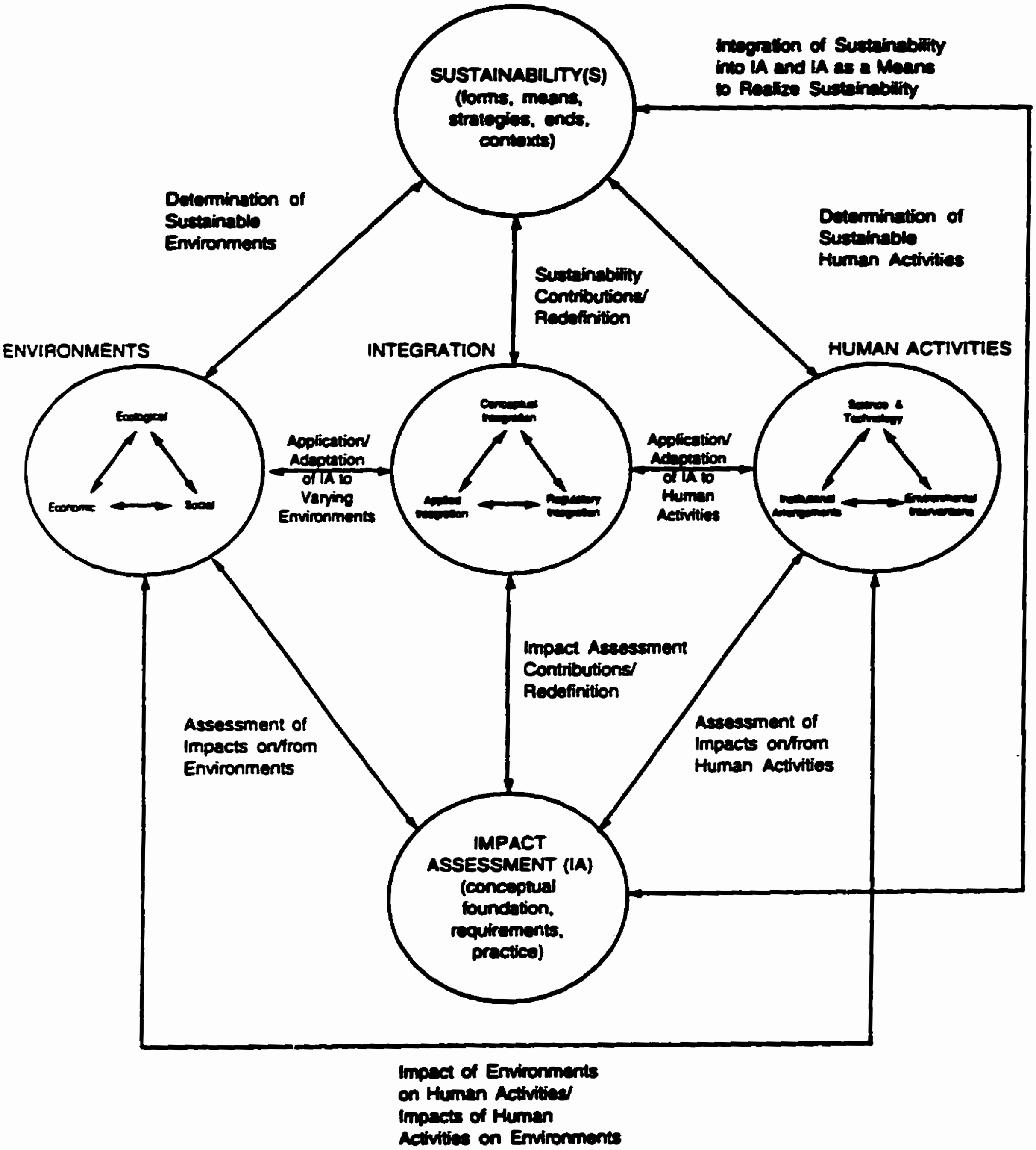
Integrating sustainability and the EIA planning process necessitates an orientation shift from a preventative approach (i.e., using a limited knowledge base to predict impacts) to a precautionary principle (i.e., maintaining natural capital under conditions of uncertainty) (Sadler 1996) [10].

Figure 8 depicts a framework for synthesizing the EIA planning process and sustainability. Both sustainability and the EIA planning process apply to a range of human activities and environments. The integration of the EIA planning process and sustainability can occur at the conceptual, regulatory and applied levels. Each field can contribute to and be redefined in the integration process. The merging of sustainability and the EIA planning process should result in changes to the ways in which environments are managed and human activities are undertaken and assessed. Sustainability should provide to the EIA planning process a clearer set of goals, a framework for the understanding and assessment of human activities and environments and a broad range of related instruments for action. The EIA planning process can be a powerful instrument for the realization of sustainability ends but it is an instrument that must be integrated within broader strategies to be effective.

Traditionally human interventions in the environment are assessed and managed through a range of partially overlapping fields of analysis and application. Examples include human settlement and environmental planning, resource management, environmental quality control, conservation and open space planning, energy, utility and transportation and waste management planning, human services and community development and economic development and planning. These fields must be linked, coordinated and integrated. Interactions among stakeholders must also be coordinated. Such initiatives as intergovernmental and inter-agency policy coordination, multi-stakeholder ecosystem planning and integrated resource management reflect this increasing awareness.

A reformulation of the EIA planning process, from a sustainability perspective, is a further potential instrument for redefining how environments and human activities are understood, assessed and managed. The EIA planning process is not the sole or necessarily the most appropriate instrument for action. The EIA planning process must be defined within the context of an interrelated suite of strategies and methods, all directed toward carefully articulated sustainability ends.

Figure 8. Framework for Synthesizing Impact Assessment and Sustainability



(Lawrence 1997a)

Summary and Conclusions

This chapter explores the relationship between sustainability and the EIA planning process both in terms of the integration of sustainability into the EIA planning process and the potential contribution of the EIA planning process to sustainability. Sustainability is defined as meeting the ecological, social and economic needs and aspirations of human and other species such that; the future is not compromised, geographic areas are not compromised for other geographic areas, human needs are met within biological limits, natural capital is maintained and enhanced, a proactive effort is made to maintain and enhance the sustainable and to eliminate the unsustainable, sustainability evolves and is adjusted to context, and normative / ethical, socio-political and decision-making objectives, instruments and interdependencies are considered.

Defining sustainability only partially addresses the concept and begs more questions than it answers. Residual issues provide the basis for a framework that includes sustainability forms, ends for sustainability, means to achieve sustainability, the contexts that shape sustainability interventions and strategies and frameworks for integration. The integration of the sustainability framework and the EIA planning process is approached at three levels - the conceptual (general frameworks for synthesis), the regulatory (redefining the intent and scope of EIA requirements) and the applied (integrating sustainability into each EIA planning process activity). The latter two levels are pursued in Chapter 6 as part of the redesign of the EIA planning process.

Much remains to refine the sustainability concept. Although there are still conflicting interpretations of the meaning and role of sustainability, the presented definition suggests common ground is possible. Although many issues, dilemmas, conflicts and constraints require further attention, what is clear is that sustainability remains a valid and important environmental management perspective. It is a perspective that can offer many important insights and lessons for environmental management practices for such fields as EIA. However, refinements and adaptations are essential if the heuristic and prescriptive value of sustainability is to be enhanced.

Care must be taken to ensure the balanced analysis of social, economic and ecological systems, with a particular appreciation of critical interdependencies. Clearly articulated sustainability visions and goals are essential.

Goals should be structured, priorities established and interconnections considered. The limits to which conflicting perspectives, interests and ideologies can be reconciled needs to be acknowledged. There are many instruments available to advance sustainability ends. The strengths and limitations of each should be assessed. Selected, mutually supportive, measures can then be integrated within general strategies. The EIA planning process can be an important instruments for sustainability, in its own rights, but it will assume a much more effective role if integrated within multi-stakeholder sustainability strategies. The sustainability concept and related frameworks must be adapted to suit regional and local circumstances. Experimentation to test various approaches in different settings is necessary. A plurality of frameworks and models will be required (Nicholas and Prigogine 1989).

The conceptual focus in integrating sustainability and the EIA planning process should be the refinement and adaptation of frameworks to varying contextual characteristics. Frameworks must be in a form suitable for testing and adaptation at the regulatory and applied levels. Conceptual EIA - sustainability integration must also be viewed within the context of other efforts to incorporate environmental and social concerns into planning and decision-making and to link and reconcile environmental, social and economic perspectives. SEA can serve as a tool for linking project level EIA to such broader initiatives. Arguably, SEA also represents a transitional instrument for the evolution from EIA to ESA (environmental sustainability analysis) (Sadler 1995). Both sustainability and EIA will continue to evolve as fields of analysis and application. The conceptual integration of the EIA planning process and sustainability must reflect on-going developments in each field.

The integration of EIA and sustainability can make the EIA planning process more ethical, value-full and boundary-spanning. Sustainability can provide the EIA planning process with greater rigour, a practical direction for change and a focus for the critical review of and reflection in EIA practice. It can help structure planning process design (e.g., selecting and evaluating alternatives on the basis of their relative and absolute contribution to sustainability). The EIA planning process can increasingly seek to operate within sustainability-based constraints and to seek out opportunities for the realization of sustainability ends. The selection and application of methods to manage risk, uncertainty and complexity will be critical in determining how best to ground the sustainability concept in EIA practice.

The planning theories described in Chapter 4 can both temper and be tempered by the effort to merge the

EIA planning process and sustainability. Sustainability is a form of socio-ecological idealism (SEI). Although offering an exciting vision for the future, it relies on the prescriptive power of an idea. In common with other forms of SEI, efforts to integrate EIA and sustainability are likely to be hampered by: a failure to appreciate the extent of value and interest conflicts; a failure to appreciate the difficulties involved in seeking to reconcile social, economic and ecological perspectives; an understatement of the complexity of problems; political naivete; a failure to appreciate the magnitude of resistance to change; and ill-defined objectives, methods and skills. Planning theory can provide valuable insights regarding means to identify and offset these negative tendencies. The relationship of sustainability and postmodernism is an especially interesting one. Postmodernism is instructive because it points to the limits of science and knowledge, the multiplicity and ambiguity of meanings, the importance of uncertainty, language and communications and the potential for oppression inherent in planning. Sustainability represents a useful counterbalance to a postmodernist perspective by demonstrating that absolute limits, core values and principles, and transcending frameworks are both possible and necessary. Finally, the merging of the EIA planning process and sustainability represents an important step toward the construction of EIA metatheories - metatheories that can (informed and refined by planning thought) both encompass and transcend the EIA planning process.

Endnotes

[1]Bioregionalism focuses on the development of self-reliant economic, social and political systems. A bioregion is defined by its life forms and topography. Self-reliance implies that production systems draw upon local resources (Diffenderfer and Birch 1994, 4).

[2] Maintaining natural capital, although an attractive principle, may be difficult to attain in practice when it is appreciated that nature's dividends are already fully invested in the maintenance of natural capital (Starr 1996, 25). Such principles can also be hampered by competing regional demands and a dynamic, turbulent, competitive and growing world population. Notwithstanding such limitations natural resources can be used more efficiently, avoidable degradation can

be minimized and quality of life can be enhanced (Starr 1996).

[3] To the extent that ecosystems become the focus on such initiatives (i.e., an ecosystem approach to planning), care will need to be taken to consistently delineate ecosystem hierarchical levels and to identify types and levels of threats to ecosystems (Gonzalez 1996). At the same time, it will need to be appreciated that ecosystems are not static and that there are a constellation of different conceptions of ecosystems - conceptions that encompass both social and natural science perspectives (Roe 1996).

[4] In some cases conflicting values can serve a positive role when, for example, the value of democratic participation serves to counterbalance the propensity toward expert-driven environmental management efforts (Freemuth 1996).

[5] The task of transcending collections of desirable characteristics will not be an easy one and will require thoughtful interpretations of nebulous concepts such as ecosystem health, healthy communities and adjustments by context (Richardson 1996; Morris 1996).

[6] Multi-stakeholder ecosystem management tends to take the form of outside-in planning (i.e., management largely determined by external developers, officials and experts) rather than inside-out planning (i.e., management where local residents and leaders are themselves the experts and who initiate the planning process) (Roe 1996).

[7] Translating sustainability visions into reality also necessitates an enhanced understanding of interconnections among attitudes, values, beliefs, perceptions and behaviour. Behavioural psychology can offer important insights into how to apply such broad concepts to everyday behaviours (Jones 1996).

[8] In keeping with other forms of socioecological idealism (See Chapter 4), advocates of sustainability often fail to appreciate that sustainability is a fundamentally political concept (Gibbs, Longhurst and Braithwaite 1996). If

sustainability is to be advanced beyond an intriguing concept, it will be necessary to address who is in control, sets the agenda, allocates resources, mediates disputes and establishes the rules of the game (Wilbanks 1994, 544).

[9] The valuation of the natural environment (e.g., user values, options values, existence values) and the determination of environmental capacities and thresholds are difficult but crucial prerequisites to strategy formulation (Sadler 1996).

[10] Such a reorientation requires a careful interpretation of how best to apply the "precautionary principle" (e.g., complete reversibility or no discharge that endangers ecological systems or environmental quality or best available technology with safety measures that keeps ambient environmental conditions well below initial loads or best available technology) (Ramchandani and Pearce 1992). The choice of how best to apply the precautionary principle will depend on such factors as the severity of the cost of degradation, reversibility potential and uncertainty (Sadler 1996).

REDESIGNING THE EIA PLANNING PROCESS

Introduction

This chapter is the first directed toward redesigning the EIA planning process. The analysis of process activities and design at the regulatory level is a selective refinement and elaboration of an article previously published by the writer (Lawrence 1994c). The analysis of integrating sustainability at the regulatory and applied levels selectively elaborates upon another previously published article by the writer (Lawrence 1997).

The analysis first revisits an issue raised in Chapter 2 - the tendency to confuse planning process activities and stages. A framework for addressing EIA activities and interrelationships is presented. Next considered is the design process at the regulatory level. Politicians and regulators design the essential elements of the overall EIA planning process by means of legislation, regulations and general guidelines. Refinements and adjustments are then made, still at the regulatory level, for activity types. Within this framework, proponents will, in concert with regulators and other stakeholders, design the planning process to suit the proposed activity and potentially affected environment. Regulatory design is addressed by means of an overview of regulatory design models choices, derived from a review of regulatory requirements in Canada and in the ten provinces. The regulatory analysis addresses the form and sequence of major activities, the identification of proponent and proposal types, the procedures for agency and public involvement and the range of aspects of the environment, potential effects and impact management measures required or recommended for consideration.

The chapter then challenges the premise that a single EIA planning process can be suitable in all circumstances and asserts instead that to force-fit a standardized planning process into any context will inevitably undermine the efficiency and effectiveness of EIA. It is argued that it is necessary to design that process to suit various contexts (i.e., a contingent approach). A range of context types are reviewed including environmental type, proposal type, proponent type, setting type, and public consultation perspectives and types. Different processes or subprocesses for different classes of situations may, however, reinforce internal and external boundaries and barriers. Consideration is, therefore, given to means for spanning and transcending such boundaries and barriers. The analysis seeks to balance the need to adapt to context against the need to span boundaries in EIA planning process design.

The final two chapter sections extend the conceptual analysis of the integration of sustainability and the EIA planning process as presented in Chapter 5. Specific means of integrating sustainability concerns into regulatory requirements are identified based on an overview of the extent to which such considerations are already reflected in EIA requirements in Canada and in the ten provinces. Also considered are modifications and refinements to EIA planning process activities to better consider sustainability concerns.

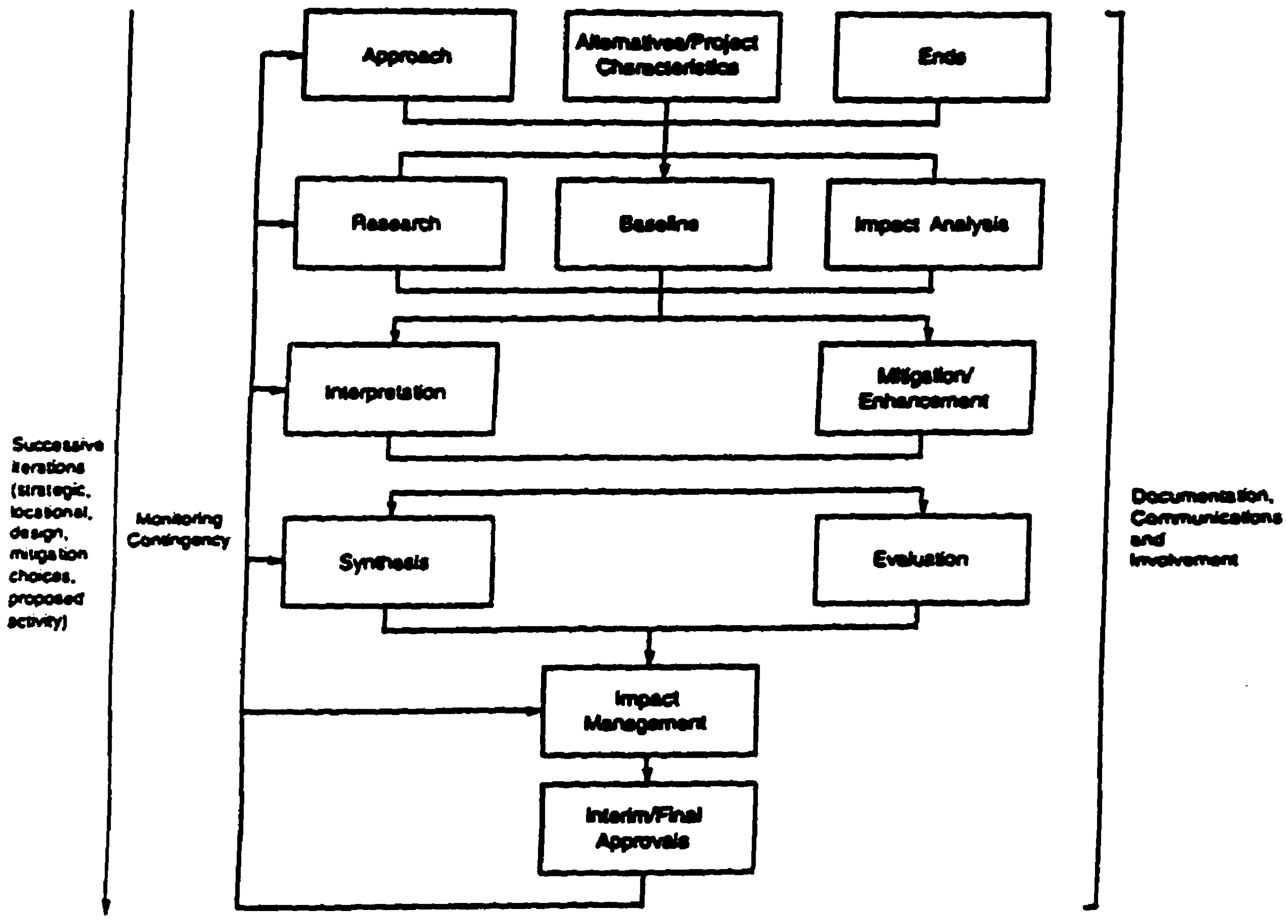
Reshaping the EIA Planning Process

The design of the EIA planning process at the applied level has, as pointed out in Chapter 2, conventionally assumed that the EIA planning process is largely composed of a linear sequence of steps or stages. A more accurate portrayal, as illustrated in Figure 9, is to view the EIA planning process as a succession of progressively more refined probes into a decision space. Each probe in this cyclical analysis is more focused with a concomitant level of detail increase. Each cycle is also composed of overlapping and interacting tasks and activities. The overall process is open and iterative. Table 20 lists several examples of activities, together within tasks within each activity.

It is also necessary to consider possible interrelationships among the various potential planning process activities. Examples of interrelationships among activities are highlighted in Table 21. The combination of stages, activities, tasks and interrelationships that occurs in practice is substantial. Although it may be possible to narrow the range of combinations for a particular class of proposals in a particular class of environments, EIA planning process design necessarily involves adjustments to suit each particular project and environment. In addition, given such interrelationships, especially the importance of ongoing stakeholder involvement, the EIA planning process will inevitably change and evolve through its execution.

As the EIA planning process proceeds through a series of iterations there will be both scanning back to

Figure 9. A Reshaped EIA Planning Process



(Lawrence 1997a)

TABLE 20 - Examples of EIA Activities

APPROACH

- Prepare study plan.
- Design planning process.
- Determine assumptions.
- Identify methods.
- Establish level of detail.
- Determine scope and aspects of environment.
- Determine time horizons.
- Determine study area (s).
- Determine research requirements.
- Prepare research design.
- Establish study team.
- Formulate conceptual framework.
- Prepare terms of reference.

ALTERNATIVES

- Identify need and/or opportunity
- Identify alternatives:
  - -non-structural.
  - -location.
  - -design.
  - -construction.
  - -operations.
  - -mitigation.
  - -after-use
  - -impact management

BASELINE ANALYSIS

- Identify data sources.
- Develop data basis.
- Collect and compile data.
- Characterize historical, existing and anticipated future trends and patterns.
- Profile community.
- Identify and characterize sensitive and significant aspects of the environment.
- Identify and characterize spatial characteristics (local, community, regional).
- Identify and characterize project and alternative characteristics.

ENDS

- Determine:
  - -purpose.
  - -goals.
  - -objective.
- Identify problems.
- Identify opportunities.
- Establish limits.

RESEARCH

- Conduct comparable project review.
- Identify applicable and comparable standards, guidelines and requirements.
- Undertake literature review.
- Conduct basic research (knowledge gaps).

IMPACT ANALYSIS

- Identify impact categories and factors.
- Analyze alternatives (screening and comparative evaluation criteria formulation and application).
- Refine characteristics of proposal.
- Identify effects.
- Measure/describe, predict/forecast and characterize effects (magnitude, temporal and spatial distribution and intensity, probability, mitigation potential, direct-indirect, effect type, incidence of effects by population subgroup, certainty of predictions).

TABLE 20 - Examples of EIA Activities

INTERPRETATION

- Alternatives:
  - -Identify major stakeholders.
  - -Identify key public concerns.
  - -Identify key agency concerns.
  - -Determine sensitive and significant aspects of environment.
  - -Identify critical attributes of alternatives.
  - -Interpret data reliability and identify areas of uncertainty.
  - -Determine screening criteria.
  - -Rank comparative evaluation criteria.
- Impact Assessment:
  - -Identify major stakeholders.
  - -Identify key public concerns.
  - -Identify key agency concerns.
  - -Identify facility characteristics likely to induce impacts.
  - -Determine sensitive and significant aspects of the environment.
  - -Identify critical interrelationships among facility components, aspects of the environment and between facility and the environment.
  - -Interpret data reliability and identify areas of uncertainty.
  - -Identify key impact management measures.

SYNTHESIS

- Determine overall basis for screening alternatives.
- Determine advantages and disadvantages of alternatives.
- Characterize overall environment
- Characterize overall project characteristics.
- Identify interrelationships among effects.
- Determine cumulative effects.
- Synthesize impact management measures.
- Synthesize findings, conclusions and recommendations.

DOCUMENTATION

- Prepare process design document.
- Prepare interim documents.
- Prepare draft impact assessment statement.
- Prepare final impact assessment statement.
- Prepare technical documents and appendices.
- Prepare public and agency consultation reports.
- Prepare monitoring/auditing reports.

MITIGATION/ENHANCEMENT

- Identify mitigation (avoid, reduce, rectify, rehabilitate) measures.
  - -Modify proposal.
  - -Modify environment between proposal and receptor.
  - -Modify receptor.
- Identify enhancement (individual, community) measures.
- Identify compensation measures - measures to compensate individuals or community for adverse impacts which cannot be prevented or reduced to acceptable levels
- Incorporate mitigation/enhancement measures into alternatives analysis
- Incorporate mitigation/enhancement measures into impact assessment

EVALUATION

- Evaluate need and/or opportunity.
- Screen alternatives (economic, socially desirable, technically feasible, environmentally acceptable).
- Compare alternatives.
- Conduct overall evaluation of proposal against:
  - -goals and objectives.
  - -baseline conditions.
  - -agency requirements and preferences.
  - -community concerns and preferences.
  - -comparable projects.

COMMUNICATIONS

- Communicate:
  - -research findings.
  - -baseline conditions.
  - -analyses.
  - -interpretations.
  - -impact management measures.
  - -syntheses.
  - -evaluations.
  - -conclusions and recommendations.
- With:
  - -proponents.
  - -elected representatives.
  - -approval agencies.
  - -interested and affected publics (users, groups, individuals).
  - -media.

TABLE 20 - Examples of EIA Activities

IMPACT MANAGEMENT

- Formulate mitigation and enhancement measures.
- Formulate compensation (impact-related, equity-related) measures.
- Undertake monitoring (baseline, impact detection, compliance).
- Formulate emergency and contingency planning measures.
- Undertake community liaison (issue identification, consensus building, conflict resolution).
- Determine financial security and environmental liability mechanisms.
- Formulate implementation schedule and strategy.
- Conduct post audits.

INVOLVEMENT

- Formulate and institute measures for coordinating:
  - -core groups.
  - -core and specialist groups.
  - -advisors and peer reviewers.
- Formulate and institute measures for coordinating:
  - - public and private organizations.
  - -public agencies.
  - -proponents and public.
- Formulate and institute public involvement measures:
  - -information out.
  - -information in.
  - -consultation.
  - -consensus building.
  - -conflict resolution.
  - -local veto/control.
- By decision point and extended involvement.

(Lawrence 1992c)

Table 21 - Examples of Interconnections

INTERCONNECTIONS	NATURE OF CONNECTION
• Approach and other EIA activities.	• Each component of EIA designed and progressively refined with stakeholders.
• Research and all other EIA activities.	• Research of methods (characteristics). • Research of experience with methods (efficiency, effectiveness, adaptations). • Comparable project experience. • Case study and original research.
• Baseline conditions and impact analysis.	• Analysis of magnitude of change from baseline.
• Impact analysis, alternatives and project characteristics.	• Identification and prediction of effects of alternatives. • Identification and prediction of effects of project.
• Impact analysis and mitigation and enhancement.	• Analysis of net effects after mitigation and enhancement.
• Evaluation, ends, alternatives and project characteristics.	• Evaluation of alternatives and project characteristics against ends.
• Analysis, synthesis, interpretation and evaluation.	• EIA involves progressively and iteratively moving back and forth between analysis and synthesis. • Synthesis of analysis and interpretation provides basis for evaluation. • Evaluation represents a synthesis of advantages and disadvantages. • Individual impacts synthesized through analysis of indirect and cumulative impacts.
• Mitigation, analysis, synthesis and impact management.	• Individual mitigation and enhancement measures integrated into overall impact management strategy.
• Interpretation, mitigation and impact management.	• Priorities for mitigation and management measures determined by interpretations of significance.
• Evaluation, mitigation and impact management.	• Mitigation, enhancement and impact management preferences established through evaluation.
• Management, baseline, impact analysis and interpretation.	• Environmental and effects monitoring. • Interpretation of significance of changes identified through monitoring.
• Approval and all other EIA activities.	• Staged approval of EIA activities.
• Documentation and all other EIA activities.	• Traceable documentation of EIA process.
• Communications and all other EIA activities.	• Communications and each EIA activity.
• Involvement and all other EIA activities.	• Study team, agency and public involvement in EIA.

(Lawrence 1992c)

previous iterations, as circumstances change, and forward to subsequent iterations, to address potential implications for subsequent areas of choice. There may also be a tiering of alternatives in the sense that suboptions may be screened, compared and possibly progressively combined before a detailed comparison of a final short list of alternatives is undertaken. The procedure used to select a preferred alternative is likely to begin from basic questions of need and opportunity, advance through fundamental approach or value choices, and then proceed to address more detailed sets of alternatives pertaining to such matters as location, design and operations. One variation of this approach is to structure the generation and evaluation of alternatives on the basis of a hierarchy of ends. In the case of waste management, for example this would entail considering choices with respect to need, reduction, reuse, recycling and recovery/disposal in a series of stages. The process would advance to each subsequent stage only if required because a combination of choices from the previous step did not adequately address need. Other examples of areas of application conducive to such procedures include electric power (e.g., conservation first), transportation (e.g., demand control first) and resource management (e.g., initial focus on non-structural choices).

In light of the above, although possible iterations and major activities can be identified at the outset, the process must remain both open and flexible to respond to the unforeseen and to facilitate stakeholder participation. In this way the legitimate concerns of interested parties can be taken into account on a project-specific basis.

Design at the Regulatory Level

The status of regulatory EIA planning process design in Canada, and in the ten provinces, is highlighted in Appendix Table A-1 and in the previously referenced article (Lawrence 1992c). These analyses are based on a review of the legislation, regulations and general guidelines for each jurisdiction. Table A-1 incorporates changes that have occurred in EIA requirements in Canada since 1992. Consideration is also given to a recent survey of EIA jurisdictions in Canada (Doyle and Sadler 1996) and to an evaluation of the Ontario and Federal processes (Gibson 1993). The text overview of regulatory EIA design, presented below, focuses on the models, choices and themes resulting from the regulatory review presented in Table A-1. Specific references to requirements within individual jurisdictions have generally not been included. Instead, the analysis focuses on the broad lessons and insights that emerged from the regulatory review.

Alternatives and Approvals

Ten basic formulations of the links between alternatives and approvals, within the EIA regulatory process, are identified and are illustrated in Figures 10 to 19.

The process depicted in Figure 10 simply identifies, predicts, interprets and manages environmental changes as a result of a proposed project, as compared with baseline environmental conditions. The results of the process are documented and submitted for review and approval. The lack of explicit references to alternatives with these requirements may inhibit the potential to avoid adverse environmental impacts. On the other hand, there may be instances where policy and program choices have been addressed at other decision-making levels, the location is fixed (e.g., as with a mine or an expansion to an existing facility) and the necessary impact management measures are standardized, proven and appropriate. Arguably, an EIA planning process should be sufficiently flexible to acknowledge that there may be no reasonable alternative.

The planning process illustrated in Figure 11 is initiated by a set of environmental planning ends (or goals) rather than a project or proposed activity. Alternatives are then generated. The alternative that best satisfies the environmental planning goals is selected. This planning process would appear appropriate at the policy and program level with major approach choices (e.g., waste management practices, systems options) but with a generic level of detail that generally precludes the evaluation of locational options or the evaluation of impact management alternatives.

Figure 12 depicts a planning process where the major area of choice pertains to location. Such a process may require that a proposed project satisfy certain locational requirements and/or that locational alternatives be evaluated. The process illustrated in Figure 12 might be especially appropriate for facilities such as pipelines, transmission lines and highways where locational choices are pivotal but where mitigation measures have tended to become quite standardized. Such an approach would only be appropriate if the environmental implications of basic policy and systems level choices have already been addressed.

With the planning process illustrated in Figure 13 the focus is on alternatives for mitigating potential adverse

Figure 10 - No Alternatives

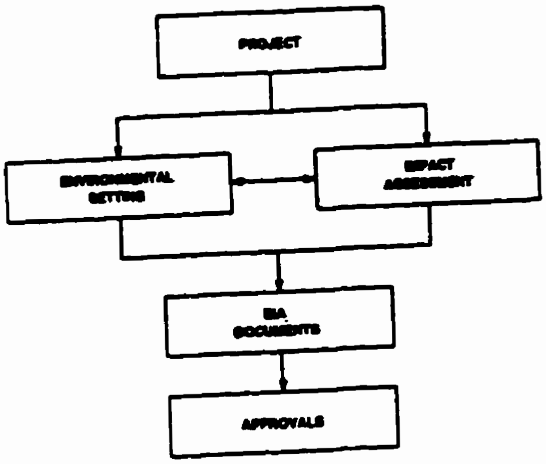


Figure 11 - Alternatives to Project

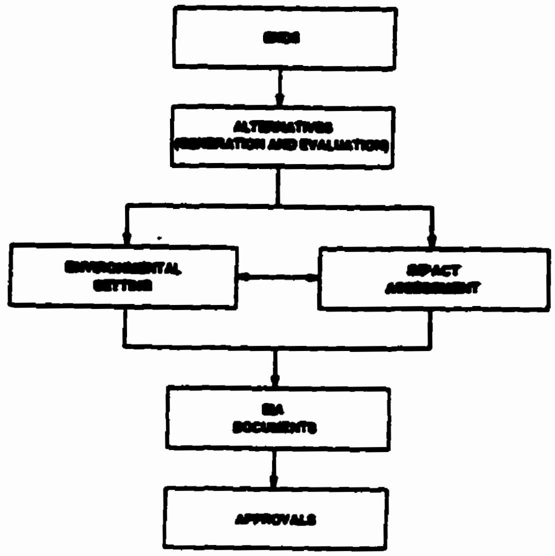


Figure 12 - Locational Requirements and/or Alternatives

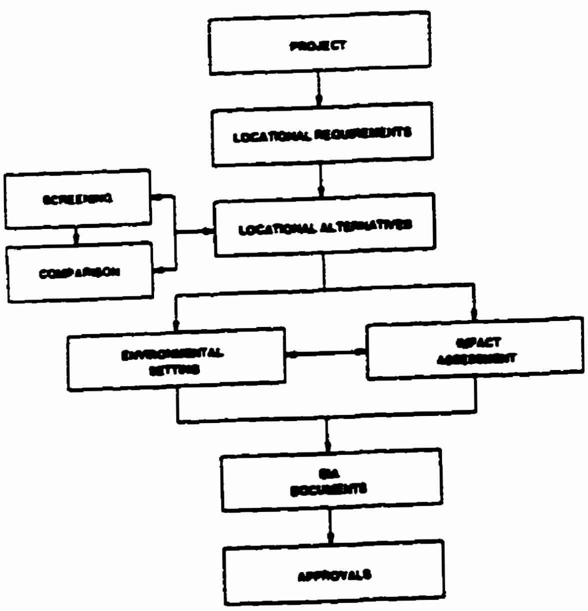
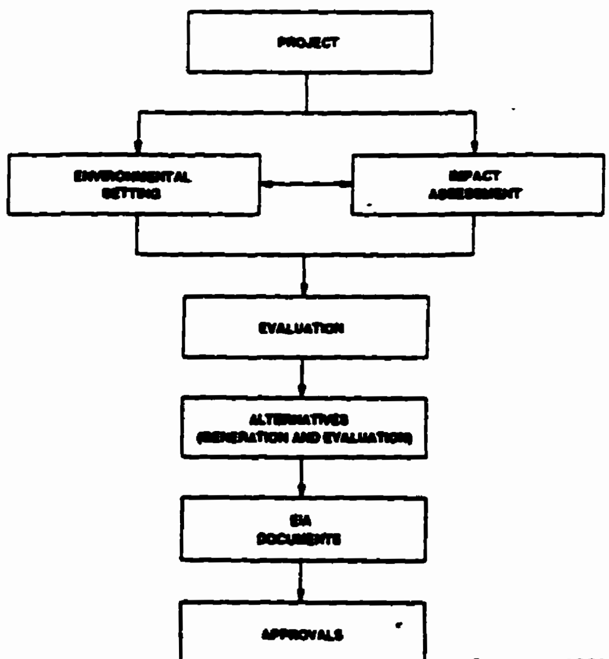


Figure 13 - Alternatives to Avoid/Manage Impacts



(Lawrence 1992c)

Figure 14 - Alternative Means to Carry Out Project

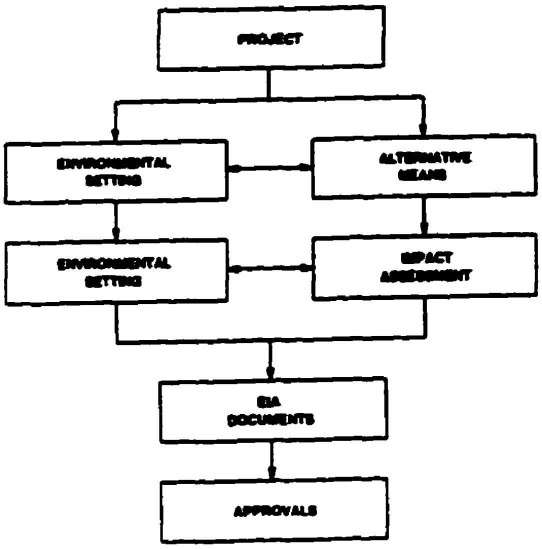


Figure 15 - Alternatives to Project and Alternative Means to Carry Out Project

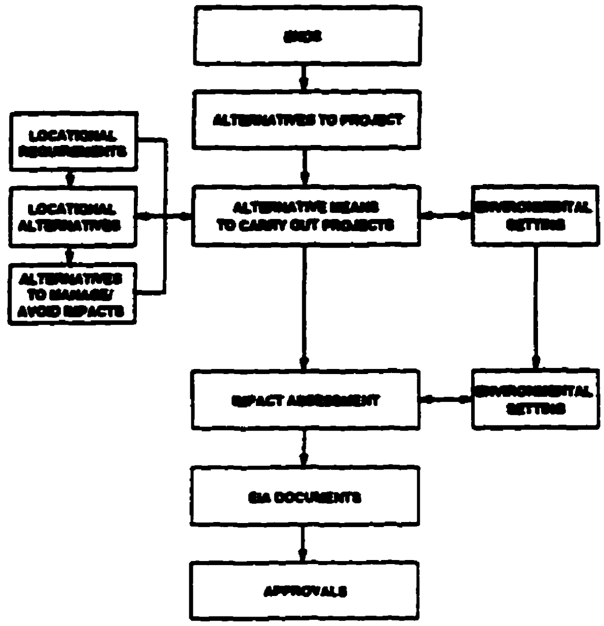


Figure 16 - Staged Approval

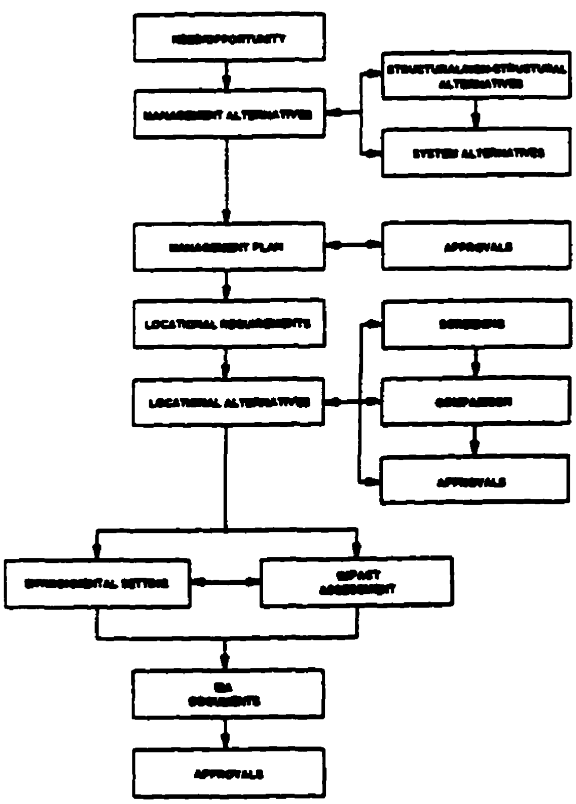
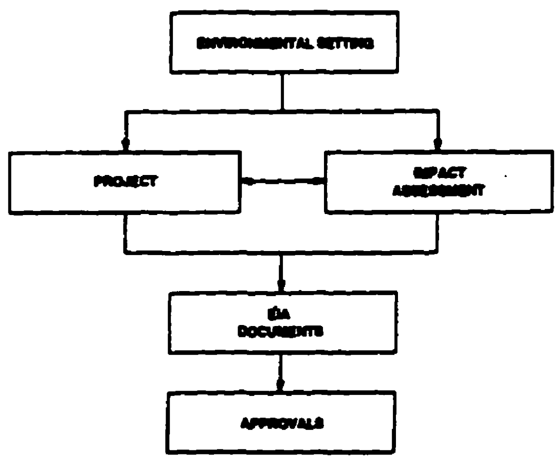


Figure 17 - Triggered by Environmental Setting



(Lawrence 1992c)

Figure 18 - Contingency Model

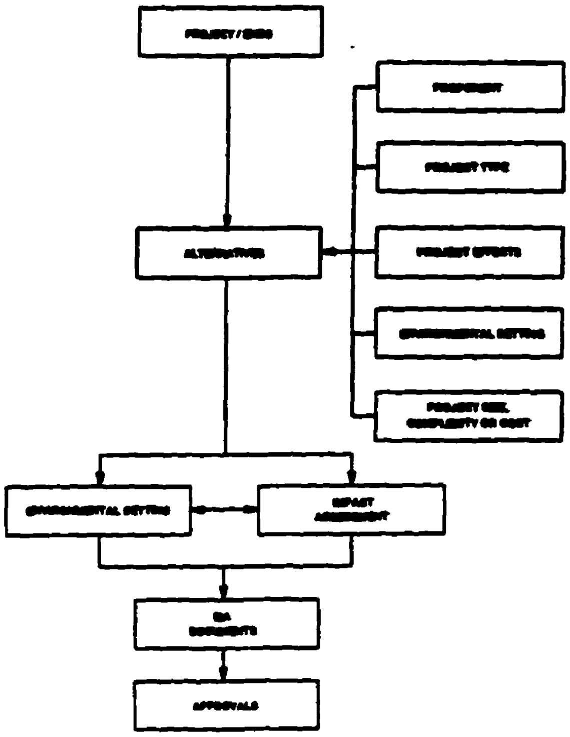
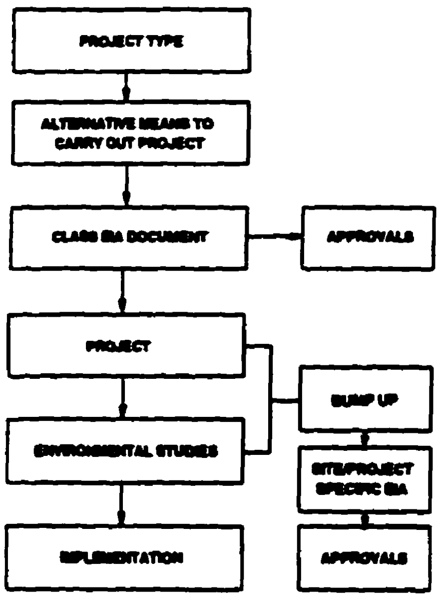


Figure 19 - Class EIAs



(Lawrence 1992c)

environmental consequences. The process would appear appropriate for situations in which basic policy and program choices have been addressed at another decision-making level, where the location is fixed (as with a mine) but where considerable discretion remains for avoiding or minimizing potential adverse impacts. In such cases a systematic evaluation of mitigation, compensation, monitoring and community consultation options is likely to be warranted.

The planning process illustrated in Figure 14 encompasses the consideration of both locational choices and alternatives to avoid or manage potential impacts.. Under this process a project report may provide a rationale for the project, detail the site selection procedures and evaluate alternatives to the methods proposed for application (i.e., construction, operations, modification, dismantling, abandonment). The planning process depicted in Figure 14 is probably most suited to situations where policy and program alternatives have been considered at another decision-making level.

The most common EIA planning process among the Canadian processes is that depicted in Figure 15. The consideration of both alternatives to and alternative methods of carrying out the undertaking is addressed directly. It has the advantage of being more comprehensive. However, it also means that choices more properly addressed at the policy or program level (e.g., transportation systems, major energy choices, waste management strategies) are often considered instead at the project level. Project level EIAs can function more efficiently and effectively if such policy and program issues are evaluated at another decision-making level and thereby form an environmental/resource management context within which individual project level EIAs can fit. It is noteworthy that the concepts of "tiering" and "area-wide environmental impact statements", as developed in the United States, have only received limited application in Canada.

The planning process illustrated in Figure 16 could be viewed as a form of tiering[1]. In this process an overall strategy is progressively defined, evaluated and approved. This process has the advantage of providing for the approval of the major structural elements of a strategy before questions of location and then impact management choices are addressed. This approach may be especially useful if the facilities to be located are controversial (e.g., waste disposal facilities, nuclear power facilities). In such cases a forum can be provided to address basic questions of need and alternatives to disposal prior to site selection and site assessment. The drawback with this approach is the potential for the planning, review and approval process to become extremely time-consuming and costly, a particular concern if there is an urgent need for facilities.

Figure 17 depicts a planning process initiated because a project or activity may be located within or abutting a particular geographic setting. Imposing EIA requirements for particular geographic settings is a potentially useful approach to protecting environmentally significant and sensitive areas and resources of national, provincial/state and municipal importance. Such procedures, together with area-wide EIAs, can also flexibly adjust EIA requirements to suit local geographic conditions. Properly scoped such requirements can provide a useful bridge between EIA and environmental, resource and land use planning. However, coordination must be assured and duplication avoided.

The planning process exhibited in Figure 18 represents an acknowledgement that a standard EIA planning process may not be appropriate for all types of proponents, projects and (as noted above) environmental settings. A variety of approaches have been used in Canada to provide some degree of flexibility, including: project classification, a project proposal, a screening process or report, a project-specific set of guidelines, a terms of reference, and generic guidelines. Although these approaches represent an opportunity to shape and focus the EIA planning process, scoping, as used in the United States to systematically streamline and focus the EIA planning and approval process, has not been formally introduced into Canada.

The processes outlined above reflect the inevitable need to adjust the EIA planning process, and its associated review and approval requirements, to suit different circumstances. Although some degree of flexibility is both necessary and appropriate, consistency in the application of EIA requirements is also desirable. Therefore, there should be a clear rationale for differences and parallel situations should be treated in a consistent manner, to the extent practical. These processes also underline the importance of comparative evaluation for avoiding and reducing potential adverse environmental consequences.

The final EIA planning process, illustrated in Figure 19, is concerned with the preparation of class or category EIAs. Class EIAs tend to be used for recurrent smaller-scale projects with common characteristics, readily predictable effects, a low level of impact magnitude and significance and standardized mitigation measures. A class EIA is prepared for a project type (e.g. expansions to sewage treatment plants, road widenings). The class EIA is subject to the full EIA requirements. Once the class EIA is approved, individual projects within the class can proceed without further EIA review requirements, providing there is adherence to the EIA planning process detailed in the class EIA. The class EIA also generally lists a series of circumstances under which an individual project could be subjected to the full EIA review and approval requirements.

Class EIAs represent a useful procedure for introducing environmental concerns into the planning of small scale, low-impact, recurrent projects. They can be problematic if the circumstances under which projects become subject to full EIA review are not sufficiently explicit, if class EIA requirements are not formalized in legislation or regulations and if no provision exists for the selective review and monitoring of the documentation and environmental impacts associated with individual projects. Particular consideration should be given to instances where projects would be located in sensitive or significant environmental settings, where the projects represent a precedent for larger scale projects, or where cumulative impacts are a concern. It is also important that the procedures for assessing individual projects ensure the systematic consideration of need/opportunity, alternatives, potential environmental effects and impact management requirements. In addition, provisions to ensure early and ongoing agency and public involvement are essential.

Proponent and Proposal Types

Part of the process of designing an EIA planning process, at the regulatory level, is determining who the process applies to and what types of undertakings or activities will be encompassed by the process. The most common approach in Canada is to use a classification procedure to determine the project types to be subjected to EIA requirements. In such cases EIA requirements apply to both public and private proponents, although the general practice is to limit the definition of undertakings to projects.

The regulatory approach of defining the project types subject to EIA requirements, irrespective of whether the proponent is public or private, would seem the most direct route to ensuring that environmental concerns are built into the planning and decision-making of activities most likely to induce significant adverse environmental effects. Presumably some discretion should remain to designate special case undertakings that do not fall within the prescribed categories. If the EIA requirements are to be applied to both public and private projects the differences between public and private proponents must be recognized (e.g., public need versus market opportunity, ability to acquire property) and these differences must be reflected in EIA requirements regarding such matters as the consideration of alternatives. This issue is considered further later in this chapter.

The question of extending EIA requirements to public plans, programs and policies is somewhat more problematic. For example, the EIA planning process, largely designed for the evaluation of capital projects, would need some changes before it could be applied to plans, policies and programs. It is also within the realm of policies, plans and programs that EIA overlaps to the greatest extent with related institutional arrangements in such areas as environmental quality control, resource management and regional planning. It is important, as discussed later in this chapter, to give careful consideration to the roles of and interconnections among these interrelated fields before EIA requirements intrude too far into the evaluation of plans, policies and programs.

Public and Agency Involvement

Part of the procedure for designing a planning process at the regulatory level is the determination of the extent and manner of public and agency involvement. With respect to agency involvement within Canadian jurisdictions, part of the review and approval process generally includes some form of document circulation process to pertinent federal, provincial and municipal agencies. In some cases assessment or project review committees are established to coordinate the review and approval process. Where applicable, explicit reference is made to municipal involvement, to Native or First Nations involvement and to the involvement of other jurisdictions and levels of government. Such coordination is necessary to address the possibilities of overlapping jurisdictions and impacts which extend across borders. Three provinces have signed harmonization agreements so far with the federal government (Doyle and Sadler 1996).

Designing the EIA planning process for agency involvement should clearly ensure that all pertinent agencies and levels of government are directly involved in the review and approval process. It also seems prudent to allow for the possibilities of transboundary impacts, overlapping jurisdictions and impacts on the activities and interests of native peoples. In view of the dangers associated with protracted review and approval procedures, it is wise to institute procedures to rapidly scope the involvement of agencies where the proposal has no to limited bearing on their mandate.

For the same reason, rather than relying exclusively on document circulation, devices, such as committees, workshops and scoping sessions, should be used to focus and expedite the review and approval process.

Regulatory requirements regarding public involvement in the EIA planning process in Canadian jurisdictions generally, at a minimum, include public notification requirements, public availability of EIA documents and government files, provisions for the incorporation of public comments and public involvement in determining the need for and conduct of public hearings or panels. Public involvement prior to the submission of an EIA is generally encouraged, sometimes by means of guidelines. The stipulation that a public information or involvement program be submitted at the outset of the planning process can further facilitate the early and ongoing incorporation of public concerns and preferences. Some jurisdictions have also made provision for the use of conflict resolution methods, such as mediation.

All Canadian jurisdictions provide the opportunity for some form of public hearing. There is considerable variation in the degree of independence and the procedures used by these bodies. The obstacles to public involvement, especially in adversarial forums because of resource limitations, have been increasingly recognized and, to some degree offset, through provisions for intervenor and participant funding.

The use of regulatory requirements to ensure that planning processes provide for early and ongoing public involvement is clearly desirable. The public has a right to be involved in the planning of any activities that interest or potentially affect them. EIA requirements should both detail minimum standards for public involvement and provide means for facilitating early and ongoing public involvement. There is a danger in detailing too precisely, at the regulatory level, the methods for conducting public involvement programs. A wide array of public involvement techniques are potentially available for use with any proposal. Various techniques will be more or less effective depending on the environment, the affected publics and the stage in the planning process. Sufficient discretion must be left to proponents, working jointly with interested and potentially groups and individuals, to determine creatively how best to convey information, facilitate involvement and resolve areas of dispute.

Definition of Environment and Environmental Effects

Environment is generally defined quite broadly in EIA requirements within Canadian jurisdictions to include impacts on the physical, biological, social, cultural and built environments. Three notable exceptions are the federal process and the processes in Saskatechewan and New Brunswick. In these jurisdictions the definition of the environment is limited to the physical and biological components, although consideration must be given to repercussions of biophysical environmental effects on health and socioeconomic conditions (Doyle and Sadler 1996). Some jurisdictions make particular note of health, renewable resources, rare and endangered species or features, and aboriginal culture or sustenance activities.

A broad definition of the environment, encompassing both biophysical and socioeconomic aspects, including interrelationships, would seem the only means of ensuring that potentially significant effects are not ignored or discounted. Highlighting aspects of the environment of particular concern may be of mixed value. Although highlighting may serve to emphasize public policy priorities it may complicate the project-specific determination of significant components of the environment. If resources are to be used in an effective and efficient manner, where the environment is defined broadly, there is a concomitant need to scope the consideration of aspects of the environment on a project type and project-specific basis.

No standard approach exists for differentiating types of effects across Canadian jurisdictions. Although not always made explicit, the general assumption seems to be that positive and negative, direct and indirect effects should be evaluated. There appears to be the general expectation that the distribution of effects over space and time should be considered, with a distinction drawn between impact magnitude and impact significance. Occasionally, EIA legislation or regulations provide a definition for a significant environmental effect or define development or undertaking in a manner indicative of what would be considered a significant environmental effect. To a more limited but increasing extent, explicit reference has been made to the need to consider the likelihood and reversibility of effects, potential impacts on resource sustainability, aboriginal rights and cumulative impacts. Drawing such distinctions, within regulations and guidelines, can assist in ensuring that impact predictions and interpretations are undertaken in an explicit and systematic manner. As a general principle, although it is worthwhile to indicate the types of impacts that should be evaluated, it is not advisable to specify the methods that must be used to interpret and evaluate those effects.

Impact Management

Requiring that EIAs consider means for preventing or reducing adverse impacts associated with the proposal and its alternatives is quite standard within Canadian jurisdictions. Although not always explicitly referenced, there also appears to be an expectation that enhancing benefits should be considered. The monitoring of environmental condition changes, effects and the effectiveness of mitigation measures is a requirement in two jurisdictions and a potential consideration in the remaining jurisdictions. Some jurisdictions have formalized commitments in compliance agreements or conditions of approval. Four jurisdictions periodically audit approvals and all jurisdictions periodically evaluate the EA process (Doyle and Sadler 1996).

The systematic consideration of mitigation and mitigation potential is a necessary component of EIA requirements, although some discretion is needed concerning if and the extent to which mitigation should be considered in the screening and comparison of alternatives. One of the traditional weaknesses of EIA practice has been the failure to evaluate the accuracy of impact predictions and the effectiveness of impact management requirements. A requirement to monitor impacts and the effectiveness of impact management measures, preferably with commitments formalized in a compliance agreement, is important if EIA is to move beyond a preapproval planning exercise (with a very gradual learning curve) and toward an ongoing environmental management function. The auditing of experiences across projects offers the potential for greatly enhancing the dissemination of EIA-related knowledge and experience. Providing for the use of conflict-resolution measures can, in some instances, assist in making the EIA planning, review and approval process less adversarial and more efficient and effective.

Adaptations to Context

Environment Type

EIA is generally viewed as encompassing three major subfields - ecological, social and economic impact assessment. Social and economic impact assessment are sometimes combined as the human environment or as socio-economic impact assessment (McDonald 1991). The similarities and differences among these subfields are important EIA planning process design considerations. Given the need to integrate ecological, social and economic perspectives in EIA transcending differences are even more important.

The three EIA subfields share a common aim - to broaden planning and decision-making beyond narrow technical and economic concerns (Craig 1990). The major steps in the EIA planning process for each do not differ appreciably (Interorganizational Committee 1995) nor do the major impact dimensions (e.g., positive - negative, scale, extent, duration, intensity, severity) (Interorganizational Committee 1995; McDonald 1991). There are many parallels in the issues addressed (e.g., threatened, rare and endangered species, vulnerable human populations) (Interorganizational Committee 1995) and all require institutional arrangements to ensure implementation.

The three subfields, however, address different variables and have a different disciplinary knowledge base (Interorganizational Committee 1995; Leistritz 1994). Major differences exist in the perspectives and conceptual tools used by the natural and social sciences. The social sciences tend to be more discursive and critical and less predictive and explanatory than the natural sciences (Burdge and Vanclay 1996). This latter difference, coupled with the complexity of social and economic systems (i.e., multi-finality - the same inputs often produces different results) make it especially difficult to predict impacts on social and economic phenomena (Finsterbusch 1995; Thompson and Williams 1990).

Social phenomena react in different ways to change and the prospect of change than do natural phenomena. The social and economic environment reacts in anticipation of change and can adapt in reasoned ways to changing circumstances (Interorganizational Committee 1995). Reality can be socially constructed through perceptions, attitudes and values (Interorganizational Committee 1995). Social impact analysis must address cultural differences (Nesbitt 1990; Edelstein and Kleese 1995; Burdge and Vanclay 1996), social equity implications, especially with regard to marginalized and disenfranchised parties (Dale and Kennedy 1981), and political - economic impacts (Rickson, Western and Burdge 1990).

Although the three subfields generally share common EIA institutional arrangements, social impacts tend to be less well entrenched in public and private planning processes and have less decision-making influence (Interorganizational Committee 1995). A greater effort may be required to ensure such concerns receive adequate consideration.

Although the differences among ecological, social and economic variables and analysis methods must be appreciated a greater integration of these subfields within the EIA planning process is also needed, beginning with a sound understanding of the interconnections among proposal components, among environmental components within disciplines (McDonald and Brown 1995) and between individual environmental components and individual proposal components. The integration of environmental and proposal components should commence with the integration of EIA within the proposal planning process (Armour 1990). Major interactions among disciplines can next be identified and implications addressed - an interdisciplinary analysis (Stefanovoic 1996). More subtle and less direct interactions can then be explored (Westman 1985). Still more systematic interdisciplinary analyses require a modified planning process (e.g., adaptive environmental assessment) (Geisler 1993; Holling 1978; Regier 1985), the explicit assessment of cumulative environmental effects (Shoemaker 1994) and the incorporation of sustainability ends and means (Sadler 1995). Disciplinary boundaries should be progressively spanned with this process. Ideally what should emerge is a truly transdisciplinary analysis. A transdisciplinary synthesis transcends synthesis by fully addressing interactions and by establishing a new metalevel of discourse (Stefanovic 1996; Klein 1990)[2].

Proposal Type

The most common proposal type distinction in EIA concerns project type. Examples include linear transportation and utility systems, airports, transit systems, waste management facilities, water resource facilities, mines and energy projects. Until recently, for example, there were different EIA requirements in British Columbia for different project types - major industry, energy and mining. EIA requirements in Canada now apply across project types. Generic guidelines have been formulated for various project types in some jurisdictions (Canada, Ontario, Quebec). Generic guidelines, by project type, can focus the analysis of alternatives, impacts, mitigation measures and issues. Care must be taken to ensure that sufficient flexibility is retained to address project and site-specific issues and concerns. Important lessons can be drawn from experience with similar projects in similar settings (Dickman 1991; Egre and Senecal 1990; Sadar and Dirschl 1995).

A further distinction can be drawn between project level EIA and the strategic environmental assessment (SEA) - the application of EIA to policies, programs and plans (Therivel *et. al.* 1992; Sadler 1996). The related field, technology assessment (TA), addresses the effects on society that occur when a technology is introduced, extended or modified (Coates 1976). The similarities and differences between EIA and SEA parallel those between EIA and TA.

SEA and TA require more than the simple extension of EIA procedures, requirements and methods, largely developed at the project level. The very limited application of EIA requirements in Canada beyond the project level, as noted earlier in this chapter, is not an accidental oversight. It reflects important differences and significant barriers. Examples of such barriers include insufficient political will, limited societal support, narrow definition of issues, compartmentalized organizational structures and bureaucratic prerogatives (Sadler 1996). Nevertheless, public and private decision-making at all levels must be broadened to systematically anticipate and evaluate social, economic and ecological consequences (Partidario 1996; Craig 1990; Porter 1995). Equally important is the need to open up policy and programmaking processes to greater and earlier involvement. Action-forcing institutional arrangements that address such concerns will be necessary. Project level EIA can offer SEA and TA many insights, procedures and methods, providing the implications of operating at different decision-making levels are appreciated. Ultimately, EIA, SEA and TA must be integrated, together and within still broader frameworks.

EIA at the project level (referred to as EIA in the balance of the section) addresses physical projects and activities. An EIA decision should determine whether a project will or will not be constructed or demolished. The ultimate product of an SEA (used to refer to both SEA and TA in the balance of this section) is a usually a series of decisions (Partidario 1996). The EIA planning process is usually initiated by a decision - the identification of a need or opportunity that may be fulfilled by a physical project. It also ends, with the exception of post approval monitoring, with a decision regarding whether a project should or should not proceed. SEA focuses on emerging issues and problems as well as ongoing activities. Hence, it is more proactive (Therivel *et. al.* 1992). SEA is more properly characterized as a continuous series of decisions (Coates 1990; Partidario 1996; Lerman 1994). This continuity of SEA decision-making makes it difficult to bound the SEA planning process. When, for example, does the policy-making and program formulation process begin and end (Ortolano and Shepherd 1995)?

The SEA planning process is less clearly defined, more uncertain, less formally structured and more open-ended and consequently more adaptable (Smith 1993; Porter 1995; Lerman 1994; Ortolano and Shepherd 1995; Partidario 1996). SEA alternatives are often more difficult to identify (Therivel *et. al.* 1992). SEA usually embraces a wider range of choices (Therivel *et. al.* 1992), although the no-action alternative is rarely considered (Lerman 1994; Coates 1990). SEA alternatives tend to overlap (i.e., rarely mutually exclusive) to a greater degree with permutations and combinations of alternatives emerging as the planning process evolves. The temporal and spatial area of application with SEA is generally much greater (Therivel 1993; Therivel *et. al.* 1992). SEA usually encompasses a wider range of issues and publics (Therivel 1993; Porter 1995) and must consider impacts on related policies and decision-making areas. With SEA impact management tends to be undertaken in a more proactive and systematic manner (Therivel *et. al.* 1992), the level of detail is necessarily broader (Tywoniuk 1990) and greater attention can be devoted to cumulative, indirect and time delay impacts as well as sustainability-related issues (Therivel 1993; Therivel *et. al.* 1992; Kennett and Perl 1995). SEA methods tend to be more theoretical and less fully developed and accepted (Porter 1995) and the range of disciplines involved in SEA tends to be narrower (Partidario 1996; Therivel 1993). The SEA planning process tends to be less formal, more political and less open to public involvement (Partidario 1996; Therivel *et. al.* 1992). Concerns with confidentiality are often used to preclude or limit stakeholder involvement, until very late in the planning process. SEA is institutionalized to a much lesser extent, as is readily evident in Table A-1. The SEA planning process more frequently involves multiple agencies (i.e., co-proponents) and levels of government (Partidario 1996). As a result channels of communications among agencies and levels of government, are more important.

These differences should be reflected in the EIA planning process. This accords with the view, presented in Chapter 3, that EIA theory building should be pluralistic and contingent. Notwithstanding such differences the over twenty years of EIA theoretical development and experience can still be highly instructive for SEA.

Boundary spanning (another characteristic of EIA theory building identified in Chapter 3) is especially important at the regulatory level. In Canada the current structure seems largely an amalgam of: EIA and a very restricted form of SEA, as represented by the statement of environmental implications for major new policies and programs at the Federal level; EIA and no to very occasional SEA as evident in most provinces; and EIA and SEA as separate systems with very limited interconnections. Ontario, with largely separate EIA, planning and SEA (the Environmental Bill of Rights) systems, is a case in point. Models, yet to be achieved in Canada but realized in other jurisdictions, include standard EIA for projects with an equivalent process for policies and programs and integrated environmental management (Sadler 1996).

The integration of EIA and SEA could begin with a commitment to apply a consistent set of environmental and sustainability principles and criteria to existing and new policies and programs. A more formal and systematic SEA could then be initiated in each jurisdiction. EIA and SEA experiences in other jurisdictions (Therivel 1993; Partidario 1996; Wood 1995; Therivel *et. al.* 1992; Sadler 1996) would be instructive in this endeavour (e.g., guiding principles) (Sadler 1996). Obvious overlaps and omissions between the two systems could be identified (Richardson 1994), as the first step toward harmonization (Kennett and Perl 1995; Partidario 1996). Some jurisdictions may elect to proceed with a single EIA/SEA system, perhaps with separate subsystems. Alternatively they may prefer a process of gradual convergence (European Bank for Reconstruction and Development 1995).

SEA should frame EIA (Lichfield 1996; Sadler 1996). Both should be based on sustainability (Therivel *et. al.* 1992). The policies, programs and plans that emerge from the SEA process should establish the terms of reference for EIA projects. SEA can address need and most alternatives to a proposed project. The geographic scope of any site search process can be narrowed, an environmental data base can be provided and a policy context can be established. A SEA can also identify generic impacts and mitigative measures, address cumulative and sustainability impacts and provide a broader impact management system (Wood and Dejeddour 1990; Sadar and Dirschl 1996; McDonald and Brown 1995; Kennett and Perl 1995; Johnston and Madison 1994; Rivas *et. al.* 1994). Public involvement is especially important and especially difficult because of the limited tradition of direct public involvement in the policy and program making process (Sadler 1996).

The framing of EIA within SEA can next be formalized into a hierarchical or tiered system (O'Riordan and Hey 1996; Wood 1995). An EIA would be triggered by specific SEA requirements (e.g., a project proposal of a certain type, scale or location) (Partidario 1994). Areal planning can then be added at the regional, community and development control levels (Tywoniuk 1990; Conacher 1994/1995; Johnston and Madison 1994; Lerman 1994). A blended approach can assess the compatibility of existing and proposed facilities with environmental protection requirements (i.e., environmental integration assessment) (Lachavanne 1991). Further extensions can encompass such related fields as risk assessment, technology assessment, resource management (Dunster 1990; Williams 1990) and environmental quality control (Arquiga, Canter and Nelson 1992, 1994; Carpenter 1995b; Coates 1976, 1990; Porter 1995; Marshall *et. al.* 1985; Margerum and Born 1995; Vig 1992; Grima *et. al.* 1986; Wyant, Meganck and Horn 1995).

As the integration process proceeds components will be redefined (Mayda 1996). Sustainability goals and objectives and ecosystem planning (Brocking 1994; Kay and Schneider 1994) and management principles (Slocombe 1993) can guide and structure integration efforts (Smith 1993). Strategic interventions (Treweek 1995; Conacher 1994/1995) and network-based institutional structures (non-hierarchical, flexible, permeable boundaries) (Marshall *et. al.* 1985; Partidario 1996) can better manage complex, rapidly changing environmental and social systems than rigid hierarchical, bureaucratic structures. Such structures can also respect valid differences among proposal types. Ultimately, environmental management systems should be nested within and responsive to national environmental strategies (Kuusinen, Lesperance and Bilyard 1994) and global and international environmental perspectives and institutional arrangements (Malik 1995; Sandford 1996; Wood and Dejeddour 1990).

Strategic and structural harmonization initiatives, as described above, will face significant institutional barriers (Caldwell 1994). They will also encounter perspectives that fundamentally conflict (e.g., ecocentric versus anthropocentric) (Bell 1994). Because such conflicts are not fully reconcilable difficult and controversial positions will need to be taken if the full potential of such systems is to be realized.

Proponent Type

EIA requirements in Canada, with the exception of Ontario, are triggered by project rather than proponent type. EIA planning process design should still be sensitive to proponent type differences. Small municipalities and native bands, for example, have limited resources and expertise. Involvement in a costly and protracted EIA planning and approval process can represent a major hardship.

There are also significant differences between public and private proponents. A private proponent operates on the basis of market opportunity rather than public need; will only commence a process if convinced of economic and technical feasibility; will only consider services within its current and anticipated future mission statement; requires an economic return of investment; will tightly circumscribe its exposure to economic risk and will require sufficient certainty to flexibly respond to changing conditions relative to marketplace competitors. A private proponent can also not expropriate land, ensure that the sale price of land is at market value, or modify regulatory requirements if necessary to achieve its purposes. These characteristics will determine if and when a private sector proponent initiates an EIA planning process, what are considered reasonable alternatives, the economic factors used to screen and compare alternatives and to predict and to manage impacts, the public involvement methods applied (e.g., limits to which it will share decision-making) and impact management choices and commitments.

At a broader level strict boundaries among proponent types are becoming less relevant. Environmental management is a multistakeholder process involving the public sector, the corporate sector, non-government organizations and the public. Public - private partnerships are more common. SEA, area-wide EIA and cumulative impact assessment usually involve multiple proponents and a diverse array of stakeholders. Harmonizing environmental requirements among government levels, if legitimate differences are respected, can avoid duplication, address omissions and ensure consistent and complementary efforts. Multistakeholder mechanisms (e.g., round tables, commissions, trust partnerships) may facilitate cooperative environmental management approaches.

The public sector is charged with defining and protecting the public interest. EIA proposals should be evaluated against public policies and priorities, preferably defined through SEA. EIA requirements, that apply to any proponent type should be specified. Supplementary requirements may be needed for particular proponent types and/or adjustments and interpretations may be required to reflect legitimate differences among proponent types. These adjustments should be made explicit and should be applied consistently.

<u>*Setting Type*</u>

Setting must also be considered in EIA planning process design. Many elements of the EIA planning process will still apply regardless of setting, including the overall role and purpose of the process, major process steps and activities, environmental components and impact dimensions, major assessment methods and some form of institutional arrangement (Burdge 1991). Consideration must, however, be given to the implications of state type (developed versus developing, newly industrialized or central and eastern Europe) (Balaban 1994), region type (remote, rural, urban fringe, suburban, urban) (Rickson *et. al.* 1995: Reed 1994; Richards 1992; Jin, Hui and Porter 1992; Leitmann 1993) and local setting characteristics.

To a greater extent in developing or third world countries, for example, significant cultural and religious differences must be considered (Burdge 1991; Kennett and Perl 1995; Edelstein and Kleese 1995; Wood 1995). The cultural impacts associated with the introduction of certain new technologies can be especially severe (Yap 1990). EIA-related expertise, skills and resources may be limited (Brown, Hindmarsh and McDonald 1991; Tongcumpou and Harvey 1994; Kakonge 1994, 1995). Limited baseline environmental data (Kennett and Perl 1995) and secondary sources may be available (Brown 1990; Wood 1995). Supplementary funding, capacity building within local institutions and a strict scoping of impacts may be required (Wood 1995). A much heavier reliance on indigenous knowledge, non-government organizations and participatory research techniques may also be necessary (Appiah-Opuku 1994; Yap 1990; Kakonge 1995; Burdge 1991; Brown 1990).

Barriers to EIA in third world countries can be substantial. EIA requirements are often initiated because of the demands of development assistance agencies rather than as a result of indigenous demand (Wood 1995). Industrial development and urban infrastructure are often viewed as acceptable and desirable (Tongcumpou and Harvey 1994), with a consequent focus on management options (Fuggle 1990). Private sector developers are frequently unreceptive to EIA (Yap 1990; Vizayakumar and Mohapatra 1991). There may be a lack of political will (Wood 1995). Public institutions are sometimes less open (Vizayakumar and Mohapatra 1991; Kakonge and Imebove 1993) and governments can be paternalistic and authoritarian (Fu-Keung 1991). There is often less of a public involvement tradition, that can be further inhibited by illiteracy and poverty (Tongcumpou and Harvey 1994; Brown, Hindmarsh and McDonald 1991; Wood 1995).

The EIA characteristics and barriers highlighted above are far from uniform across third world countries. What is evident is the need for EIA process modifications to accommodate cultural setting differences. Integration of EIA into project design and implementation is crucial (United Nations Environment Programme 1988). Given the potential for implicit, inappropriate assumptions, it is generally best if lead roles are assumed by personal with a substantial and long term understanding of and experience in such settings.

The matching of the EIA planning process to different settings should proceed in stages. First, state type characteristics (e.g., newly industrialized) should be considered followed by an analysis of applicable jurisdiction characteristics. In the latter case all potentially applicable regulatory requirements, policies and priorities should be anticipated and satisfied. Interconnections with related decision-making areas should also be addressed.

Region type characteristics (e.g., resource communities) should next be considered. A regional and community study area profile should then be undertaken, focusing on characteristics with the potential to influence and constrain available choices. Further refinements should be introduced as the geographic focus of the planning process narrows, culminating in a systematic profile of local setting. Again, particular consideration should be given to attributes that might affect EA planning and decision-making processes.

A sound understanding of potential setting implications is best acquired in an open planning process characterized by an ongoing dialogue with all stakeholders. Valuable lessons and insights can also be obtained through the systematic consideration of comparable proposals in comparable settings.

Transcending setting type differences is questionable if the aim is to develop a generic EIA planning process suitable for any and all settings. Instead, EIA should be guided by sustainability goals. It should also be sensitive to ecosystem boundaries and characteristics, cognizant of potential cumulative effects and directly linked to other forms of environmental management. An enlarged spatial perspective, especially with regard to indirect connections to and from other environmental systems, will be especially important.

Public Participation Perspectives and Types of Publics

The necessity and desirability of public and agency involvement in the EIA planning process is a given. The choice of method is open to debate. The EA planning process should select and adapt public consultation methods to match the characteristics, needs and desires of interested and potentially affected segments of the community.

Public consultation methods tend to be depicted in hierarchical structures (Parenteau 1988; Sinclair and Diduck 1995), often based on distinctions drawn from urban and regional planning literature (Arnstein 1969). The lowest level of this structure is usually identified as non-participation (i.e., either a closed planning process or deliberate manipulation). This level is unacceptable. At the next level the public is informed and educated - information flow out to the public. Public consultation, the next level, involves a dialogue (an exchange of information, perspectives and positions) between the proponent and interested and potentially affected members of the public. Decision-making authority continues to reside with the proponent. Public involvement occurs periodically, usually just prior to and subsequent to major decision points. The remaining levels represent degrees of citizen control ranging from a partnership, through delegated power and up to full citizen control. Extended public involvement or joint planning is the rule and frequent use is made of conflict resolution and consensus building techniques.

Conflicting perspectives often emerge between those viewing forms of citizen participation short of citizen control in a pejorative manner (i.e., tokenism) and those agreeing with informing and consulting the public but who consider sharing or delegating authority to the public as unreasonable and unwarranted (Gagnon, Hirschl and Howlitt 1993). These conflicting positions are not fully reconcilable. To some degree they reflect different political economic perspectives (Dale and Lane 1994).

Nevertheless, there is middle ground between these conflicting perspectives. A valid role for education, consultation and shared decision-making in the EIA planning process can be acknowledged. Different methods will be appropriate for different proponents, settings and proposal types and for different stages in the planning process. The absence of public consultation, misrepresentation and limiting public participation to the one way transmission of information is unacceptable. Various forms of shared decision-making, citizen advisory committees for example, have had a better record in securing higher levels of public acceptable and in obtaining proposal approval (Landre and Knuth 1993). An increased emphasis on public consultation and, especially, shared decision-making is more consistent with minimizing social impacts, opening up the EIA planning process and facilitating more effective planning and decision-making.

The EA planning process design should anticipate and be responsive to the concerns, interests and preferences of potentially affected publics. A particular effort is needed to meet the needs of culturally distinct groups, more vulnerable groups and individuals and groups and individuals likely to experience the most severe impacts. As discussed earlier in this chapter, this concern can be addressed to some extent at the regulatory levels (e.g., special provisions for First Nations involvement, intervenor funding), but must be extended to the applied level. Examples of potentially affected publics include: directly and indirect affected or interested individuals, groups and organizations;

citizen groups; local and province-wide interests groups; community leaders and key informants; segments of communities based on variations in traditions, lifestyle and institutions; elected representatives; and the media. Public participation methods should be designed and applied to meet the varying needs of each public, appreciating that different interests will be represented at different stages in the EA planning process.

Resource planning and management is instructive regarding how a contingent approach to public participation in EIA planning process design can be transcended (Duffy, Roseland and Gunton 1996). Innovative approaches to multi-stakeholder involvement (e.g., round tables, environmental networks, environmental commissions) (Kofinas and Griggs 1996; Wilson, Roseland and Day 1996), and experimental approaches to the devolution of authority (Taylor and Wilson 1994) (e.g., co-management agreements, local stewardship councils) (Pinkerton 1993, 1996; Hawkes 1996; Harris 1991; Lerner 1994; Berkes, George and Preston 1991) point to the considerable potential of shared decision-making to build consensus and resolve conflicts across stakeholders (Flynn and Gunton 1996). Again, innovative approaches must overcome significant institutional barriers (Caldwell 1994) and confront major value and ethical divisions (Lerner 1994; Howlett 1992; Clow 1992; Grant 1992; Bell 1994).

Combinations of Factors

The various factors that can and should influence EIA planning process design are not mutually exclusive. Varying combinations of environment, proposal, proponent, setting, and public types, should be considered . Although differences should be appreciated, barriers and boundaries must be spanned and transcending frameworks formulated and applied.

Integrating Sustainability - Regulatory Level

EIA is an action-forcing mechanism. Consequently, reforming EIA within a sustainability framework will require reforms to EIA requirements as defined in EIA legislation, regulations and guidelines. Table 22 lists criteria for assessing if and to what extent EIA requirements are consistent with a sustainability perspective. The criteria are applied to EIA requirements in Canada (the Federal government and the ten provinces) in Appendix Tables

Table 22 - Integrating Sustainability into EIA Requirements

Principles and Priorities

- action -forcing
- explicit consideration of sustainability in purpose, principles and priorities
- adaptable to different activity and environment types
- mandatory consideration of need / opportunity and reasonable alternatives

Proposal Types

- broad range of public and private projects
- provision for small and multiple projects
- application to policies, programs, legislation, plans and activities or by parallel process

Definition of Environment and Effects

- comprehensive definition of environment (physical, biological, social, economic)
- comprehensive definition of effects (direct and indirect)
- explicit consideration of interactions among effects including cumulative effects
- explicit consideration of trans-boundary effects

Impact Management

- explicit consideration of mitigation and enhancement
- explicit consideration of monitoring, contingency measures and enforcement
- provision for monitoring among stakeholders and across projects

Public Involvement

- required public consultation program
- provision for conflict resolution
- provision for participant / intervention funding
- special provision for aboriginal people

Coordination and Integration

- provision for inter-jurisdictional planning and agreements
- provision for stakeholder forums
- provision for interdepartmental project committees
- provision for interdepartmental sustainability committees
- integration of EIA and ecological preservation and with areal, watershed, energy, transportation, communications, resource management and waste management planning

(Lawrence 1997a)

A-2 and A-3. A previous article by the writer (Lawrence 1997) also addressed the subject. Major conclusions stemming from these analyses are highlighted below.

The regulatory integration of sustainability and EIA should begin with the explicit integration of sustainability into EIA legislation, guidelines and institutional arrangements. The Canadian examples demonstrate the considerable potential for merging sustainability and EIA requirements. At the same time it is far from clear whether that potential will be realized. Results to date have been mixed and the commitment is already weakening in some instances. Promising initiatives include explicit consideration of sustainability principles, cumulative and trans-boundary effects, conflict resolution mechanisms, inter-jurisdictional planning, environmental auditing, and the involvement of native peoples. Preliminary, albeit halting, steps have been taken to establish an environmental policy and program framework for EIA, to more directly link areal planning and EIA and to span boundaries among agencies and between proponents and other stakeholders. These and other experiences should be monitored and compared.

A greater effort is required to ensure that need/opportunity and reasonable alternatives are considered, to apply EIA and related action-forcing mechanisms to policies, programs and technologies, to integrate project level monitoring requirements into broader environmental reporting mechanisms and to fit EIA within more comprehensive environmental management policies and strategies. The aim should not be the formulation of a single set of sustainability-based EIA requirements to apply to any and all proposal types and environmental settings. A diversity of approaches facilitates a more experimental approach to EIA regulation and permits adaptations to different classes of proposals and contextual characteristics. At the same time coordination, auditing of experiences and data and knowledge sharing are essential. Care should be taken to counterbalance any propensity toward unnecessary centralized planning and control.

Integrating Sustainability - Applied Level

Effectively integrating sustainability into the EIA planning process requires a sustainability perspective in each planning process activity (Beatley 1995b). This analysis is structured on the basis of the same EIA planning process activities described earlier in this chapter.

Approach

The EIA planning process should be formulated and executed within the context of other initiatives to build environmental and social concerns into public and private planning and decision-making. The planning process should be viewed from a holistic systems perspective (Manning 1990). An ecosystem approach is conducive to such a perspective. An ecosystem approach recognizes and includes the whole system, is based on natural units, focuses on interrelationships among system elements, views humans as an integral part of the system, recognizes the importance of all species to ecosystem integrity and incorporates concerns such as carrying capacity and resilience to avoid irreversible human damage to the natural environment (Sadler 1996).

Disciplinary and professional barriers (WCED 1987) should be transcended and geographic and temporal boundaries should be extended. The planning process should be anticipatory, prescriptive (Smith 1993) and consensus-based (Peat *et. al.* 1983). Planning process design and implementation should be adapted (Holling 1978) to the proposal type and to regional and local social, economic, environmental and institutional conditions.

Ends

Ends in the EIA planning process pertain to direction (e.g., intermediate objectives), destination (e.g., goals and end states) and procedures (e.g., planning process principles and objectives). The EIA planning process should be guided by sustainability goals and objectives and should be defined within sustainability limits. No net loss of natural capital is likely to be an overriding limit. The maintenance of the source and sink functions performed by natural systems will, therefore, be required (Sadler 1995). The establishment of safe minimum standards and a requirement for in-kind compensation (e.g., fish habitat loss for fish habitat loss) will, in turn, be necessary.

The EIA ends should be supportive of larger systems sustainability visions and goals, objectives and criteria (Smith 1993; Gibson 1992b). Likely priorities include linking the EIA planning process to global charge, climate change and biodiversity (Sadler 1996). Sustainability ends must be sufficiently precise to assess if and the extent to which those ends will be achieved by alternatives or by the proposed action (Wood 1995). Sustainability ends should focus on specific problems and opportunities and should reflect sustainability values. The ordering and weighting of goals and objectives should be consistent with regional sustainability imperatives. The satisfaction of essential needs and the regeneration of damaged and endangered natural systems and system components should be priorities. EIA ends should be sufficiently flexible to adapt to changing environmental conditions and priorities (Brown and Quiblier 1994).

Alternatives / Project Characteristics

There should be a conscious search for choices that further sustainability ends and are consistent with and supportive of sustainability initiatives by other parties. The broadest possible range of alternatives, including alternative sets of criteria, should be addressed (Gibson 1992b). Sectoral and regional assessments can facilitate the identification of such alternatives (Sadler 1995). The relationship of alternatives to systems patterns (e.g., Is the alternative precedent setting? Does it contribute to a negative pattern?) should be specified. The range of alternatives assessed should reflect the values and value differences among the various stakeholders in the EIA planning process, but all from an overall sustainability perspective and within safe minimum standards. A greater effort is also required to address preventative strategies and methods, appreciating that such methods are not the panacea that they are sometimes portrayed to be (Ochsner and Chess 1996). A particular effort should be made to identify the best practical environmental option (Sadler 1995). Differences among alternatives in their contribution to sustainability ends should be specified.

Research

The EIA planning process should draw upon other experiences in applying sustainability principles and imperatives. EIA practice should extend, apply and adapt sustainability frameworks, principles and imperatives. The EIA planning process is an opportunity to enhance the sustainability knowledge base (Meadows, Meadows and Randers 1992). EIA professionals should share their knowledge with other environmental professionals and other stakeholders in the environmental movement.

Baseline Conditions

EIA professionals should focus on the consistency of environmental conditions and intrusions with sustainability principles. Valued ecosystem components should be identified (Shoemaker 1994). Ecologic, social and economic carrying capacities should be considered (Gardner 1989). Key interrelationships within and among natural, economic and social systems should be identified. Functions, processes and linkages bearing on systems sustainability should receive particular attention. Ecological and social indicators can help to characterize baseline conditions. Examples of possible criteria and indicators of environmental sustainability indicators include greenhouse gases, acidification, toxic substances, source and sink functions and biodiversity (Sadler 1995). A dynamic characterization of baseline environmental conditions is needed. This entails assessing historical trends and cycles and extending the description of environmental conditions into the future (e.g., future generations).

Impact Analysis

Impact identification and prediction should begin with impact hypothesis statements (Gardner 1989). The magnitude, geographic extent, frequency, duration and degree of reversibility of potential environmental consequences should be characterized. Rigorous estimation methods (e.g., modelling, simulation, expert panels) should be used, augmented by field monitoring, sensitivity analyses and iterative reassessment and readjustment (Resendiz-Nunez 1992). Such sustainability concerns as the substitution of non-renewable resources, the efficient use of renewable resources, biological and genetic diversity, energy efficiency, waste minimization and the potential for the degradation of environmental quality should be explicitly considered. Potential links to ecological thresholds and carrying capacities, the potential for indirect and cumulative effects, trans-boundary implications (Saylor and McCloud 1994) and ecosystem risk should receive particular attention.

Interpretation

Whether sustainability is fostered or inhibited should be explicitly addressed. Impact significance interpretations should assess whether the proposed action threatens ecological limits (e.g., source and sink capacities), biological diversity, essential needs or sustainable resource use (Sadler 1996). The potential to induce cumulative effects, to exceed greenhouse gas emission target indicators, to adversely affect systems sustainability and resilience and to reduce social equity should be considered. The values of those most likely to be affected should be thoroughly assessed.

Mitigation and Enhancement

The EIA planning process should focus on measures to reduce pressures on ecological limits by enhancing key processes and functions and by restoring damaged and degraded ecosystems (i.e., sustainable redevelopment).

Other priorities include avoiding the depletion of resources, minimizing effects on the most vulnerable, avoiding situations where future generational options are foreclosed, maintaining biodiversity, adhering to safe minimum standards, providing in-kind compensation and ensuring no net loss occurs in natural capital (Sadler 1995, 1996).

Synthesis

Frameworks and models that further an understanding of potential threats to the sustainability of social, economic and ecological systems (and their interrelationships) should be used. Ecological, social and economic perspectives, frameworks and strategies should be progressively linked and, where practical, harmonized. The implications of conflicting perspectives, values and interests and the barriers to integration should also be acknowledged. Integration within the EIA planning process should be placed within broader environmental management frameworks. Regional assessments can be especially helpful in clarifying cumulative effects (Sadler 1995).

Evaluation

Evaluation screens and compares alternatives and assesses the proposed action. Actions that exceed ecological thresholds or safe minimum standards, sacrifice essential needs, reduce biological and genetic diversity and consume resources beyond natural growth and regeneration rates should be excluded. Differences among alternatives and between proposed actions and baseline conditions regarding pressures on ecological limits and assimilative capacities, future options maintained or precluded, effects on the most vulnerable environmental components, resource productivity, ecological diversity, impact management uncertainties, irreversible environmental effects and risks and potential cumulative effects should be assessed (Milbraith 1989; Resendiz-Nunez 1992; Sadler 1995). Sustainability criteria should generally give preference to choices that are less likely to fail, that protect and enhance the integrity, resilience and adaptability of socio-ecological systems and that are resilient in the face of surprises and changing conditions (Gibson 1992b). Alternatives and proposed impacts should also be evaluated against sustainability policies and objectives established in SEA and within broader sustainability strategies, goals, objectives and policies (Sadler 1995).

Impact Management

Impact management includes mitigation, compensation, monitoring and involvement measures. Cost-effective measures should be used to prevent serious environmental degradation even where there is scientific uncertainty (i.e., the precautionary principle). Environmental liabilities (i.e., the user-pay principle) should be defined and victims compensated. Key environmental components and sources of potential impacts should be monitored, with explicit consideration of resiliency and contingency planning (Brooks 1992). Monitoring should permit the integration of individual activity monitoring within broader monitoring systems (e.g., regional environmental accounting, trans-boundary monitoring of cumulative effects). Geographic information systems (GIS) can facilitate the integration of monitoring and impact management systems (Smith 1993). Monitoring indicators should be suitable for integration within larger scale "state of the environment" reporting (Government of Canada 1991). Opportunities for ecological rehabilitation of the natural environment and renewable resources should be identified (Gardner 1989). Individual impact management measures should be integrated into an overall impact management strategy. The EIA impact management strategy should be linked to broad impact management frameworks and strategies including environmental quality control and enforcement mechanisms.

Approvals

The involvement of interested and affected parties in judicial and administrative procedures and, in turn, in implementation (UN 1992) should be facilitated. Planning and management authority should be delegated to the level of public authority most conducive to public involvement and to the sharing of planning and decision-making authority. Links to higher decision-making levels must still be maintained if trans-boundary and inter-jurisdictional sustainability concerns are to be adequately addressed.

Documentation

EIA documents should provide a traceable record of how sustainability is incorporated into the EIA planning process. Documents and data should be understandable to and suitable for use by stakeholders, peers and other parties in comparable situations. Document and data formats should be suitable for integration within broader environmental management strategies. Documents and data should be broadly distributed, consistent with the objective of enhancing the sustainability knowledge base.

Communications

EIA communications should focus on sustainability objectives, differences and implications. Trans-boundary concerns should be carefully scrutinized. Communications among stakeholders (especially for the most vulnerable groups) and the sharing of sustainability knowledge (especially for developing countries) should be priorities. The establishment and use of EIA networks could greatly enhance the transfer of information and knowledge among environmental professionals (Shillington and LeBlanc 1995).

Involvement

Early and on-going stakeholder involvement in the EIA planning process is essential (Smith 1993). It is especially important to encourage the direct participation of representatives from a variety of critical perspectives in alternatives generation and evaluation and in criteria and scenario formulation and refinement (Gibson 1992b). Consensus building and conflict resolution should be facilitated through a diverse array of public consultation methods. The EIA planning process, as a sustainability instrument, can contribute to local organization, participation and democracy (i.e., the EIA planning process as a creative experiment to empower communities) (Sadler and Jacobs 1990). Involvement also extends to the inclusion of the scientific community, non-government organizations and the private sector. Groups and organizations with a broader perspective should be included in the planning process. Care should be taken to ensure that public concerns and suggestions are explicitly identified and addressed in the process and in documentation .

Summary and Conclusions

Major areas addressed for redesigning the EIA planning process include an activity-oriented approach to process design, a more systematic approach to process design at the regulatory level, procedures that balance the need to adapt to context against the need to span boundaries and the integration of sustainability and the EIA planning process at both the regulatory and applied levels.

The analysis of EIA activities suggests that the EIA planning process is more properly viewed as a succession of progressively more refined probes into a decision space. Each probe in this cyclical analysis is more focused with a concomitant increase in detail. Each cycle is also composed of overlapping and interacting activities and tasks. The overall process is open and iterative.

The review of EIA planning process design at the regulatory and applied levels suggests that there is sufficient experience and expertise to identify design principles (Lawrence 1992c). These principles can address core minimal requirements, preferred orientation shifts, ideals to aim for (in a performance standards sense) and areas where adjustments could be made to suit different proposal types and environmental conditions. An ongoing dialogue between the regulatory and applied levels is essential.

The review of the relationships between the EIA planning process and context suggest that differences, and the implications of differences, among environment, proposal, proponent, public and setting types should be respected. This suggests the need for both generic guidelines for each contextual category, and individuals adjustments, at both the regulatory and applied levels, to reflect unique circumstances. Consideration should also be given to frameworks for transcending categorical differences.

The analysis of the regulatory integration of sustainability and the EIA planning process demonstrates the potential to integrate sustainability concerns into EIA requirements. It also illustrates that experience has been mixed, that there are promising initiatives, that much has yet to be addressed and that the resistance to change will likely be considerable. A particular priority is fitting EIA and other forms of environmental management within broader sustainability frameworks.

The applied integration of sustainability and EIA requires the explicit consideration of sustainability concerns in each activity in the EIA planning process. The potential scope and thrust of such efforts is increasingly evident. The true test will be how and to what extent sustainability principles, imperatives and instruments can be incorporated into EIA methods and practices. Procedures for integrating sustainability into EIA practice will necessarily be selective. Ends, means and linkages, essential to the sustainability of the pertinent social, economic and natural systems and relevant to the proposed actions, must be the focus. An experimental approach of testing, assessing and sharing various procedures for introducing sustainability into EIA practice will be required. This process is likely to proceed more rapidly if lessons learned in parallel efforts to incorporate sustainability into other forms of environmental management are reviewed and assessed. Concomitantly, environmental professionals incorporating sustainability into the EIA planning process should share their experiences and knowledge with others in related fields.

This review of the overall EIA planning process lays the groundwork for the more focused analysis provided in Chapters 7 to 9.

Endnotes

[1]Tiering refers to the concept of a "multi-tiered" approach to preparing EIAs. The first tier covers general issues with a program orientation. Subsequent levels incorporate, by reference, the general discussions from the broader document, while focusing on issues specific to the being evaluated (Bass and Herson 1993, 79-80).

[2]Transdisciplinarity signifies the interconnectedness of all aspects of reality, transcending the dynamics of a dialectical synthesis to grasp the total dynamics of reality as a whole (Klein 1990, 66).

REFINING ANALYSIS AND SYNTHESIS ACTIVITIES

Introduction

This chapter selectively reviews analysis and synthesis activities within the EIA planning process. The activities considered include; screening and scoping, baseline and impact analysis, interpretations of significance, cumulative effects assessment (CEA) and environmental management. The rationale for the choice of activities is provided in Chapter 1. The analysis of cea is partially based on a previously published article by the writer (Lawrence 1994b). The review of themes within these areas provides the basis for criteria that are then applied to Canadian EIA guidelines (both generic and proposal specific) and to ten EIA examples.

The EIA planning process activities, encompassed by this analysis, have not been as well addressed in EIA practice as would be hoped. A recent survey of EIA practitioners (324 responses) is instructive (Sadler 1995). Baseline analysis and impact identification appear the most fully developed and effectively performed activities. Only 36% of respondents rated including a full range of considerations as marginally successful or unsuccessful. Natural environmental considerations were rated as having greater decision-making influence than social environmental considerations (68% versus 42% very or moderately successful). Impact predictions, although receiving considerable attention in EIA literature, remain less successful than would be preferred. Only 33% of respondents indicated that EIAs were very successful or moderately successful in making precise, verifiable predictions. Only 22% of the respondents gave impact prediction an excellent or good effectiveness rating. Screening and scoping activities fared somewhat better but there was still considerable room for improvement - 25% (screening) and 31% (scoping) poor and very poor ratings. The determination of impact significance also received low ratings - 62% marginally successful or unsuccessful. Given the greater attention devoted to screening, scoping and significance interpretations in EIA requirements in the United States those activities would likely be less effective in EIA practice in Canada. The same study identifies health and risk issues and cumulative effects as major EIA trends (Sadler 1995). Although these subjects have received considerable attention in EIA literature, largely in the last decade, it could be expected that application in practice has been more sporadic.

Screening and Scoping

The terms screening and scoping are not always used with great precision in the EIA planning process. Most commonly screening refers to the determination of which actions will be subject to EIA requirements and / or what form of environmental review (e.g., a full or partial review) will be undertaken (Wiesner 1995; Wood 1995; CEAA 1994). Definitions of scoping are more variable. Defined most broadly scoping is a process for identifying, evaluating, organizing and focusing the consideration of issues, alternatives, aspects of the environment, mitigation measures, participants and interrelationships in the EIA planning process, in documentation and in the government review and approval process (Ross 1987; Wolfe 1987; Marshall and Wolfe 1985; Erickson 1994; Wood 1995; Sadler 1996). Both screening and scoping involve judgements of significance (addressed later in this chapter), should commence early in the planning process and should make ample provision for technical and non-technical involvement (Wolfe 1987; Erickson 1994).

Screening distinctions are necessary with any EIA requirements. What occurs more gradually, if at all, is the formulation and application of detailed screening criteria and guidelines. The basis for screening decisions should be defined in advance rather than in response to individual applications (i.e., an anticipatory rather than a reactive approach). Scoping received very little attention in the early years of EIA regulatory requirements (Wolfe 1987). The need for scoping became increasingly evident (Kennedy and Ross 1992) and was formerly recognized when the Council on Environmental Quality (CEQ) in the United States issued scoping guidelines in 1978 and 1981 (Wolfe 1987). The formalization of scoping, as an intrinsic element of EIA practice in Canada, is less widespread and has taken more time. Scoping can more readily be applied in EIA now because of a greater integration of the EIA planning process into project design, improved technical capabilities, knowledge and methods, a greater emphasis on public participation, mitigation and monitoring at the expense of data collection, and an increased acceptance by EIA participants of the need for scoping (Kennedy and Ross 1992).

The need to screen proposals is not a subject of much debate. Of greater controversy is whether proposals are screened arbitrarily, often on the basis of political influence. Many potential advantages have been attributed to scoping. Scoping may contribute to more rigorous and more structured methods and procedures (Wolfe 1987; Beanlands 1985). Potential problem areas may be identified earlier in the planning process (CEQ 1981). Key problems could be identified and addressed in greater depth (Wolfe 1987; Kennedy and Ross 1992; CEQ 1981, 1983; Wood 1995). Irrelevant and insignificant issues may be eliminated (Wolfe 1987) and issues of limited significance could receive less attention (CEQ 1981, 1983). Study boundaries (temporal, spatial, administrative, ecological) may be identified earlier and with greater precision (Glasson 1995; Beanlands and Duinker 1983). Stakeholders could be identified, brought together and involved in key areas of judgement earlier and throughout the planning process (CEQ 1981; Glasson 1995; Wolfe 1987). Resources and research could be focused on key issues rather than wasted on insignificant issues (Wolfe 1987; Erickson 1994). EIA documents may be more understandable, succinct, focused and thorough (Wolfe 1987; Kennedy and Ross 1992; CEQ 1981, 1983). Scoping can facilitate decision-making by the public and by officials (Wolfe 1987). It could contribute to greater inter-agency coordination, to diminished conflicts and delays, to less frequent legal challenges and, on occasion, to the resolution of conflicts (Wolfe 1987; CEQ 1981, 1983). All of these ascribed advantages will not necessarily be realized or realized to their full potential. There is also the potential, if scoping is poorly executed, that potentially significant alternatives, effects and impact management measures may not be addressed, may be prematurely rejected or may be inadequately considered (Erickson 1994).

Sufficient experience has been acquired with screening and scoping to identify a range of ground rules for enhanced practice. A successful approach starts with a commitment to identify and to address issues in a systematic and explicit manner (Sachs and Clark 1980). A screening and scoping plan should be formulated, technical and public issues should be solicited, listed and grouped and a strategy should be formulated for addressing each issue, for communicating with agencies and the public and for documenting the scoping process (Wolfe 1987; Ministry for the Environment 1992; CEQ 1981). All value judgments should be substantiated (Wolfe 1987). Clear and specific generic and proposal-specific guidelines and criteria are essential (Wolfe 1987; Wood 1995). Screening and scoping requirements and approaches need to be designed and adapted for each proposal (CEQ 1981). A flexible approach that anticipates and responds to issues as they emerge is also necessary (Sachs and Clark 1980; CEQ 1981). Preliminary field investigations, an overview of primary and secondary data sources and provisions for local involvement can greatly facilitate early issue identification and refinement (Mygatt 1984; CEQ 1981). Particular care needs to be taken to identify major linkages among potential direct and indirect impacts (Beanlands and Duinker 1983). A precautionary approach in addressing areas of uncertainty is essential. This entails conservative assumptions and the retention of alternatives and effects where there is significant uncertainty.

Screening and scoping should be an open multi-stakeholder process (CEQ 1981; Bass and Herson 1993; Wood 1995; Sadler 1996). A full range of environmental disciplines needs to be involved (Erickson 1994). Early and on-going public involvement in the determination of issues, in the provision of local knowledge and experience and in the establishment of priorities is crucial (Wolfe 1987; Mygatt 1984; Wood 1995; Erickson 1994). There should be a clear and accessible public record of the screening and scoping process, traceable links from public concerns to the basis for decision-making and a right of appeal to screening and scoping decisions (Wood 1995). Agency involvement is equally important. Proponents need to maintain close contact with the responsible environmental authority, agencies whose jurisdiction or interest might be affected need to be contacted to identify issues and particular care needs to be taken to anticipate and address regulatory standards, policies and positions (Erickson 1994; Bass and Herson 1993; Wood 1995).

The role of screening and scoping in the EIA planning process is not as obvious as would first appear. Screening must be instigated at the outset of the process because screening determines what EIA requirements, if any, will be applied (CEAA 1994). However, a proposal could potentially proceed part way through one approval process, unanticipated issues and potential impacts could be identified, and it may become necessary to shift the proposal to another approval stream. Such potential circumstances demonstrate the importance of well defined and substantiated screening criteria and thresholds, an adaptable EIA planning process and an appeal procedures for screening decisions.

As is evident from Figure 5 (in Chapter 2), scoping tends to be viewed as a stage, undertaken near the outset of the planning process, that defines and focuses the process (Erickson 1994). Although this is, in part, the case scoping can more broadly be viewed as a tool for scanning (increasing variety), focusing (reducing variety) organizing and communicating both the overall EIA planning process and each activity within the process (Wolfe 1987). With each EIA activity a range of issues must be identified, priorities must be established and an appropriate response determined. In each case a multi-stakeholder (agency and public) approach is necessary. This iterative procedure broadens and then focuses the agenda for attention and action. It can be applied to planning process design (CEQ 1981; Weisner 1995), project management (Erickson 1994), study design (Wolfe 1987), boundary determination (Beanlands and Duinker 1983), the identification of reasonable alternatives (Wiesner 1995; CEQ 1981), the selection of proposal characteristics (e.g., as potential sources of impact) (Kennedy and Ross 1982), environmental analysis (e.g., social and ecological scoping) (Beanlands and Duinker 1983), the identification of potential and significant impacts (Wood 1995; CEAA 1994; Beanlands and Duinker 1983) and the determination of an appropriate range of mitigation and monitoring measures (Kennedy and Ross 1992).

Screening and scoping also apply to documentation. Screening and scoping can determine the content, the length (e.g., page limits) and the level of detail of EIA documents (CEQ 1981; Bass and Herson 1993). Links to other documents (e.g., incorporation by reference), the choice of language (e.g., plain language, definitions for technical and scientific terms), the degree of rigour (e.g., sound methods, succinct analysis rather than encyclopaedic descriptions) and the rationale provided for findings and conclusions (e.g., no post hoc rationalizations) can all be shaped and influenced through screening and scoping procedures (Bass and Herson 1993).

Screening generally takes the form of an administrative institutional procedure. Legislation and regulations define how proposals are to be screened. Regulations and/or guidelines tend to be used to define the criteria and thresholds for inclusion or exclusion and to identify the criteria to be applied in assessing if the status of a proposal should be reconsidered. There tends to be a heavy demand for well defined ground rules. Still there will be instances (e.g., highly significant or sensitive environments, precedents for other actions) where a small proposed action can potentially trigger severe environmental impacts. Not all such special situations can be anticipated in generic criteria or guidelines. A further issue, generally inherent to screening procedures, is the degree of discretion that proponent agencies (in contrast to the environmental authority that administers the legislation) should have in determining whether a proposed action should or should not be subject to any or all EIA requirements (Wood 1995). The institutional arrangements associated with screening encompass the structures and procedures established both within proponent agencies and within the environmental regulatory authority. These structures and procedures are necessary to ensure that screening reports are properly prepared and reviewed and to consider appeals against screening decisions.

Scoping can be extended to the approval process through the identification of environmental review and consultation requirements necessary for proposal approval (Wolfe 1987). Generic and action-specific scoping guidelines and institutional arrangements are necessary for overseeing scoping and the appeal of scoping decisions (Wood 1995). Scoping guidelines and procedures can establish time limits, explicit review criteria (e.g., comments restricted to agency's mandate) and limits on what is circulated (e.g., summary documents only to certain agencies) and which stakeholders will receive it (e.g., partial circulation for particular for particular proposal types and settings). The agency review process can also be facilitated through agency and public scoping meetings, the designation of expeditors, the use of agency core groups and task forces and fast tracking procedures in the event of favourable findings (CEQ 1981, 1983; Bass and Herson 1993; Marshall *et. al.* 1985). Administrative and judicial tribunals, charged with making recommendations or decisions regarding EIA applications, can participate in the scoping process by clarifying and refining issues to be addressed in the interrogatory process, requiring intervenors to combine their cases and facilitating the use of mediators and other conflict resolution mechanisms to identify areas of consensus and to resolve areas of dispute.

Baseline and Impact Analysis

Baseline and impact analysis are concerned with the identification and prediction of environmental condition changes, with and without a proposed action or actions. It is the most heavily trodden ground in EIA literature, although, as pointed out in the introduction, EIA practice continues to lag well behind theory. In view of the attention already devoted to baseline and impact analysis in EIA literature, this overview focuses on major themes and lessons. A particular focus is the treatment of risk and uncertainty in EIA. A relatively recent development in EIA theory and practice has been the increasing overlap and merging of EIA with the related field of risk assessment.

Baseline Conditions Analysis

The identification and prediction of environmental conditions without the proposed action has been plagued by two problems in EIA practice - superficiality and encyclopaedic, unfocused descriptions. Structure and focus is critical in baseline analysis. Methods should be defined at the outset, with a clear rationale for each element. Provision should also be made for adjustments and refinements to methods through the course of the EIA planning process. A broad environmental context needs to be established. This requires clear and substantiated temporal, spatial, administrative and ecological boundaries (Beanlands and Duinker 1983; Jain, Urban and Stacey 1977). Baseline analysis does not mean simply describing existing conditions. Historical trends and conditions need to be assessed in order to identify patterns and natural variability limits (Wiesner 1995; Jain, Urban and Stacey 1977; Beanlands 1985; Westman 1985). Depictions of historical environmental conditions provide the basis for predictions of future environmental conditions - predictions that parallel the time horizons associated with the proposed action. The analysis of baseline conditions is also the foundation for monitoring (Wiesner 1995).

The baseline conditions analysis needs to be focused (i.e., not just data for data's sake) (Hyman *et. al.* 1988; Smith 1993). Environmental data need to be in a form suitable for incorporation into a causality chain (often addressed through conceptual and quantitative models), directly and indirectly linking the proposed action to the environment (Jeltes 1991; Beanlands 1985; Westman 1985; Beanlands and Duinker 1983). Some components of the environment are more significant and more vulnerable to change that others. Sensitive and significant components of the environment (e.g., valued ecosystem components - VECs, valued socio-economic components - VSCs) and critical interrelationships should be identified and highlighted (Beanlands and Duinker 1983; Westman 1985). Carefully considering agency and public requirements, concerns, preferences and knowledge can contribute to more focused and effective baseline data collection and analysis (Ginger and Mohai 1993; Erickson 1994). A range of data sources is desirable. Sources should be referenced and the strengths and limitations of each source should be identified and considered (Dickman 1989; Ellis 1989). Data gaps and limitations should be indicated as should strategies for addressing limitations.

1989; Ellis 1989). Data gaps and limitations should be indicated as should strategies for addressing limitations. Particular care should be taken to avoid systematic biases in data collection procedures (Culhane, Friesema and Beecher 1987).

Impact Prediction - Rigour and Relevance

Loosely structured procedures have historically been employed to identify, predict (where deemed practical) and reduce potential adverse environmental consequences. This has led to a demand for a more scientific approach. Impact prediction, it is argued, should be treated as an interdisciplinary-interprofessional investigation or pre-project experiment rather than as the documentation of impacts (Treweek 1995; Duinker 1985). Potential impacts should be treated as hypotheses to be tested and verified through monitoring (Beanlands and Duinker 1983; Duinker 1985; Treweek 1995). Ideally impact predictions should be verified through a post-audit analysis of the effectiveness of predictions and mitigation measures and complemented (a comparative diachronic study) by analyses of from historical to present and comparable actions and control (from the present to the future)of environments and communities (Beanlands and Duinker 1983; Burdge and Johnson 1977; Burdge 1994; Culhane, Friesema and Beecher 1987). Other elements of a more scientific approach to impact prediction include: the explicit identification and substantiation of both overall study design and individual study methods; the careful definition of temporal and spatial boundaries; the rapid construction of a model(s) of the impacted system suitable for testing alternative hypotheses; the rigorous use of experimentation, pilot projects and case studies; a sensitivity to the potential for reification (confusing models with reality); the peer review of methods and of scientific and technical quality; and the differentiation and consideration of internal validity (how well methods and indicators designed and executed), reliability (external validity - consistency of findings across different random samples), changes in measurement procedures and system bias (non-random distribution) (Jeltes and Hermans 1990; Canter 1983; Valiela 1984; Hyman *et. al.* 1988; Hart, Enk and Hornick 1984).

The quest for a more scientific approach to impact prediction, although raising many valid points, needs to be tempered. As noted in Chapter 3, impact assessment must operate within legitimate temporal and resource-based decision-making constraints. The problems faced in the EIA planning process are decidedly different from those encountered in the laboratory. The distinction between analytical and holistic science is instructive (Miller 1993). Analytical science addresses tightly circumscribed problems with well defined and proven methods. Holistic science address complex, messy problems, where little is known. Holistic sciences emphasizes intuition, judgment and imagination (Miller 1993).

The ideal of objective, value-free science and, therefore, impact prediction is questionable. Science, and, to a greater extent, impact assessment are inherently normative (Lee, Haworth and Brunk 1995). Subjective judgments must be made at every juncture of the impact assessment process. Values, attitudes and perceptions will strongly influence the interpretation of findings (Lee, Haworth and Brunk 1995). The tempering of the demands for rigour with the need for relevance points to the need to devote particular attention to adequate problem definition; recognize varying historical, social, economic and political dimensions and perspectives; define and provide a rationale for each impact considered; justify all judgments; provide for ample public and agency consultation; and identify prediction constraints and their associated implications (Julien 1995; Miller 1993; Lee, Haworth and Brunk 1995; Ellison 1988).

Impact predictions in the EIA planning process will not always involve the projection of past trends, assuming the continuing operation of historical cause-effect relations (Westman 1985). In complex environments it is possible, even likely, that historical conditions will not persist in a readily predictable manner. Predictions, in such cases, are on the basis of inference (Westman 1985). It is helpful to distinguish among probable (based on extrapolation), possible (range of values), plausible (practical or realistic) and preferable (normative - desired) future conditions (Vlachos 1977). Predictions should also be characterized. Examples of useful distinctions include magnitude (level of effect impinging on the environment), spatial distribution, temporal distribution (duration and frequency), directness, probability and uncertainty (Bisset 1984; Julien 1995; Culhane, Friesema and Beecher 1987).

Biophysical Impact Predictions

Biophysical and socioeconomic environmental impact analyses are not undertaken in exactly the same manner. Biophysical impact predictions draw upon the ecological sciences (Treweek 1995). An ecological context (structural components, functional relationships) needs to be established (Beanlands and Duinker 1983; Treweek 1995).

Sensitivity to change, sources of stress, resilience - recovery processes and key ends points or leverage indicators should be identified (Cairns and Niederlehner 1993; Alberti and Parker 1991). A particular focus should be the identification of valued ecosystem components (VECs) and key biological processes, using well defined and consistently applied criteria (Cairns and Niederlehner 1993; Treweek 1995; Duinker 1985). A critical task is the determination of the biological level (e.g., organism, species, communities, populations) at which the VECs occur and the level at which possible perturbations are likely to occur (Beanlands and Duinker 1983). It has been argued that changes can be predicted more accurately at the level of individual organisms and local ecosystems (Beanlands 1985). Care should be taken to identify and address abiotic - biotic interactions and biophysical - socioeconomic interactions (Erickson 1994).

Socioeconomic Impact Prediction

Social and economic impact assessment impact predictions draw upon the social sciences. The application of social science knowledge and theory for impact prediction purposes can be problematic. The social sciences are characterized by a plurality of vaguely defined, partially overlapping and competing concepts and paradigms (Burdge 1994). There are differing practitioner perspectives (e.g., technical, political), varying models of society (e.g., functional-ecological and systems theory, conflict theory, exchange theory), and conflicting views on the appropriate basis for knowledge development (epistemology) and application (e.g., research, adversarial, collaborative) (Halstead *et. al.* 1984; Lang and Armour 1981).

The plurality of conflicting, and ultimately irreconcilable, perspectives evident in the social sciences is mirrored within communities and within society at large. Different actors, with different perspectives and value sets, will have varying perceptions of proposed actions and their associated impacts (Wilson 1981). Social reality is more than complex; it is socially constructed on the basis of, often shifting, perceptions, values and attitudes (Burdge 1994). Thus social impacts begin with the proposal announcement, can be significantly altered (in either a positive or negative direction) by shifts in perceptions and attitudes, and can vary appreciably by individual, group and community (Torgerson 1981). Interactions among individuals, among groups and among individuals, groups and institutions can further complicate the basis for impact identification and prediction (Wilson 1981). Consideration must be given to interactions between the natural and socio-economic environments, between the social and economic environments, between the human and built environments and between the socioeconomic environment and formal and informal political systems.

Not surprisingly, it can be extremely difficult to predict or control the future of social and economic systems or to differentiate between changes with or without a proposed action (Burdge 1994; Canter 1983). Allowance should be made for a multitude of societal futures. Many social and economic factors, at several levels of analysis, should be considered (Wilson 1981). Examples include cultural context, population characteristics, personal, interpersonal, group and community characteristics, social and political systems, institutional arrangements and community structures and resources (Erickson 1994; Interorganizational Committee 1994; Finsterbusch 1980; Burdge 1994) [1]. Areas of conflict and social, economic and political inequities are especially important (Burdge 1994; Interorganizational Committee 1994; Wismer 1996b). Community consultation is crucial (Burdge 1994). The construction of a sound community profile is essential (Lang and Armour 1981; Wildman 1990). Qualitative data are often as important as quantitative data (i.e., focus on issues that matter rather than those that are easily measured) (Burdge 1994). Care should be taken to avoid a technocratic, authoritarian planning approach.

<u>*Uncertainty in Impact Prediction*</u>

Uncertainty occurs in the EIA planning process when the nature of an outcome or its probability is unknown (Hyman *et.al.* 1988; Westman 1985; Culhane, Friesema and Beecher 1987). Inasmuch as EIA is largely anticipatory and the future can never be predicted with absolute precision, uncertainty is inherent to the EIA planning process. Examples of sources of uncertainty in the EIA planning process include: the lack of theory or explanatory paradigms (Carpenter 1995a); scientific uncertainty (lack of information, knowledge or scientific agreement regarding cause-effect relationships) (Carpenter 1995a; Westman 1985; Costanza, Funtowiez and Ravetz 1992; Brown and Treissman 1994; Mostert 1996); inevitable differences between proposed actions/potentially affected environments [2] and control communities/environments/proposals (Carpenter 1995a); partial and suspect monitoring of historical and comparable impacts (Carpenter 1995); experimental design control and replication limits (measurement uncertainty) (Carpenter 1995a; Brown and Treissman 1994); data measurement errors (Costanza, Funtowiez and Ravetz 1992); descriptive uncertainty (i.e., knowledge limits regarding what parameters and interrelationships define the system) (Brown and Triessman 1994); methodological uncertainty (i.e., different methods often yield different results) (Mostert 1996); intervening variables (Carpenter 1995a; Constanza, Funtowiez and Ravetz 1992; Brown and Treissman 1994) and novelty in technology, materials or siting (Carpenter 1995a). There may also be uncertainties associated with the phasing of the EIA planning process (i.e., important decisions regarding EIA scope made on basis of incomplete information) (Mostert 1996), future socioeconomic developments and policy (Mostert 1996), analytical procedures (i.e., models do not completely correspond to reality) (Carpenter 1995a; Brown and Treissman 1994); and resource and timing constraints.

Uncertainties occur with every EIA activity (Mostert 1996). There are uncertainties in problem definition (Fischoff *et. al.* 1981), in proposed actions (e.g., residuals to be generated, land and resources to be consumed) (Hyman *et. al.* 1988), in the pathways from proposed actions to the environment, in environmental conditions (historical, current and likely future ecological, social and economic conditions) (Grima *et.al.* 1986), in the valuation of environmental components and impacts (Hyman *et. al.* 1988; Grima *et.al.* 1986), in the screening and comparison of alternatives and in the monitoring (what, where and how) of proposed actions, environmental conditions and potential impacts (Whyte and Burton 1980).

Uncertainty should be addressed throughout the EIA planning process (Dickman 1991). One-time pre-impact studies provide little chance of contributing useful and reliable predictions (Valiela 1984). Monitoring is essential. Post audit effectiveness analysis and the thoughtful application of comparative and control analyses (comparative diachronic studies) are highly desirable (Burdge 1994). Care should be taken to identify and characterize uncertainty sources and types (Valiela 1984; Mostert 1996). The aspects of the analysis that are most uncertain and most likely to affect decision-making should be identified (Reckhow 1994). Uncertainty should be bounded (Canter 1993a), recognizing that uncertainty tends to be greater with long time horizons, broad geographic areas and higher levels of biological and social organization (Beanlands and Duinker 1983). Prudent strategies, under conditions of uncertainty, include hedging away from large losses (e.g., with the use of decision analysis), conservative assumptions and safety margins, the use of sensitivity analyses to test alternative assumptions, the possible use of game theory (when probabilities are unknown, possible outcomes are uncertain and behaviour tends to be risk aversive) and a focus on aspects of the environment that are most vulnerable to change (Hyman *et. al.* 1988). Care should be taken to ensure that subjective choices are explicit, governing norms, values and interests are identified and substantiated and all potentially affected parties are involved in addressing uncertainty and in contributing to subjective decisions (Mostert 1996).

The communication of uncertainty is especially important, in view of the pivotal role of perception in the determination of social impacts. Examples of ground rules for the communication of uncertainty, as identified by Canter (Canter 1993a), include: making clear not all data are equally uncertain; saying what is uncertain; saying what you have done to redress uncertainties and what else you will be doing; if there are small, difficult to reduce, remaining uncertainties, saying so; explaining cautiousness; not hiding behind uncertainties; acknowledging and apologizing if you are not responding as rapidly as you should be; and never saying there is no evidence if you haven't tested the possibility.

Risk in Impact Prediction

Risk, as noted in Chapter 3, is an important characteristic of the EIA planning process. Risk refers to a known probability that a particular outcome will occur (Hyman *et. al.* 1987). Risk, as used in the EIA planning process, generally pertains to hazards or dangers with adverse probabilistic consequences for the human or natural environments (Whyte and Burton 1980; Erickson 1994). Risk assessment (RA), a related field to EIA, identifies and estimates risk (Wiesner 1995). Risk management is an umbrella term that encompasses risk analysis or assessment, risk evaluation (the determination of the importance of risk), risk mitigation and monitoring measures (Carpenter 1995b; Erickson 1994; Grima *et. al.* 1986; Wiesner 1995). EIA and RA, although clearly related, have evolved along largely separate paths. Those paths began to intersect when risk assessment was used as a tool in EIA to address human health (and more recently ecological risk) risk concerns. RA in the EIA planning process has served to supplement assessments against regulatory standards and guidelines and to extend qualitative evaluations of health and safety concerns. The application of RA in the EIA planning process has been largely confined to large, controversial (high levels of risk as perceived by the public) projects, usually involving nuclear materials and hazardous chemicals and wastes (Carpenter 1995b). RA offers much more to EIA than a useful quantitative procedure for assessing a narrow range of specific human health and ecological risk concerns. Risk, in common with uncertainty, is a perspective, that should imbue each activity in the EIA planning process.

The risk assessment process identifies hazards (conditions of exposure), estimates risk (dose-damage assessment, exposure assessment, risk characterization, uncertainty analysis), evaluates (comparative risk, risk acceptability) (Erickson 1994; Carpenter 1995b; Wiesner 1995; Grima *et. al.* 1986; Stackelburg and Burmaster 1995; Hyman *et. al.* 1988; Smith 1993; Lowrence 1976; Whyte and Burton 1980) and manages risk (Carpenter 1995b). Table 23 highlights insights and lessons from RA of potential application in the EIA planning process.

Interpretations of Significance

The question of when a proposed action, a component of the environment or a potential impact is significant is not a new one in EIA theory or practice. Significance has to be assessed if a determination is to made regarding what actions are or are not to be subject to EIA requirements (i.e., screening). In the United States, under the National Environmental Policy Act (NEPA), this involved distinguishing between categorical and non-categorical exclusions (Rau and Wooten 1980). Under NEPA requirements a further distinction has to be made between federal actions that have or do not have the potential to significantly affect the human environment (FONSI - finding of no significant impact) (Canter and Canty 1993; Burchell and Listokin 1975; Rau and Wooten 1980). An Environmental Impact Statement (EIS), a comprehensive analysis of impacts and alternatives, is necessary when potentially significant impacts are identified. An environmental assessment (EA), a much briefer document and a much less time-consuming and costly procedure, is required when there is a finding of no significant impact. Not surprisingly, the issue of when impacts are

Table 23 - Lessons and Insights from Risk Assessment and Management for the EIA Planning Process

- a broader definition of environmental effects to consider human health and ecological risks (Arquaiga, Canter and Nelson 1992; Smith 1993; Rabl and Peuporter 1995)
- the integration of a risk perspective and risk principles into the planning process (Erickson 1994; Grima *et. al.* 1986; Canter 1993a)
- a fully integrated interdisciplinary approach (Canter 1993a)
- the differentiation between chronic (long term effects such as susceptibility to cancer and other diseases over the lifetime of the exposed organism) and acute (abnormal events) sources and effects (Erickson 1994; Hunsaker and Lee 1985)
- the stress placed on emergency response planning (Ellis 1989; Canter 1993a)
- the distinction between deterministic (single point) and probabilistic (range of values under specific exposure conditions) predictions (Stackelberg and Burmaster 1994; Arquiaga, Canter and Nelson 1992)
- the systematic consideration of the potential to generate effects (i.e., a hazards analysis) (Carpenter 1995; Wiesner 1994; Whyte and Burton 1980; Erickson 1994)
- the investigation of conditions of exposure (i.e., a pathways analysis) (Canter 1993a)
- the evaluation of the effects of a proposed action within the context of effects already being experienced by people and the natural environment (Erickson 1994; Foster 1986; Grima *et. al.* 1986)
- the systematic assessment of the relationship between exposure and effects (i.e., dose-response relationships) (Carpenter 1995b; Canter 1993a; Whyte and Burton 1980)
- the formal characterization of effects (e.g., intensity, frequency) (Smith 1993; Canter 1993a; Carpenter 1995b)
- the estimation of overall risks (Lowrence 1976)
- the formalized treatment of uncertainty (e.g., worst plausible and worst case analysis, use of fuzzy logic) (Whyte and Burton 1980; Stackelberg and Burmaster 1995; Dooley 1985; United Nations 1994; Grima *et. al.*1986; McCullough and Burton 1982; Lein 1992).
- the application of laboratory analysis (e.g., animal testing), bearing in mind the limitations of such analyses (Carpenter 1995b) .
- the explicit consideration of how conservative predictions should be (e.g., worst case or worst plausible) (Lein 1992; Carpenter 1995b; Grima *et. al.* 1986)
- the appreciation of the uncertainties associated with self-organizing and non-deterministic social and ecological systems (Carpenter 1995b) and the critical importance of selecting end points that are relevant, accessible to prediction and management and susceptible to the hazard being assessed (Suter II 1990; Carpenter 1995b; Canter 1993a)
- the differentiation between estimated effects and the importance of effects (Whyte and Burton 1980)
- the normative, value-full, nature of effects assessment (Lee, Haworth and Brunk 1996)
- the differentiation between estimated and perceived effects (Covello 1989; Lowrence 1976; Westman 1985; Smith 1993)
- the explicit recognition of factors contributing to risk perceptions (e.g., familiarity, understanding, uncertainty, volition, alternatives, effects on children, effects on future generations, victim identify, dread, trust in institutions, reversibility, equity, sensitive populations) (Covello 1989; Lowrence 1976; Covello, Sandman and Slovic 1988)
- the formalized evaluation of the importance of effects with explicit criteria (Canter 1993a; Grima *et. al.* 1986)
- the consideration of effect acceptability based on such considerations as predicted effects, public perceptions, risk-benefits, background and comparative risks (Carpenter 1995; Ellis 1989; Whyte and Burton 1982; Fischoff *et. al.* 1981; Grima *et. al.* 1986)
- the acknowledgement that acceptability is a subjective / political (value-full) decision requiring the involvement of all sectors of society (Fischoff *et.al.* 1981; Lee, Haworth and Brunk 1995; Hyman *et. al.* 1988; Fischoff *et. al.* 1981) and often necessitating dispute resolution (Ehrmann and Stinson 1994)

Table 23 - Lessons and Insights from Risk Assessment and Management for the EIA Planning Process

- the importance of two-way communications, including a sensitivity to perceived risk, the dangers of risk persuasion rather than risk information and the explicit consideration of uncertainty and public issues (Covello, Sandman and Slovic 1088; Kamrin 1993; Covello 1989)
- overall effects management (the mitigation and elimination of unacceptable risks) (Carpenter 1995b), including effects reduction, monitoring and remedial planning (Erickson 1995; Canter 1993a; Hope 1995)
- the tools of risk assessment (e.g., event trees, decision networks, probability analysis) (Canter 1993a)
- the central role of research and development (Ellis 1989; Arquiaga, Canter and Nelson 1992)

or are not significant has been the subject of considerable debate and numerous legal challenges (Thompson 1990). The Council on Environmental Quality (CEQ), in an effort to clarify the issue, issued regulations in 1978 that defined "significantly". So far significance has been less of an issue with EIA regulatory requirements in Canada. It is addressed in guidelines, most notably at the Federal level (FEARO 1985; CEAA 1994), but has not been at the forefront of debates in EIA practice to the same degree as in the United States. Nevertheless, significance interpretations are ubiquitous in EIA practice.

Discussions of significance tend to begin by differentiating among context, intensity (or magnitude or severity) and importance (or significance) (Rosen 1976; Westman 1985; Bass and Herson 1993; Canter and Canty 1993). Arguably, an interpretation of significance is only meaningful if placed within a spatial (e.g., global, national, regional, local), a temporal (i.e., proposed actions within the context of other past, current and likely future actions and environmental conditions), an ecological (e.g., broader ecological systems) and a social (e.g., broader social systems) context (Canter and Canty 1993; Beanlands and Duinker 1983; CEAA 1994). The characterization of context should also encompass the perspectives of affected interests, the potential effects of other activities that might affect the same environment (i.e., cumulative effects), and the impacts associated with comparable actions (Bass and Herson 1993). Contextual characterizations make it possible to address such matters as scarcity, scale, reversibility, thresholds and change from baseline (FEARO 1985; Canter and Canty 1993; Beanlands and Duinker 1983).

Magnitude (also referred to as severity or intensity) is concerned with the extent of environmental condition change, with and without a proposed action (Bass and Herson 1993; Thompson 1990; CEQ 1987). Magnitude, as described in the previous subsection, is the product of analysis. Context and magnitude, together with a range of other factors, are considerations in significance interpretations.

Significance tends to be used in two broad senses in the EIA planning process - statistical significance and significance for decision-making purposes. Statistical significance represents a relatively value free way of isolating impacts from natural variation (Beanlands and Duinker 1983). Statistical significance is one among many factors that can contribute to decision-making. Significance interpretations are clearly normative. A sense of context and an appreciation of impact magnitude (informed by analyses of statistical significance, where practical) is a useful point of departure. A range of additional criteria and methods also contribute to significance interpretations.

The simplest types of significance interpretations are those that take the form of regulatory, quantitative thresholds of acceptability. Such regulatory thresholds determine whether a proposal is or is not subject to a particularly set of requirements (i.e., screening) or are used to ascertain whether a proposed action is or is not acceptable (FEARO 1985; Beanlands and Duinker 1983; CEAA 1994; Canter and Canty 1993). Regulatory thresholds are generally used for physical environmental parameters (e.g., air quality, water quality). A proposal that fails to satisfy a regulatory threshold may be reconsidered if it can be demonstrated that mitigation measures will bring environmental outputs (e.g., emissions, effluents) below the threshold limit.

Regulatory threshold limits generally apply to only a small proportion of the environmental impacts associated with a proposed action. Significance interpretations of environmental components (e.g., to identify VECs) and of impacts not addressed through regulatory thresholds require considerable judgment. Such judgments need not be *ad hoc* or implicit. Non-regulatory thresholds, bearing in mind contextual considerations, can be established, substantiated and applied. Specific criteria can be established for defining significant and sensitive environmental components and for determining when impacts, either alone or in combination (i.e., cumulative effects), are significant. Both quantitative and qualitative scaling levels can be defined to differentiate between the significant and the insignificant and to address degrees of significance (e.g., high, medium, low significance) (Barnes and Westworth 1994). Criteria and scaling levels should be clearly defined, substantiated and consistently applied. Significance interpretations are not the exclusive prerogative of the "expert" (i.e., professional judgments). Public and agency involvement in the determination of impact significance is essential (FEARO 1985; Canter and Canty 1993). Significance can be integrated into the EIA planning process by using technical criteria in instances where likely change can be predicted with reasonable accuracy but a negotiated approach tends to be more appropriate where information is limited and / or there is a high degree of uncertainty (Sadler 1996).

Table 24 provides examples of general criteria for determining impact significance for individual and cumulative impacts. A distinction is drawn between the magnitude and importance of individual impacts and between

Table 24 - Examples of general significance criteria

Individual Impacts		**Cumulative Impacts**	
Magnitude (quantitative)	**Importance (qualitative)**	**Additive**	**Non-additive**
Do the proposal impacts represent a major, adverse change(s) from baseline conditions? (Erickson 1994; Smith 1993; Rau and Wooten 1980)	Are government requirements, policies, standards or criteria likely to be contravened? (Canter and Canty 1993; CEAA 1994; CEQ 1987; Principles and Guidelines 1983; FEARO 1985; Rau and Wooten 1980; Erickson 1994)	Is the proposal precedent setting? (CEAA 1994; CEQ 1987; Rau and Wooten 1980)	Are the direct impacts from the proposal likely to induce high magnitude indirect effects? (Rau and Wooten 1980; Bass and Herson 1993)
Do the proposal impacts extend over a wide geographic area or result in trans-boundary impacts? (CEAA 1994; Canter 1983; Spaling 1994)	Is the project inconsistent with government objectives, guidelines or draft plans and policies? (Rau and Wooten 1980)	Are significant impacts likely when the impacts from the proposal are combined with the impacts associated with other activities (past, present and likely future) that are likely to affect the same environmental components? (CEAA 1994; CEQ 1987)	Are indirect effects from the proposal likely to seriously compound direct effects (i.e., feedback effects)? (CEAA 1994)
Do the proposal impacts occur over a protracted period? (CEAA 1994; Spaling 1994; Smith 1993; Erickson 1994)	Is the project highly controversial? (Canter 1983; Bass and Herson 1993; CEAA 1994; CEQ 1987; Principles and Guidelines 1983; Rau and Wooten 1980)	Is the proposal likely to generate growth-inducing effects (e.g., spin-off industries, secondary employment) (Bass and Herson 1993)	Is time crowding of impacts likely to occur (i.e., frequent and repetitious impacts upon a singular medium)? (CEAA 1994; Spaling 1994)
Are the proposal impacts highly repetitious?	Are highly sensitive or significant environmental receptors (e.g., critically affected by small shifts in other variables) likely to be displaced or seriously disrupted? (Canter 1983; Beanlands and Duinker 1983)	Is the proposal likely to result in regional structural development changes? (Contant and Wiggins 1991)	Is space crowding of impacts likely to occur (i.e., impacts so dense in space cannot be absorbed)? (Spaling 1994)
Are major irreversible or permanent impacts likely? (CEAA 1994; Nova Scotia 1995; Erickson 1994)	Does the proposal introduce a new technology (s) and /or is it highly uncertain and / or does it involve unique or unknown risks? (CEAA 1994; Bass and Herson 1993; Smith 1993; Rau and Wooten 1980)	Is the proposal likely to result in severe fragmentation changes in the landscape pattern? (Spaling 1994)	Are major temporal discontinuities in the experiencing of impacts likely (i.e., major, difficult to anticipate, delays in experiencing impacts)? (Spaling 1994)
Does the proposal exceed a quantitative threshold criterion or move environmental components outside normal stability limits? (Canter and Canty 1993; CEAA 1994; Spaling 1994; Beanlands and Duinker 1983)	Does the proposal involve the irreversible or irretrievable commitment of significant resources or does it reduce the primary productivity of an ecosystem component (s)? (CEAA 1994; Rau and Wooten 1980; Bass and Hersen 1993; Rosen 1976; Beanlands and Duinker 1983)	Is the proposal part of a multi-project proposal?	Are major spatial discontinuities in the experiencing of impacts likely (i.e., impacts not gradually dispersed over space, cross boundary movements)? (CEAA 1994)

Table 24 - Examples of general significance criteria

Individual Impacts		Cumulative Impacts	
Magnitude (quantitative)	**Importance (qualitative)**	**Additive**	**Non-additive**
Is the proposal likely to occur and are severe impacts likely? (Canter 1983; Erickson 1994; CEAA 1994)	Does the proposal achieve short term goals to the detriment of long term goals or curtail the choices of beneficial uses of the environment? (Bass and Herson 1991; Rau and Wooten 1980; Rosen 1976)	Is the proposal a pre-condition for the implementation for another undertaking with potentially significant adverse environmental effects? (CEAA 1994)	Are proposal impacts likely to surpass major environmental thresholds (i.e., inputs that fundamentally change systems behaviour)?
Will the proposal substantially degrade environmental quality? (Bass and Herson 1993; Smith 1993)	Does the proposal affect public health and safety, well-being or quality of life? (CEAA 1994; Bass and Herson 1993)	Does the proposal involve compounding effects (e.g., multiple sources or pathways)?	Is the proposal likely to result in major bioaccumulation effects (i.e., effects up the food chain)?
Will the proposal result in major inequities in the distribution of risks and benefits? (Erickson 1994)	Is the project likely to exceed the carrying capacity of the potentially affected environment? (Bass and Herson 1993)	Will the proposed policy, program or plan (SEA) scope the range of choices that will be considered in project-level EIAs (tiering)?	Is the proposal, in combination with other past, present and future actions affecting the same environment, likely to jeopardize environmental or resource sustainability?

additive and non-additive cumulative impacts. Cumulative impacts are discussed at greater length later in this section. Examples of significance criteria for individual environmental components are provided in Appendix Table A-4.

An additional input into significance interpretations is provided through the application of methods related to EIA or often used in the EIA planning process. Examples include risk assessment (described in the previous subsection), cost benefit analysis, risk benefit analysis and other evaluation methods (described in Chapter 8) (Whyte and Burton 1980; Smith 1993).

Agencies and the public should be involved in each significance interpretation. The basis for judgments should be provided (Sadler 1996).

Cumulative Environmental Effects

There is no generally accepted definition of CEA (Hegmann and Yarranton 1995; Rees 1995b). Many, complex, CEA definitions include characteristics of CEA. Such definitions are overly complex and, because of their selectivity, misleading. A more basic definition, followed by a thorough exploration of CEA characteristics, seems more in order. The definitions provided by Shoemaker (Shoemaker 1994), which appear to represent refinements to definitions formulated by the US Council on Environmental Quality (CEQ) (CEQ 1978; Canter and Kamath 1995), seem largely appropriate. An initial distinction must first be drawn between cumulative environmental effects (CEE) and CEA.

A CEE is defined as *a change in the environment resulting from multiple initiatives of the past, present and reasonably foreseeable future, which combine in an additive, amplifying or discontinuous manner. Key instances occur when such interactions endanger or threaten or induce impacts on or loss of valued environmental components* (Shoemaker 1994, 2). This definition points to multiple impact sources, an extended temporal perspective, the additive and non-additive and the direct and indirect nature of interactions, and the need to consider linkages or pathways between sources and sensitive and significant environment components. Possible further refinements to this definition include references to an extended spatial perspective (Hegmann and Yarranton 1995) and to valued environmental interactions. In the case of the latter there is a danger that the environment could be viewed as static, spatially circumscribed and unconnected components. Key environmental interactions may be as or more significant than valued environmental components.

CEA, at a most basic level, is the process of systematically analysing and evaluating CEE (Spaling and Smit 1993). Consistent with the distinctions drawn earlier in this chapter, this definition could be refined to refer to the process of systematically analysing, interpreting and integrating CEE. Evaluation, as defined in this thesis, is used in a different, but complementary sense, and is addressed in Chapter 8. Shoemaker extends the definition of CEA to refer to the *evaluation and analysis, in an integrated manner of CEE, which involves combining scientific, socio-economic and natural values in an adaptive planning process for extending time frames and spatial boundaries* (Shoemaker 1994, 3). This definition points to the integrative and value-full (social, economic, natural) nature of CEA. It also makes clear that CEA requires both personal and processed knowledge, necessitates an adaptive planning process and extends time frames and spatial boundaries.

CEE are not new phenomena. They are as old as humanity (Shoemaker 1994). The environment is highly interactive (not segregated along tight disciplinary lines) and invariably affected by a complex web of multiple, interacting sources. Interactions between sources and effects rarely take the form of simple cause and effect relationships. EIA has chosen to focus on direct (and, to a lesser, extent, indirect), additive environmental impacts of single projects (Smith 1993). This focus is neither a realistic reflection of human - environment interactions nor a systematic response to public environmental concerns. The symptoms of the failure to adequately address cumulative environmental change are clearly evident at a range of scales (Rees 1995b). Examples include ozone depletion, climate change, deforestation, soil degradation and the loss of biodiversity (Rees 1995b; McCold and Holman 1995). CEA represents a response to the gulf between EIA, alone and in combination with other forms of environmental management, and what is required to adequately address these concerns. It also reflects the increasing urgency of these problems, as demonstrated by more frequent and more widespread dramatic and irreversible human-induced environmental changes (Rees 1995b; Sadler 1995). The types of environmental effects not addressed by conventional, project-oriented EIA appear to be the most environmental devastating (Clark and Lepperd-Slack 1994). Given the resources devoted to EIA, the usefulness and credibility of EIA may well in doubt unless the EIA planning process can more adequately address CEE (Roots 1986).

The first EIA regulatory acknowledgement of CEE occurred in the United States when the CEQ defined CEE in regulations in 1978 and required that they be considered (Rees 1995b; Clark 1994). Since that time CEE has been the subject of considerable debate and very costly and time-consuming litigation (Clark 1994) in the United States. Notwithstanding the long history of CEA in the US, CEE are rarely considered in EIA practice. In a recent review of 89 EAs only 2 meet the CEQ requirements and both instances represented special cases (McCold and Holman 1995).

The consideration of CEA in Canada, at the regulatory level, has proceeded more gradually, with a greater emphasis on conceptual frameworks and administrative procedures (Spaling and Smit 1993). Federal court rulings (Rafferty - Alameda and Oldman River dam projects) and EARP panel decisions have helped to formalize the consideration of CEE at the Federal level (Robinson 1991; Spaling and Smit 1993). The consideration of CEE is now a requirement under Federal EIA legislation. It is also a requirement in Alberta and in British Columbia (Doyle and Sadler 1996). CEE is implied, addressed in guidelines or a potential consideration (as reflected in references to environmental interactions) in other Canadian jurisdictions but the subject is approached, if at all, on a case-by-case basis.

The growing awareness of CEE, arising from multiple projects in regional settings, has led to several notable CEA examples (Damman, Cressman and Sadar 1995; Hegmann and Yarranton 1995; Shoemaker 1994). However, the systematic consideration of CEE is still rare (Therivel and Morris 1995). A variety of reasons are offered for the dearth of CEA in practice. Examples include; confusion regarding the establishment of spatial and temporal boundaries, the absence of coordinated land use planning systems, a lack of emphasis by proponents, limited guidance by government agencies, timing and funding constraints, and the limited development of procedures and methods (Canter and Kamath 1995; Cada and Hunsaker 1990).

Descriptions of and discussions about CEA tend to begin with certain general approach distinctions, some valid and some questionable. A distinction is drawn, for example, between CEA from a source perspective (e.g., interconnections between projects and other existing, present and potential future activities) and CEA from an environmental recipient perspective (e.g., habitats, watersheds, geological features) perspective (Contant and Wiggins 1991; CEARC 1986; Therivel and Morris 1995). Source-based CEA corresponds to multi-project EIA and SEA and reflects a proponent perspective. Environmental recipient - based CEA corresponds to area-wide EIA and reflects a regional environmental planning and resource management perspective. The distinction, although useful, is somewhat forced in the sense that multiple sources and broadened spatial boundaries will almost inevitably mean an area-wide perspective. Instances will also occur when the two perspectives are combined (e.g., a multi-project hydro-electric and watercourse improvement system, together with the related induced development, within a watershed system or systems).

A further distinction has been drawn between a scientific and a planning approach to CEA (Spaling and Smit 1993). The same authors refine this distinction into four categories - 1) the phenomena (what is subject to change, 2) analysis (process of analysis) 3) evaluation (significance of change) and 4) planning (action priorities) (Spaling and Smit 1993). These distinctions are questionable in several respects. The social and natural sciences contribute to the knowledge base and array of methods used in any form of EIA. Thus to suggest that one CEA approach is unscientific is questionable. EIA, as noted in Chapter 1, is a form of planning. Nevertheless, it is still useful to treat EIA (and CEA as a subset of EIA) as a separate field of theory and practice (which it is, albeit under the broader umbrella of planning) and then to explore the interconnections between EIA and other forms of environmental planning and management (addressed later in this chapter). To refer to a planning approach for CEA is not especially helpful. The distinction has already been made between CEE and CEA. Thus CEE is not a perspective but rather the subject matter of CEA. The distinctions among analytical, evaluative and planning CEA are more appropriately depicted as steps in the CEA planning process. The terminology is questionable in all three cases. CEA focuses on interactions and integration (rather than analysis), interprets the significance of change (rather than evaluates change, addressed in Chapter 8) and manages change (rather than plans change, addressed in Chapter 9). As noted above, all of CEA is a form of planning.

Before embarking on a review of the CEA planning process some authors identify overarching principles, concepts and frameworks. Hegmann and Yarranton, for example, in discussing, CEA approaches and methods, differentiate among five increasingly more specific levels - disciplines, concepts, frameworks, techniques and technical aids (Hegmann and Yarranton 1995). The upper three levels provide the structure within which specific techniques and technical aids are applied. Other authors (Shoemaker 1994; Duinker 1994; Wright 1994) identify concepts and principles that should shape CEA. These concepts, principles and frameworks, although insightful, are not unique to CEA. They are instead suggestive of the need to refine the EIA planning process to incorporate a CEA perspective.

CEA should integrate and transcend disciplinary boundaries; place CEA within a broader context; emphasize monitoring and management especially with regard to indirect effects, areas of uncertainty and human health and ecological risk; incorporate a higher degree of scientific rigour, tempered by a recognition of the importance of traditional knowledge; extend time horizons (e.g., life cycle) and spatial boundaries (e.g., study areas, zones of influence, setback); and link CEA into overall social (e.g., net community gain) and ecological (e.g., no loss of natural capital) goals, within a broader commitment to sustainability (Shoemaker 1994; Hegmann and Yarranton 1995; Caldwell 1989; Duinker 1994; Okrainetz 1994; Sadler 1995). Particular stress is placed on the identification of thresholds (e.g., carrying capacity, ecosystem stress assimilative capacity, limits of acceptable change) and on the application of ecological principles (e.g., biodiversity, succession, resilience, stability, surprise, ecosystem integrity) (Wright 1994; Hegmann and Yarranton 1995; Shoemaker 1994). These authors illustrate the need for overall principles and concepts to guide and shape the EIA planning process. CEA is, by definition, more complex that conventional project-level EIA or even SEA. Uncertainties increase with the broadening of the range of actions, environmental components and interactions considered, the extended time horizons and spatial boundaries, and the multiplicity of actors. The need to scope and shape the planning process, on the basis of considerations, such as those noted above, is that much more urgent with CEA.

If a continuum is envisioned between conventional, project-level EIA and CEA, the differences between the two ends of the continuum are quite pronounced, as highlighted in Table 25.The distinctions, identified in Table 25, create something of a false dichotomy. In practice it is more a question of emphasis. SEA and area-wide EIA exhibit many CEA characteristics. Similarly, project level EIA can apply many CEA properties. Thus, there is considerable

Table 25 Characteristics - conventional and cumulative effects assessment

ASPECTS	CONVENTIONAL EIA	CUMULATIVE EFFECTS ASSESSMENT
Purpose	• project evaluation	• management of pervasive environmental problems
Proponent	• single proponent	• multiple and/or no proponents
Sources	• individual projects with high potential for adverse environmental impacts	• multiple projects and/or activities
Disciplinary Perspective	• disciplinary and, to a lesser extent, interdisciplinary	• transdisciplinary and, to a lesser extent, interdisciplinary
Temporal Perspective	• short to medium term • continuous dispersion over time • proposed activity	• medium to long term • discontinuous dispersion over time (e.g., time lags) • past, present and future activities
Spatial Perspective	• site-specific • focus - direct on and off-site impacts • continuous dispersion over space	• broad spatial patterns • wide geographic areas (e.g., cross boundary impacts) • discontinuous dispersion over space (e.g., spatial lags)
Systems Perspectives	• tendency - single ecological system • tendency - single socioeconomic system	• multiple ecological systems • multiple socioeconomic systems
Interactions	• interactions among project components • interactions among components of environment • interactions between project and environment • primarily major, direct interactions • assumption that interactions additive	• also interactions among projects and other activities • also interactions among environmental systems • also interactions between activities and environmental systems • major and minor, direct and indirect interactions • expectation that some interactions non-additive (e.g., synergistic, antagonistic)
Significance Interpretations	• significance of individual effects interpreted • assumption that if individual impacts insignificant combined impacts also insignificant	• significance of multiple activities interpreted • expectation that combined impacts may be significant even though individual impacts insignificant
Organizational Level	• intraorganizational	• interorganizational
Relationship to Planning	• weak links to comprehensive environmental objectives • project level planning • incremental project evaluation	• explicit links to comprehensive environmental objectives • program and policy level planning • middle ground project evaluation and comprehensive planning
Relatonship to Decisionmaking	• reactive; after initial decision to initiate activity	• proactive; anticipates future actions
Impact Management	• monitoring and management of major, direct impacts	• comprehensive impact monitoring and management system

(Lawrence 1994b)

fertile ground within the overlap between these two related fields.

A considerable body of CEA literature concentrates on formulating conceptual frameworks to enhance our understanding of the activities that generate environmental effects (sources or inputs); the links or pathways from activities to the environment; the constituents or components of the environment; and the patterns of interactions between sources and the environment and among environmental effects (or outputs) (Spaling 1994). Such frameworks can facilitate a more focused effort to identify, interpret and manage major cumulative effects. Table 26 highlights examples of these distinctions. Factors that may control interactions among sources, pathways and environmental components include boundaries (spatial and temporal), hierarchy (organizational level), organizational complexity, assimilative capacity and other thresholds, dynamic variables, stability and resilience (Spaling 1994).

For sources of effects or inputs it is necessary to determine: the number of actions under consideration (e.g., single, multiple, global, cause unknown) (Sonntag *et. al.* 1987; Spaling and Smit 1993); the types of actions (e.g., similar or different actions, common or uncommon actions, human actions or natural events) (Contant 1984; Spaling and Smit 1993; Irving *et. al.* 1986); the temporal characteristics of the impact sources (e.g., extent to which activities, whether historical, existing or future, short, medium or long term duration of activities, frequency of activities, continuity of distribution of activities over time) (Sonntag *et. al.* 1987: Dickert and Tuttle 1985); the spatial characteristics of the impact sources (e.g., local, regional or global actions, activity scales, continuity of distribution of activities over space) (Orians 1986); the number and type of proponents (Lane *et. al.* 1988); and the nature and extent of interconnections among actions (Lane *et. al.* 1988).

Activities or sources are linked to the environment through a variety of environmental media or pathways (e.g., ground water, surface water, air, energy). Those links can vary in the extent to which they concentrate or disperse over space and time. They may be additive, interactive, compounding or synergistic (Clark 1994; Peterson *et. al* 1987). There may be variations in the continuity of links (e.g., temporal or spatial lags, indirect and non-linear impacts) (Spaling and Smit 1993). There may be interconnections among pathways (e.g., air to surface water, groundwater to surface water). Not all these pathways to the environment will be readily apparent. Thus, it may be necessary to

Table 26 - Characterizing cumulative effects

Components	**Characteristics**
Sources (inputs)	• action quantity • action type • temporal dimension • spatial dimension • proponents • sources connections
Pathways to the environment	• environmental media • degree of concentration • degree of continuity • pathway connections
Environment	• systems structure and types • resources • ecological significance • state of environment • environmental connections
Interactions	• connections to sources • strength of connections • direction of connections • temporal distribution of effects • spatial distribution of effects • types and nature of effects • significance of connections

(Lawrence 1994b)

differentiate levels or understanding or uncertainty regarding the links between activities and the environment.

The characteristics of the potentially affected environment will naturally vary depending upon geographic setting. The number, types, structure and functions of pertinent ecological (Regier 1986; Spaling and Smit 1993), social, economic, institutional and political systems should be identified. Within this general context, major resources (Fox 1986) (e.g., number, type, significance) and ecological components (Lane *et. al.* 1988) (e.g., VECs) can be identified and analysed. Properties that can influence a system response to perturbation include organizational pattern or connectivity among components (Holling 1978), spatial behaviour, dynamic variability, stability and resilience (Spaling 1994). The state of the potentially affected environment and critical environmental components (e.g., healthy, impaired, collapsed, stable, unstable, resilient, not resilient) should be interpreted.

A stress response model (webs of causality) provides a useful framework for moving beyond linear cause - effect relationships (Spaling 1994; Drouin and Leppert-Slack 1991). Whether a system is maintained, enhanced or degraded is determined by the type, magnitude and frequency of stress. System stress sources (e.g., past and present development) should be identified and stages of stress reaction (e.g., alarm, coping, breakdown) should be identified and assessed (Rapport, Regier and Hutchinson 1985; Spaling 1994; Sallenave 1994).

Interactions can occur among sources and the environment (via pathways), among sources (e.g., incremental growth, growth inducement) and among effects (e.g., interactions over time and space, synergisms, cross-boundary effects) (Spaling and Smit 1993). Major interactions or linkages should be identified (FEARO 1993; Therivel and Morris 1995). When major interactions appear likely the strength of the connections (e.g., strongly connected, weakly connected), the direction of the connections (e.g., direct, indirect, feedback) (Contant and Wiggins 1991) and whether the interactions are within or among various environmental systems (e.g., physical to biological, physical to social and economic, biological to social and economic) should be established. The analysis should determine changes in system structure or function over time and space (e.g., zones of influence, degree to which concentrated or dispersed, degree to which continuous or discontinuous) (Spaling and Smit 1993; Spaling 1994).

A determination should be made of how various combinations of effects follow a traceable cause - effect sequence, are collective or additive or are interactive (synergistic or antagonistic) (Baskerville 1986; Preston and Bedford 1988). Examples of types of change include linear, additive, exponential, discontinuous and structural surprises (Sonntag *et. al.* 1987; Contant and Wiggins 1991). With additive effects, nibbling or patchiness effects are of concern (e.g., fragmentation and loss of natural areas and structures) (Spaling and Smit 1993; Contant and Wiggins 1991). As noted in Table 27 a variety of factors can result in non-additive cumulative effects. Consideration should be given to whether significant potential effects are reversible or irreversible. Concepts such as thresholds, assimilative capacity and limits of acceptable change point to the need to focus on determining when systems are no longer resistant to change or acceptable to people.

Significance interpretations will be necessary (Stakhiv 1988). Significant sources, pathways, environmental components and interactions should be identified. A significant cumulative effect could, for example, extend the community or region, have long term implications or be highly uncertain (FEARO 1993). The long term sustainability of ecological systems, VECs and resources should assume a preeminent role in such interpretations. General strategies should be formulated to manage, effectively and efficiently, significant cumulative effects.

The major stages in the planning process for both EIA and CEA are essentially the same. Table 28 highlights how CEA can be integrated into the EIA planning process.

Methods to undertake CEA have received increasing attention in the past few years (Shoemaker 1994; Hegmann and Yarranton 1995; Canter and Kamath 1995; Damman, Cressman and Sadar 1995). Numerous criteria for selecting methods have been identified. Some criteria apply to any EIA method. Examples include being: traceable and understandable; practical within time and resource constraints; appropriate for different levels of resolution; suitable for available data (both quantitative and qualitative) and methods; addressing significance differences; suitable for presentation to agencies and the public; and, linkage to impact management measures and requirements (Damman, Cressman and Sadar 1995; Irving *et. al.* 1986; Canter and Kamath 1995). Others criteria focus on requirements particular to CEA. Examples of these criteria include: flexible temporal boundaries and ability to address temporal accumulation; flexible spatial boundaries and ability to address spatial accumulation; ability to address multiple sources;

Table 27 - Reasons effects non-additive

Reasons	Definition	Examples
• Indirect Impacts	• secondary impacts resulting from a primary activity (Sonntag *et. al.* 1987) • produced at some time or distance from an initial perturbation or by a complex pathway (Contant and Wiggins 1989)	• physical impacts generating biological impacts and then social impacts
• Growth Inducing	• results in spin-off activities or establishes precedent for additional activity (Spaling and Smit 1993)	• oil exploration
• Time Crowding	• inability of system to recover from earlier perturbation before new one (Contant and Wiggins 1989; Spaling and Smit 1993) • frequent and repetitious impacts upon a single medium (CEARC 1988a)	• overlapping construction activities from multiple projects • multiple effects of effluent in a lake (Contant and Wiggins 1991)
• Space Crowding	• inability of system to recover from close perturbations before new ones (Contant and Wiggins 1989) • so dense in space cannot be absorbed (CEARC 1988a)	• diverse array of activities in urban fringe
• Temporal Discontinuities	• delays in experiencing impacts (Sonntag *et. al.* 1987)	• hydrogeological processes
• Spatial Discontinuities	• impacts not gradually diluted or dispersed over time (Holling 1978) • space lags (Sonntag *et. al.* 1987)	• downstream impacts upon an especially sensitive environment • long range transport of air pollutants (Contant and Wiggins 1991)
• Threshold Effects	• inputs to system that fundamentally change system behaviour (Sonntag *et. al.* 1987) • triggers (Contant and Wiggins 1991) • saturation • ecological carrying capacity (Clark 1994)	• ecosystem disturbed to point that functionally collapses
• Biomagnification	• bioaccumulation (Peterson *et.al.* 1987)	• impacts up the food chain
• Feedback Effects	• indirect impacts that loop back and compound direct impacts	• perceived risk a direct impact that can induce additional social impacts (e.g., out-migration)

(Lawrence 1994b)

Table 28 - Integrating cea into the eia planning process

PROBLEM DEFINITION

- place project need and opportunity within the context of systemic environmental problems and opportunities
- design process to address links to broader planning levels at key decision points
- use area-wide and program EIAs to address middle ground between project review and pervasive problems

DEFINITION OF ENDS

- ensure that project goals and objectives consistent with and supportive of system goals and objectives (Williamson 1992)
- ensure that system objectives specific and supportive of individual project review (Munro 1986)

BOUNDING OF ANALYSIS

- extent temporal and spatial boundaries to allow for potential indirect and nonlinear effects
- ensure that natural, social and economic boundaries allow for potential interconnections across systems
- allow for connections to other jurisdictions and involve interest groups with broader perspectives

ASSESSMENT OF ALTERNATIVES

- link project alternatives to systems patterns (e.g., precedent setting developments, nibbling effects) (Spaling and Smit 1993)
- consider consistency of alternatives with policies, programs, systems and areal planning (Fox 1986)
- incorporate broader level goals into project evaluation criteria (Bedford and Preston 1988)
- combine alternatives into alternative strategies

IMPACT ASSESSMENT

- place project-related concerns within broader context of public environmental concerns
- involve broader environmental interest groups in planning process
- adjust scoping and baseline characterization to allow for links from local to regional systems
- identify, predict, interpret and manage interactions among project and environmental components; consider potential for additive and non additive effects
- identify, predict, interpret and manage effects of project in combination with other past, present and future activities (Davis 1993; McCold and Holman 1995); consider potential for additive and non-additive effects

IMPACT MANAGEMENT

- formulate general impact management policy and strategy at outset of planning process
- integrate individual mitigative measures into overall impact management strategy
- link project-level impact management to broader planning level impact management strategies (e.g., integrated monitoring (Hicks and Brydges 1994; Williamson 1992)
- work across planning levels to address public concerns and conflicts that transcend individual projects
- develop, refine and use mechanisms for interorganizational and interjurisdictional cooperation
- consider alternative institutional arrangements for monitoring and joint planning purposes (Peterson *et. al.* 1987)
- favour broader assessments (e.g., SEA, area-wide assessments)

(Lawrence 1994b)

ability to trace and account for specific environmental change processes; ability to address structural (e.g., energy flows, succession) and functional (e.g., population structure, habitat modifications) effects; ability to address interactions (e.g., human and biological environments, direct and indirect effects); and ability to focus on VECs, stress response mechanisms and thresholds (Smit and Spaling 1995; Damman, Cressman and Sadar 1995; Duinker 1994). The general conclusion of methodological reviews tends to be that there is no method universally suitable for CEA (Canter and Kamath 1995; Smit and Sparling 1995; Hegmann and Yarranton 1995). Instead, a plurality of methods are recommended, adjusted on a case-by-case basis.

The picture painted of the potential for the enhanced application of CEA is a bleak one. A litany of obstacles have been identified. Examples include: no clear cut rules for establishing temporal or spatial boundaries (Clark 1994; Damman, Cressman and Sadar 1995); lack of environmental baseline data; comprehensive monitoring not in place (Clark 1994; Damman, Cressman and Sadar 1995); complex social and ecological interactions that make it difficult to identify cause-effect relationships, predict future conditions or resolve uncertainties (Rees 1995b; Hegmann and Yarranton 1995; Clark 1994; Shoemaker 1994; FEARO 1992; Damman, Cressman and Sadar 1995); a paucity of CEA methods and audited CEA experiences (Damman, Cressman and Sadar 1995; Ross 1994); the limited consideration of social and economic impacts; and much of the CEA literature focuses on ecological systems and issues.

The largest obstacles seem to be in the area of institutional arrangements. Data, often incomplete and at varying scales, are dispersed among multiple agencies and are rarely shared and accessible (Clark 1994; Damman, Cressman and Clark 1994). No one agency is responsible for cumulative effects or cumulative effects monitoring (McCold and Holman 1995; Damman, Cressman and Sadar 1995). Jurisdictional boundaries overlap and CEA roles and expectations are confusing and often conflicting (FEARO 1993; Slocombe 1994). Agency expectations of proponents are poorly defined and EIA and other environmental requirements are enforced and implemented to varying degrees (FEARO 1993).

Methodological priorities for enhancing the design and application of CEA include: the improved measurement of environmental change and impacts - linked to thresholds of acceptability, within sustainability frameworks and consistent with state-of-the-environment (SOE) reporting (Shoemaker 1994); applied research to address issues such as: temporal and spatial boundary definition; the representation of temporal and spatial variations, including infrequent episodic events; the early identification of signs of stress and how best to identify strong connections, thresholds and triggers; improved procedures for addressing uncertainty; the elaboration of the social and economic dimensions of CEA (Gibson 1992b; Shoemaker 1994; Hirsch 1988; Dickert and Tuttle 1985; Orians 1986; Sonntag *et. al.* 1987); refinement of CEA methods, drawing upon the systematic auditing of CEA experiences (Shoemaker 1994; Damman, Cressman and Sadar 1995); enhanced procedures for stakeholder, especially public involvement in CEA (e.g., VEC identification, significance interpretation, CEA performance) (Shoemaker 1994); and the linking of CEA to other forms of environmental planning and management, within the context of broader debates regarding prevailing global development patterns and their consequences (Rees 1995b; Slocombe 1994).

By its very nature CEA is inter-jurisdictional. The matching of jurisdictional and systems boundaries has been one of the most intransigent problems plaguing CEA. (Dickert and Tuttle 1985). Creating new levels of government and administration may well result in unacceptably high costs. Institutional and political resistance to such reforms is also likely to be intense. Less cumbersome and costly and more flexible mechanisms for fostering inter-agency cooperation and control offer greater potential for ensuring that the analysis and management of cumulative effects are not confounded by institutional barriers. Innovative institutional arrangements are an essential element of cumulative effects management.

There needs to be a clear commitment (reflected in resource commitments) to CEA, both in principle and in terms of quality and effectiveness (McCold and Holdman 1995; Shoemaker 1994). Roles and responsibilities need to be better defined (Shoemaker 1994). Inter-agency data management systems require substantial enhancement (i.e., tiered, consistent and accessible). Greater cooperation and coordination among stakeholders is required. Resources will need to be shared and at least a partial integration of environmental planning and management institutional arrangements is required (Hegmann and Yarranton 1995; Eccles, Green, Morrison and Kennedy 1994; Damman, Cressman and Sadar 1995; Shoemaker 1994). A greater level of consistency among governmental levels and agencies regarding CEA is needed and expectations of proponents need to be detailed in guidelines (Goldstein 1992).

EIA and Environmental Management

The final form of synthesis considered concerns the synthesis of the EIA planning process with other forms of environmental management. In order to integrate the EIA planning process with other forms of environmental management it is first necessary to ensure synthesis within the EIA planning process (i.e., across disciplines, among EIA forms and between EIA and the planning process). As noted in previous sections, although individual disciplines can make an important contribution to EIA analysis, a more holistic and transdisciplinary perspective is necessary to address interrelationships (especially cumulative effects), interpret significance, evaluate alternatives and provide a sound decision-making basis (Jantsch 1971; Carpenter 1981; Gibson 1992a) The tendency is for the EIA planning process and the project planning and design processes to proceed in parallel with selective inputs across processes at key decision points. The preferable arrangement, although rarely attained, is a single integrated process (Armour 1990; McDonald and Brown 1995). The various forms of EIA are generally depicted in a nested or tiered structure, comprised of different planning stages or organizational levels or levels of aggregation (Sadler 1995; Clark 1994). The broadest level (or earliest stage) is the evaluation of policies and program with SEA. An intermediate level involves plan evaluation (using SEA), area-wide EIA and multi-project EIA. The final stage or level is project-level EIA. The intermediate level or stage tends to be viewed as most conducive to CEA. As demonstrated in the previous section, CEA can be infused into any form of EIA and into each activity in the EIA planning process (Shoemaker 1994).

The most obvious first step in linking and integrating EIA and other forms of environmental management is to bridge the gap between the EIA planning process and planning, especially environmental planning. As detailed in Chapter 4, EIA can greatly benefit from planning theory. Examples of other potential contributions from planning and plans to the EIA planning process include: broad principles, goals and objectives; environmental data bases; general growth scenarios and strategies; planning policies and controls; the classification of existing and planned land use; the determination of land use constraints, suitability, limits and thresholds (most notably, environmental carrying capacity); the identification and characterization of significant and sensitive natural areas (VECs); the planned allocation and distribution of infrastructure (roads, transit, utilities) and a wealth of research and experience in forecasting, alternative generation, evaluation and public consultation (Marshall *et. al.* 1985; Clark 1994; Westman 1985; Hegmann and Yarranton 1995; Shoemaker 1994; Eccles *et. al.* 1994). More innovative environmental planning approaches can also contribute an enhanced understanding of the harmonization of human and ecological processes, ecosystem planning principles and methods, natural system planning (e.g., watersheds, geological features), procedures for balancing resource management and environmental protection and concrete examples of the formulation and application of sustainability principles and imperatives (Wilson, Roseland and Day 1996; Dorney 1989; Shoemaker 1994; Hegmann and Yarranton 1995).

Although a much newer field of analysis and application, the EIA planning process can provide planning with specific procedures for the incorporation of ecological and social values into decision-making. It can also offer insights regarding focusing (screening and scoping), impact identification and prediction, interpreting significance, comparing alternatives, addressing interrelationships (CEA), managing risk and uncertainty, resolving conflicts and monitoring and managing change (Marshall *et.al.* 1985; Dias and Chinery 1994).

Suggestions for frameworks to link and integrate the EIA planning process and planning tend to begin with parallel hierarchical levels, all directed by sustainability objectives and criteria (Gibson 1992b). SEA is placed opposite policy and systems planning, area-wide EIA in combination with multi-project EIA matches regional, watershed and natural area planning and project planning is juxtaposed against project level EIA (Tywoniuk 1990; Shoemaker 1994; Gibson 1992a). CEA is depicted as inputing to planning and EIA measures of stress-response and ecological thresholds for VECs (Shoemaker 1994; Dias and Chinery 1994). CEA, in turn, is framed within the regional carrying capacity and acceptable growth levels establishing through regional environmental planning (Rees 1995a; Westman 1985; Hegmann and Yarranton 1995; Marshall *et. al.* 1985; McElliott 1978). Environmental monitoring (focused on sustainability criteria and indicators), undertaken as part of regional planning , provides a context for project-level monitoring (Rennick 1994; Gibson 1992a). The output from project-level EIA monitoring is feed back into regional environmental monitoring (Rennick 1994). Monitoring efforts should encompass baseline and effects monitoring as well as the monitoring of the successes and failures of mitigation and rehabilitation efforts and addressing areas of ignorance and uncertainty (Gibson 1992a). The interrelationships among these components and levels are considered reciprocal and synergistic, especially if informed by the ecosystem planning approach and by sustainability principles, imperatives and criteria (Slocombe 1993; Gibson 1992a). Ultimately these frameworks are viewed as a transitional step along the journey toward integration within a larger environmental management form of planning (McDonald and Brown 1995). Frameworks for integration would also need to be flexible, comprehensible to ordinary participants and conducive to the direct participation of a variety of perspectives (Gibson 1992a).

The conceptual integration of the EIA planning process and planning is much easier to envision than implement. There are substantial institutional barriers, arising from the largely separate evolution of planning and EIA (Lawrence 1992). With separate institutional arrangements and procedures, but considerable common ground, overlap, duplication and conflicting requirements are inevitable (Richardson 1994). Examples of potential interconnections between EIA and planning requirements include: an EIA of a plan; the scoping of project-level EIAs within the context of planning policies and designations; EIAs of infrastructure projects envisioned in a plan; the triggering of EIAs when proposed developments might affect an environmentally sensitive area designated in a plan; the same development proposal potentially being subject to both planning and EIA review and approval requirements; overlapping planning processes; and development induced by a major project subject to an EIA, requiring planning (Richardson 1994).[2] It is relatively simple task to implement changes in requirements to minimize duplicate requirements and major areas of overlap. More problematic is the question of how best to merge, at least in part, largely separate institutional arrangements. As the scope of each field progressively broadens the need for institutional reform and integration will become both more difficult and more urgent. Institutional reforms will necessitate planning on the basis of ecosystem boundaries and a considerable degree of horizontal (across disciplines and sectors) and vertical (encompassing planning, assessment and regulatory structures) integration (Gibson 1992a).

The need for both conceptual and regulatory integration does not stop with the EIA planning process and planning. Examples of other forms of environmental management include: integrated resource management (focuses on interrelationships and balancing of multiple resource uses against environmental protection and enhancement objectives); environmental management systems and standards (by private industry); environmental quality strategies (encompasses prevention, mitigation, protection and restoration); state of environment reports and environmental and social indicators; and conservation strategies, environmental policies and green plans (Lang 1986; Margerum and Born 1995; Shoemaker 1994; Dias and Chinery 1994; Street and Barker 1995; Selman 1994; Kuusinen, Lesperance and Bilyard 1994).

Having recognized these additional forms of environmental management, the issue then becomes if and the extent to which all forms of environmental management, including EIA and environmental planning, can be progressively synthesized into a composite structure - integrated environmental management (IEM) (Thompson 1995; Margerum and Born 1995). If IEM is to have direction and structure it should be placed within the context of global issues and directed toward sustainability ends (Rees 1990, 1995a, 1995b; Smith 1993; Dias and Chinery 1994). Just as a blended form of EIA / environmental planning operates at several levels the same would be true for IEM. The policy level would be broadened (beyond SEA and strategic and policy planning) to encompass environmental policies and strategies. Conservation strategies and green plans would be blended with regional planning, area-wide EIA and multi-project EIA. Environmental management standards would be combined with project planning and project level EIA. IEM would be informed and refined through SOE reporting, sustainability criteria and indicators and environmental monitoring and auditing (Thompson 1995; Marshall *et. al.* 1985; Gibson 1992a). CEA would help differentiate between sustainable and unsustainable practices (Shoemaker 1994; Rees 1995a).

IEM could be informed and refined by drawing upon a range of concepts and methods. Examples include ecosystem planning approaches (Slocombe 1993; Ziemar 1994); biodiversity (CEQ 1993); risk assessment (Brown and Treissnau 1994; Hegmann and Yarranton 1995); public participation, conflict management and co-management procedures and models (Davies 1991; Flynn and Gunton 1996; Witty 1994; Pinkerton 1996; Hawkes 1996; and experimental management together with the systematic use of in-depth case studies of environmental problems and solutions (Briassoulis 1989; Marshall *et. al.* 1985).

The sustainability concept, as detailed in Chapters 5 and 6, addresses the interconnections among ecological, social and economic systems. IEM, if it is to be a sustainability tool, must also address those interconnections. If IEM is to consider interconnections with other societal management ends and instruments, under the general umbrella of sustainability, care must be taken to ensure that basic environmental requirements and imperatives (e.g., no net loss of natural capital) are not compromised (Rees 1995a; Sadler 1995).

Conceptual synthesis within IEM and between IEM and other sustainability instruments, although not a easy task, is far less difficult than the institutional and societal transformations required to realize the vision. Resistance to change will be intense, as evidenced by the limited extent to which Agenda 21 has been implemented. Realistically, the focus initially should be on the expression and realization of IEM within existing institutional arrangements. Over time, ideally, the combination of internal and external pressures may nudge such systems toward the fuller realization of IEM. Realistically, there is little evidence that such an outcome is likely in the foreseeable future.

EIA Guideline Evaluation

Consistency in the treatment of analysis and synthesis activities in the EIA planning process, as expressed in EIA practice, is at least partially dependent upon the direction provided by generic and proposal-specific guidelines. Appendix Table A-5 lists criteria for guideline evaluation for the selected analysis and synthesis activities. The criteria were derived from a review of the previous sections of this chapter. Appendix Table A-6 defines scaling levels for criteria application. Appendix Table A-7 applies the scaling levels to generic and project specific guidelines for Canada and for the ten provinces. Appendix Tables A-8 and Table A-9 provide a qualitative application of the guideline evaluation criteria. The major themes resulting from the criteria application are described below.

In reviewing the tables it is immediately evident that there is considerable variability across jurisdictions and between the matters addressed in generic as opposed to project-specific guidelines. Many of the criteria are not applied or are only applied to a limited extent. Frequently, requirements, that would appear suitable for any EIA, are only addressed in project-specific guidelines. This leaves open the possibility of unnecessary variability within the same jurisdiction. The absence of project-specific guidance in Ontario (this deficiency has been corrected) inhibits scoping and leaves open the potential of a protracted and costly public and agency process, where EIA requirements are only determined during the course of EIA review. This unfortunate pattern has been realized in Ontario and has been compounded by general EIA guidelines that focus on procedural matters and only selectively address substantial environmental concerns and methods.

Ideally overall direction for scoping should be provided within generic guidelines supplemented by adjustments for individual projects within project-specific guidelines. None of the jurisdictions provide this level of guidance. Several jurisdictions do provide varying degrees of scoping direction through project-specific guidelines. Project specific guidelines help expedite scoping but it is important that ample provision be made for full stakeholder involvement in the preparation of draft and final guidelines. It is helpful if generic and specific guidelines stress issue identification and the early identification of VECs.

The need to identify and substantiate spatial and temporal boundaries is a theme that is picked up by several jurisdictions. It should be addressed in all jurisdictions, preferably through generic guidelines. Limited guidance is provided regarding data management and data collection and analysis techniques or concerning the treatment of uncertainty.

Baseline condition analysis and research is addressed, to varying degrees, by all jurisdictions. A greater and more consistent effort could be made to stress the need to consider historical conditions and impacts, provide a base for impact predictions and monitoring, address natural variability, explain sources and methods, identify, delineate and substantiate the selection of VECs, project future conditions (using future scenarios, where warranted) and address interrelationships. Limited reference is made to research and in only one Federal project was the review of comparable projects recommended.

Most jurisdictions, through project specific guidelines, provide detailed lists of potential impacts to consider. Much less emphasis is placed on identifying and substantiating criteria and methods. Little regard is given to the impact identification process.

All jurisdictions make the point that impacts, as distinct from baseline conditions, must be predicted. Several jurisdictions identify impact magnitude categories (e.g., severity, duration, direct, indirect, frequency). Further explanations could have been provided and cooperation across jurisdictions could facilitate consistent categorization.

Guidance regarding impact prediction methods is more limited and uneven. A more consistent set of performance standards for impact prediction methods could be formulated and applied across projects and jurisdictions. Some project-specific guidelines provide useful examples of such principles.

The need to address uncertainties and data limitations is identified in several jurisdictions. The jurisdictions that provide more specific guidance represent a useful model. It should be possible to identify principles and performance standards in general rather than just in project-specific guidelines. Human health risk is a concern identified in several jurisdictions. More specific guidance is only provided on a project-specific basis and no reference is made to the possible use of deterministic or probabilistic risk assessment.

Although the need to address impact significance is broadly acknowledged, additional guidance could be provided in several jurisdictions regarding the importance of context and the use of explicit, consistent and substantiated criteria for assessing significance. More guidance could also be provided regarding significance determination procedures, especially concerning the importance of stakeholder involvement.

The importance of addressing interrelationships, indirect effects and cumulative effects is a common theme, although the consideration of cumulative effects is only a requirement in three jurisdictions (Alberta, BC, Canada). Procedures for addressing interrelationships in general and cumulative effects in particular are highly inconsistent among jurisdictions. Only Canada and Alberta have addressed the matter in any detail.

Overall rigour, especially in impact predictions, is a theme in general guidelines for a few jurisdictions - largely in eastern Canada where the Beanlands and Duinker study (Beanlands and Duinker 1983) has apparently been more influential. More specific guidance is selectively provided in some project guidelines. These project guidelines provide many useful principles and performance standards, including the need to appreciate the importance of traditional knowledge.

Several jurisdictions note the need to assess proposals against regulatory requirements, land use plans and broader policies. Specific sustainability themes (e.g., greenhouse gas, sustainable resource use) are occasionally mentioned for individual projects. The broader application of sustainability principles is only mentioned in one jurisdiction - Manitoba. Much more guidance will be needed before sustainability can be addressed systematically in

EIA practice. The draft Sustainable Development Act in Manitoba (Manitoba 1996) includes a provision for sustainability assessments. If implemented, including the provision of guidelines, an interesting precedent and model could be established.

Most jurisdictions provide a reasonable level of guidance regarding public involvement and clear and succinct documentation. A greater level of coordination would be helpful in identifying a consistent set of principles and performance standards.

EIA Proposal Evaluation

This section applies analysis and synthesis criteria to ten (main reports only) EIAs. Appendix Table A-10 lists criteria for proposal evaluation for the selected analysis and synthesis activities. The criteria were derived from a review of the previous sections of this chapter. Appendix Table A-11 defines scaling levels for criteria application. Appendix Table A-12 applies the scaling levels to the ten EIAs. Appendix Tables A-13 and A-14 provide a qualitative application of the proposal evaluation criteria. The major themes resulting from criteria application are described below.

As with the EIA guidelines there is considerable variation in the treatment of analysis and synthesis activities across the ten EIAs. Although some EIAs adequately address many of the criteria listed in Appendix Table A-10, there is room for improvement in all cases.

In some instances the EIAs include refinements and innovations that extend beyond generic and project specific guidelines. Unfortunately, it does not appear that these innovations are widely shared. The explicit references to the Beanlands and Duinker report (Beanlands and Duinker 1983) or to distinctions drawn in the Beanlands and Duinker report are noteworthy, although in some cases the terminology has been adopted with only limited application of the substantive principles and methods. Interconnections among disciplines and among potential impacts are often not addressed as systematically as would be desirable. A particular problem area is the links between biophysical and socioeconomic impacts. Unnecessary inconsistencies are also evident between the approaches, methods and formats used in the socioeconomic disciplines as compared with those used for the biophysical disciplines. Although allowance must be made for testing different approaches and adaptations are needed to suit context, there still appears room for a higher level of consistency than is evident in these EIAs.

Project-specific guidelines appear to have assumed a valuable role in focusing the EIAs by identifying key issues, environmental components (VECs and VSC [valued socio-economic components]) and choices. The scoping process is especially effective where there was a high level of agency and public involvement and where project-level EIAs could be placed within the context of broader strategies and policies. There is only one case where a systematic scoping procedure is used to screen out potential impacts that are clearly negligible or not applicable.

Most EIAs identify temporal and spatial boundaries, albeit with varying degrees of substantiation. The establishment of ecological boundaries strengthen the EIA structure and focus especially when addressed for each VEC and VSC. Administrative boundaries are rarely addressed. Most EIAs identify sources in the form of a reference list. References within the text contribute to a more traceable process. Data collection and analysis methods are generally described with varying degrees of precision and substantiation. Explanations of sampling procedures tend to be more thorough with biophysical disciplines, especially physical disciplines. Data appear to be generally up-to-date and ample use is made of primary data. It is not possible, in an analysis of this type, to indicate whether the use of primary methods is appropriate. Data gaps and limitations are often identified and, in some instances, resulted in supplementary data collection and links to monitoring. In some cases level of confidence or uncertainty ratings are applied. The nature of data uncertainties and decision-making implications could have been addressed in a more thorough and consistent manner.

All the EIAs include baseline analyses. The more effective analyses focus on VECs and VSCs (often VSCs encompassed within VECs), place the description of local environmental conditions within a regional context and undertake literature reviews and original research to address data gaps. It is especially helpful if the sensitivity of VECs and VSCs to project-type impacts is highlighted. There are several examples of the use of historical data, although the tendency is to use historical data where they are available (i.e., readily available statistics) rather than necessarily as a basis for determining natural variability and to provide a foundation for impact predictions and monitoring. The use of figures, tables and graphs enhances the treatment of spatial and temporal variations in baseline conditions. In some cases projections of future environmental conditions, to parallel the duration of potential impacts, are included, although it is more common to assume that existing conditions would continue to prevail in the future. Allowance is generally made for public input to data collection. There are no obvious biases in the presentation of scientific research. Limited systematic consideration, with a couple of notable exceptions, is given to comparable projects. There is only one example of the use of a control community. Baseline analysis methods are generally described and often substantiated but to varying degrees. The identification and systematic analysis of other historical and current impact sources, likely to affect the same environment, is with a couple of notable exceptions, not included. The absence of such analyses greatly inhibits the subsequent consideration of CEE. The baseline analyses are not generally structured around environmental models, as per adaptive environmental assessment (Holling 1978), although physical models are used in several cases.

A broad range of potential environmental impacts are addressed in all cases. Impact identification tends to be more systematic and effective when it is treated as a natural extension of the scoping analysis, with suitable refinements and adaptations, to reflect knowledge acquired through research and the baseline conditions analysis. There are only a few cases where a definition and a rationale are provided for each criterion or VEC. Potential impact identification is facilitated, in the few cases where systematic procedures (e.g., matrices) are used to address project - environmental linkages. The cases where potential impacts are presented as hypotheses to be tested provides a sounder basis for the subsequent impact predictions.

Impacts are predicted in all cases, although there is substantial variation among the EIAs in the procedures employed. Methods (e.g., matrices, models, network diagrams) are generally explained. Positive and negative impacts, with and without the project, are generally predicted, although, as noted above, the assumption tends to be made that environmental conditions without the undertaken would correspond to present conditions. Impact predictions tend to take the form of an intra-disciplinary analysis. Although impact predictions are often quantified there are also many examples of qualitative discussions of potential impacts that could have been supplemented by the use of quantitative prediction methods. Potential impacts are presented as hypotheses in several cases, although sometimes they are more in the nature of issues to consider than hypotheses to test Statistical significance and impact reversibility are rarely considered. Prediction limits are often identified usually with some provision for uncertainty (e.g., ranges, conservative assumptions, sensitivity analysis) and often with a connection to monitoring. There are also many cases where limits are noted but implications are not addressed. Impact magnitude classification systems are used in several cases, with varying degrees of substantiation of the distinctions drawn. EIA practice would appear to have advanced to the point that a greater level of consistency in the design and application of such procedures would appear in order.

Uncertainty and level of confidence is a common theme in the EIAs, although a theme often not addressed as systematically as would be desirable. In many cases, where uncertainties and data gaps are identified, further data collection and analysis were undertaken. Frequent use is made of such devices as prediction ranges, conservative assumptions, sensitivity analyses, contingency measures and links to monitoring. Much less use is made of comparable situations, control communities and pilot projects. The analysis of uncertainty tends to be qualitative. Few references are made to natural variation. Impact probability tends to be addressed, if at all, by ordinal scaling procedures (e.g., low probability or likelihood). Human health risk and the potential for unplanned events is a common theme. Both tend to be addressed qualitatively, usually by means of conservative design and operations assumptions, contingency measures and references to pertinent literature. There are examples of quantitative human health (two cases) and ecological (three cases) risk assessments, both deterministic and probabilistic. The potential exists for the greater application of risk assessment in EIA. The systematic incorporation of public input into uncertainty and risk interpretations, decisions and management is rare.

There is only one example where impact significance, as distinct from impact magnitude, is addressed in a systematic manner. In several other cases impact magnitude and significance largely overlap or are treated as equivalent. There are also instances where impact significance, if addressed as all, takes the form of qualitative interpretations scattered through the text. There would appear to be substantial room for improvement in the treatment of impact significance in EIA practice.

Many interrelationships among impacts are addressed in the EIAs, often with the use of network diagrams and occasionally with models. Links from individual project components directly to individual environmental components tend to be addressed systematically. Interconnections among impacts within disciplines are often addressed but usually less systematically. Interconnections across disciplines tend to be limited to the most obvious links. Despite this general pattern there are positive examples of the systematic tracing of impact connections within and among disciplines. The risk assessment analyses tend to be the most rigorous in the treatment of interconnections. Cumulative effects is a theme in many of the EIAs reviewed, although the tendency is to limit the analysis to a few obvious potential cumulative effects. Where cumulative effects are addressed the tendency is to focus on the cumulative effects from the source rather than from the receptor perspective. Limited reference is, therefore, made to such concepts as environmental carrying capacity. There are only a few instances where explicit consideration is given to the potential for synergistic effects. Some, especially smaller project EIAs, do not to refer to cumulative effects.

Most of the EIAs are structured on the basis of a study design, although there is considerable variation in the level of detail provided. Several EIAs use impact hypotheses, although as noted above, the hypotheses are sometimes essentially issue lists or lists of considerations. Links from impact predictions to monitoring requirements are often made, primarily for physical and biological impacts. A higher degree of rigour is evident in physical disciplinary analyses. Assumptions are frequently stated but not always substantiated. Any biases tend to be subtle. Institutional constraints are practically never identified. Scientific and technical terms are usually defined. Peer review is rarely employed.

There are scattered references to broader environmental management issues, policies and frameworks. There are also several references to issues bearing on sustainability. Direct references to sustainability are much more rare. The few cases where sustainability is addressed are limited to the selective consideration of resource and ecosystem sustainability issues. There is considerable room for improvement in the treatment of environmental management and sustainability issues in EIA practice.

Overall, the EIAs provide a succinct and understandable analysis. Provision is made for some level of public consultation in all cases. There is considerable variation in the extent of public consultation undertaken and in the degree to which public issues and concerns are systematically addressed and incorporated into each stage of the EIA planning process. The EIAs are generally sensitive and responsive to public and agency concerns.

Summary and Conclusions

The EIA planning process is refined through an analysis of screening, scoping, baseline and impact analysis, impact significance interpretation, cumulative effects assessment and environmental management activities. Lessons from practice, in these areas, are derived from a review of generic and project-specific guidelines for Canada and for the ten provinces and from a review of ten EIAs.

Some level of screening and scoping is necessary and inevitable in the EIA planning process. A planning process, based upon the rational planning model (as discussed at length in Chapter 4), faces the impossible task of an almost infinite range of potential alternatives, effects and interrelationships. Screening and scoping can reduce the task to manageable proportions. Screening and scoping are rarely undertaken as consistently, systematically and as openly as is desirable. Screening and, especially, scoping are best viewed as continuous activities in the EIA planning process. Both also pertain to documentation, institutional arrangements and approval procedures.

Baseline and impact analysis identify and predict change, with and without a proposed action and its alternatives. Both are also ongoing activities rather than distinct stages in the EIA planning process. Baseline analysis and impact predictions need to be focused, systematic and substantiated, with a particular sensitivity to interrelationships. Balancing rigour and relevance in impact predictions is difficult but necessary. Differences between biophysical and socioeconomic impact analyses need to be acknowledged and considered. Uncertainty and risk should assume a more prominent role in each EIA planning process activity.

Significance interpretations are also not confined to one step in the EIA planning process. They occur whenever judgments must be made. Significance interpretations need to take into account context, impact magnitude and impact importance. Statistical significance, although helpful, is not always applicable. Thresholds should be identified where practical but in many instances significance interpretations will be the product of negotiation among stakeholders in an open planning process. Significance interpretations should be explicit and consistent. The potential for consistency can be greatly enhanced with clearly defined and consistently applied criteria.

Cumulative effects assessment (CEA) is not a stage "tacked on" at the end of the EIA planning process. It is a dynamic EIA approach that systematically considers interactions among project characteristics, environmental components and other activities. Infusing a CEA perspective into the EIA planning process is, therefore, essential. Conceptual frameworks for CEA have received considerable attention but CEA methods require further refinement. CEA can provide a useful bridge between project-level EIA and policy and program level EIA (strategic environmental assessment - SEA). It is also a means of addressing many pervasive environmental problems not customarily addressed by conventional EIA. The obstacles to CEA, especially with regard to institutional arrangements, are considerable.

The integration of EIA with other forms of environmental assessment must begin with synthesis within the EIA planning process. A transdisciplinary perspective is required. The integration of EIA with other forms of environmental management can be envisioned conceptually and would necessarily proceed as a a gradual process of convergence. Although the benefits of greater integration are readily apparent it is also evident that there are substantial institutional and political barriers to such reforms.

The guideline evaluation demonstrates the substantial variability across the eleven jurisdictions and between generic and project specific guidelines for the analysis and synthesis activities considered. Many issues, that should have been addressed in generic guidelines, are inconsistently addressed, if at all, in project-specific guidelines. The guidelines in all the jurisdictions fall well short of the ideal, as represented by the scaling levels. There are, however, several positive examples that, if applied collectively and consistently, would enhance the treatment of these analysis and synthesis activities in EIA practice.

It is difficult to make broad generalizations about the treatment of analysis and synthesis in EIA practice based on the contents of the ten EIAs. Even across the ten examples there is much variability. There are, however, many instances of innovative and insightful practice in the examples considered. Such examples should be reviewed, refined and more broadly shared. It is also evident that there is ample room for improvement. A greater level of consistency can be achieved and still leave room for innovation and adaptation.

Endnotes

[1] Social, cultural and ecological differences are especially difficult to address and are often not adequately considered. In the case of a recently approved diamond mine in the Northwest Territories, the EIA failed to provide for either community-directed baseline traditional knowledge studies or community-based monitoring of social, cultural or ecological conditions (Wismer 1996b).

[2]Sargent (Sargent 1996) provides a insightful example of how planning and EIA requirements in one jurisdiction (Ontario) could be integrated.

REFINING EVALUATION ACTIVITIES

Introduction

This chapter assesses the role of evaluation in the EIA planning process. The overall evaluation process is reviewed, together with lessons for EIA evaluation from policy, plan and program evaluation and from site selection. As in Chapter 7, the analysis provides the basis for criteria that are then applied to Canadian EIA guidelines (both generic and proposal specific) and to ten EIA examples.

Evaluation addresses both alternatives (relative differences) and the proposed undertaking (absolute acceptability). It is also extended to encompass the evaluation of the EIA planning process (and its consequences) both during and subsequent to the completion of the EIA planning process. Ideally, the tools of evaluation should be used to evaluate the field of EIA and its actual and potential role within and relative to other forms of environmental management.

Evaluation, in common with other EIA activities in the EIA planning process, has fallen short of the ideal in EIA practice. Again, a recent survey of EIA practitioners is instructive (Sadler 1995). Only 3% and 19% of respondents respectively assigned excellent or good effectiveness ratings to the treatment of evaluation in EIA practice. A full 27% of respondents assigned poor ratings and a further 6% assigned very poor ratings. These ratings are comparable to those assigned to impact prediction and less favourable that those assigned to screening, scoping, report preparation and review. Evaluation is concerned with providing clear, consequential information to decision-making. The responses that addressed the perceived success of EIA in addressing this objective were as follows: - very successful (15%), moderately successful (44%), marginally successful (25%) and unsuccessful (8%). As is clearly evident from the above, there is substantial room for improvement in the treatment of evaluation in the EIA planning process.

The role of evaluation in the EIA planning process is first addressed by defining evaluation and other key related concepts. An overview of major evaluation steps in the EIA planning process is then presented. The implications of the qualitative versus quantitative evaluation procedure debate, as derived from an article by the writer on the subject (Lawrence 1993), are highlighted in this overview.

Evaluation, although a central element of the EIA planning process, is not as fully developed and applied as would be desirable (as evident from the survey results noted above). Evaluation has been pursued in some depth in planning and policy and program analysis. Many of the sources cited in this chapter are drawn from the fields of plan and program evaluation. Notwithstanding this shared knowledge and methods, there are decided differences in the scope and orientation of EIA evaluation and plan and program evaluation. Lessons for the EIA planning process, from plan and from program evaluation, are highlighted as a further means of refining evaluation activities.

A substantial level of effort has been devoted to the evaluation of locational choices in the EIA planning process. The siting of locally unwanted land uses (LULUs) has received particular attention in the EIA evaluation literature and substantial resources in EIA practice. Arguably the siting of LULUs is the "leading edge" of evaluation activities in the EIA planning process. An overview of evaluation implications of site selection approaches, methods and experiences, with particular reference to the siting of LULUs, is presented. This overview highlights the findings of a previously published article by the writer (Lawrence 1996).

Finally, by drawing up the analyses noted above, criteria for assessing EIA evaluation activities, are formulated and applied to both EIA guidelines for Canada and for the ten provinces and to ten examples of EIA reports.

Defining Evaluation

A clear definition of evaluation is an essential first step toward the refinement of evaluation activities in the EIA planning process. Although many sources were reviewed, none provided a fully satisfactory definition that included all the major attributes of the concept. It was, however, possible to construct a composite definition. Most characterizations of evaluation describe evaluation as assessing or appraising choices. Assessment appears to encompass three elements 1) analysis (obtaining, organizing and measuring data) 2) valuation (significance determinations and value judgments) and 3) integration (aggregating and resolving incommensurables) (McAllister 1980; Lichfield, Kettle and Whitbread 1975; Lichfield 1996; Voogd 1983; Hobbs 1985). It is already evident, from this first step toward a definition, that evaluation is an umbrella concept that incorporates and supplements analysis, interpretation and integration (addressed in Chapter 7) within a larger conceptual framework. This framework is further refined in Chapter 9 with the addition of impact management.

Evaluation tends to be depicted as an open (in the sense of shaping and being shaped by external influences, most notably political and public representatives), learning (adaptive to change and progressively improving) process that is served through the application of methods (Faludi and Voogd 1985; Lichfield, Kettle and Whitbread 1975). As noted above evaluation is directed toward choices. These choices can be both absolute (screening of acceptability of alternatives and of proposed action) and relative (comparison of options) (Nijkamp 1985; Lichfield, Kettle and Whitbread 1975). Evaluation is differentiated from decision-making and from decision-makers. Yet it provides an informed basis for decision-makers and integrates the perceptions, preferences, knowledge and judgments of decision-makers and other stakeholders (Hobbs and Voelker 1978; Lichfield, Kettle and Whitbread 1975). Informed choice, in the EIA planning process, means that the products of analysis, synthesis and valuation are conducive to an enhanced appreciation of the social, economic and ecological consequences of available choices (McAllister 1980). The choices addressed by evaluation can apply to different proposal types (e.g., policies, programs, projects, technologies) and can occur at any step in the EIA planning process. Evaluation can be either *ex ante* (prior to proposal approval) or *ex post* (after proposal approval) (Voogd 1983). A further distinction can be drawn between *a priori* (choices not known at outset) and *a posteriori* (choices known) *ex ante* evaluation (Voogd 1983). *Ex post* evaluation can either evaluate the process that lead to the decision (including other forms of evaluation) or the consequences of that decision (through monitoring or post audit assessment).

Taking the distinctions highlighted above, evaluation is defined as *an open, learning process for assessing choices as a basis for informed judgments on the part of interested and affected parties about proposed and implemented actions.*

Any assessment of the role of evaluation in the EIA planning process also entails the use of several evaluation terms or concepts. An overview of these terms (highlighted in Table 29), in combination with the definition of evaluation, sets the stage for the subsequent exploration of the potential role of evaluation in refining the EIA planning

Table 29 - Evaluation Concepts

	Concepts	Summary Definitions
•	Criteria	-principles or standards used to judge or compare alternatives (VHB *et. al.* 1990)
•	Criteria level	-magnitude of each criterion (typically measured in different scales and in different units) (Maclaren 1986; VHB *et. al.*1990; Lichfield, Kettle and Whitbread 1975)
•	Criteria weights	-the relative importance of criteria (Maclaren 1986; Hobbs 1985)
•	Measurement levels	-nominal level - categorization -ordinal level - ranking (interval not specified) -interval level - relative measurement (each of equal measurement) but unknown origin -ratio level - absolute measurement (same as interval but known origin) (Hobbs and Voelker 1978; Elliott 1981; Voogd 1983)
•	Scaling	-transformation of attribute into a measure of value (Hobbs 1985; Hobbs and Voelker 1978)
•	Standardization	-transformation of criteria scores into a common measurement unit (e.g., 0 to 1) (Maclaren 1986; Hobbs 1985; VHB *et.al.* 1990)
•	Ranking	-ordering alternatives or criteria (e.g., A is preferred to B, B is preferred to D) (Canter, Atkinson and Leistritz 1985)
•	Rating	-placement of criteria or alternatives on a continuous scale (e.g., 0 to 10) (Canter, Atkinson and Leistritz 1985)
•	Exclusionary screening	-alternatives must surpass a threshold of acceptability (Hobbs *et. al.* 1984; Hobbs and Voelker 1978)
•	Comparative evaluation	-differences among alternatives considered and preferred alternative selected
•	Qualitative evaluation	-measurement unit unknown; nominal or ordinal level (Voogd 1983)
•	Qualitative comparative evaluation	-an exploration of differences and tradeoffs using reasoned arguments supported by data measured at different levels (criteria may or may not be ranked)
•	Quantitative evaluation	-measurement unit known; interval or ratio level (Voogd 1983)
•	Quantitative comparative evaluation	-data transformed to a common scale and combined mathematically with weighted criteria
•	Dominant alternative	-alternative with as good or better outcomes than remaining alternatives for all criteria (VHB *et. al.* 1990)
•	Decision	-to reach a conclusion; a procedure for applying a universal or pre-given concept (Dekema 1981)
•	Judgment	-to reach a unity of meaning; an event only achieved through dialogue (Dekema 1981; McAllister 1980)

◆

process.

The Evaluation Process

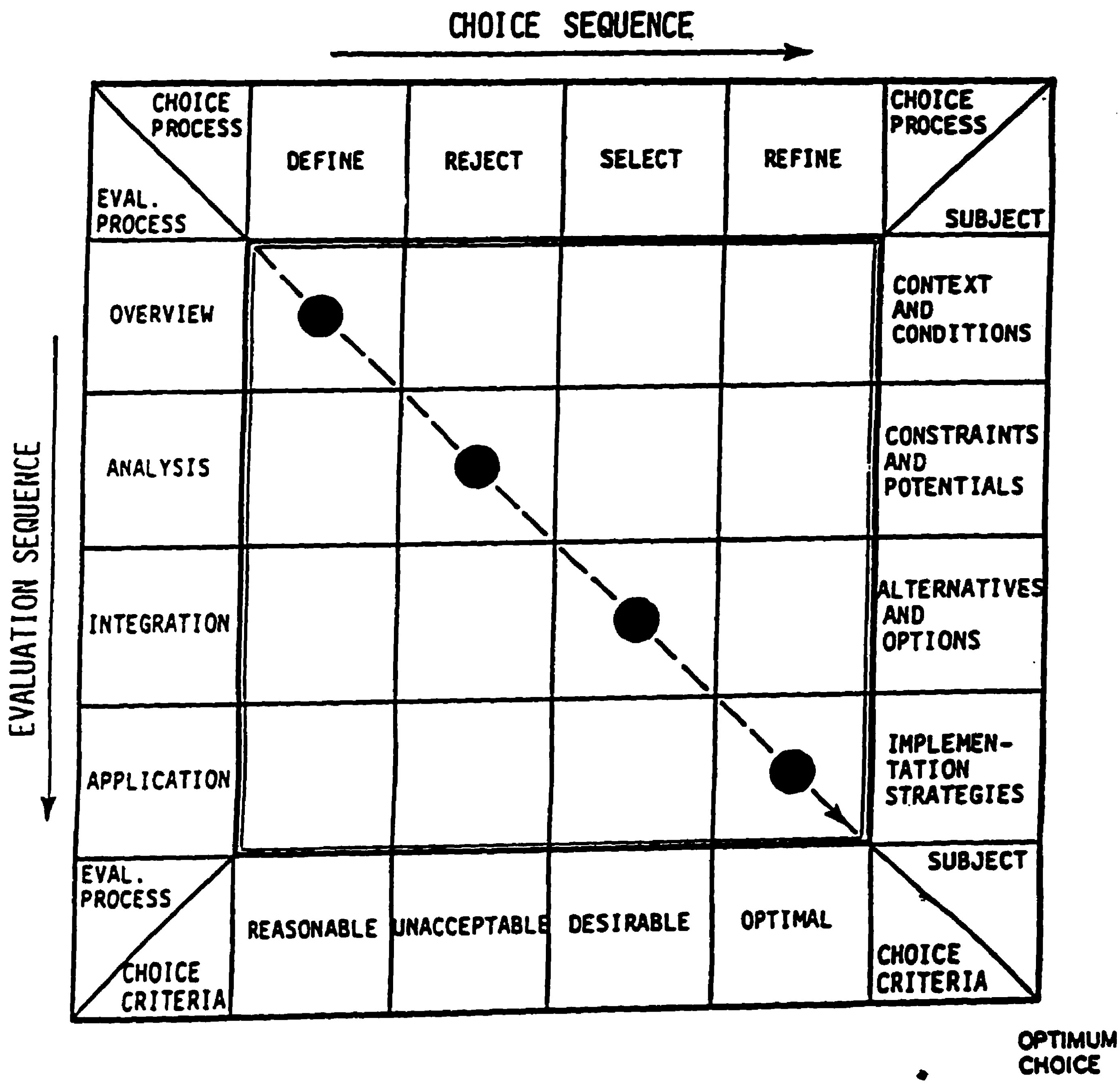
Introduction

Evaluation in the EIA planning process plays a key role in systematically exploring a solution space - a space defined through problem definition. Goals and objectives direct the search process. Potential choices (or alternatives) are identified and evaluated. Goals and objectives are refined into criteria that, in turn, are applied to the evaluation of alternatives. Alternatives can be assessed in terms of both absolute acceptability and relative desirability. The application of criteria requires the consideration of differences in impact magnitude (often addressed through the scaling of impacts) and impact importance (often addressed through criteria ranking and weighting). Impact magnitude and importance can be considered separately and then integrated or viewed as an integrated whole.

The process of generating and evaluating alternatives tends to be an iterative process that occurs at several levels of details. Typically an EIA planning process would first address broad generic alternatives (i.e., basic approaches for meeting the identified need), then consider locational options (e.g., alternatives areas, sites, corridors and routes) and finally address impact management choices (e.g., with respect to design, operations, mitigation, after use, monitoring) At each level the process tends to be one of a progressive narrowing of choices coupled with a concomitant increase in the level of detail. This relationship is illustrated conceptually in Figure 20. As depicted in Figure 20 the evaluation - choice process, at each level of detail, tends to occur sequentially as follows: define reasonable alternatives through an overview of context and conditions; reject unacceptable alternatives through an analysis of constraints and potentials; select a desirable alternative through the integration of impact magnitude and significance differences among alternatives and for options within alternatives; and, optimize the selected alternative through refinements expressed in implementation strategies and extended through application.

A priori evaluation culminates in the determination of whether the preferred alternative (or more likely a combination of alternatives) is or are acceptable even after passing various screening steps and after demonstrating

Figure 20 - Evaluation and Choice Sequences in the EIA Planning Process



a preference over all other alternatives considered. If a proposal is considered acceptable evaluation, (*ex post*) evaluation continues, expressed through monitoring and auditing.

The major steps in the evaluation process, as highlighted above, include; problem/opportunity definition, formulation of goals, objectives and criteria, alternatives generation, the screening of alternatives, impact scaling and criteria ranking and weighting, comparison of alternatives, proposal acceptability, and post approval evaluation.

An overview of each of these steps is provided in the following sections, with the exception of post approval evaluation. Post approval evaluation (i.e., monitoring and auditing) is addressed in Chapter 9. The evaluation process, as described above, largely parallels the rational planning model (see Chapter 4). Accordingly then, much of the discussion regarding the characteristics, strengths and limitations of rational planning and its alternatives, can be extended to the treatment of evaluation in the EIA planning process.

Problem/ Opportunity Definition

Problem/opportunity definition in evaluation means that the point of departure is an acknowledgement that there may be a gap between what is and what should or could be (VanGundy 1988; Lichfield, Kettle and Whitbread 1975). The task then becomes one of understanding the gap (including the determination of whether there is a gap) and characterizing the gap (i.e., the problem or, to view it from a positive perspective, the opportunity) (Bardwell 1991).

Problem/opportunity characterization means confronting such basic questions as - Does the problem gap or opportunity exist? Is it measurable? Is it necessary to solve the problem or take advantage of the opportunity? Are the required resources available to address the problem or opportunity? Is the problem or opportunity within your sphere of influence? (VanGundy 1988). If these questions are not addressed at the outset, time and resources can be wasted in pointless initiatives.

Once the issue of whether the problem or opportunity merits action has been adequately addressed, attention can then turn to problem characterization - another often poorly performed task in the EIA planning process and in other related fields. As one commentator notes, ninety per cent of problem solving entails 1) solving the wrong problem, 2) stating the problem so it cannot be solved, 3) solving a solution, 4) stating problems too generally, and 5) trying to get agreement on the solution before there is agreement on the problem (International Associates 1986). How the problem or opportunity is defined will determine the solutions considered, whether any solutions are practical, how the potential solutions are evaluated and the quality of solutions that emerge from the evaluation process (Bardwell 1991).

In light of the above, a systematic approach to problem definition or opportunity is essential. EIA activities such as scoping, analysis, interpretation and evaluation can contribute procedures and methods. Direct multi-stakeholder involvement, through scoping, can greatly expedite problem definition. The procedures employed will vary depending on the problem/opportunity type (e.g., well structured, semi-structured , ill-structured) and on many contextual considerations (e.g., number and type of decision-makers and other stakeholders, constraints on the generation and choice of alternatives) (Lichfield 1996; VanGundy 1988). Alternative problem or opportunity definitions may need to be considered. A flexible, experimental approach is usually desirable (Carroll 1982).

Problems and opportunities are often complex and multi-faceted (i.e., an array of subproblems or sub-opportunities, rarely arranged in a tidy hierarchical structure). An open (to stakeholders), creative and systematic approach to problem or opportunity definition requires the explicit consideration of such issues as problem or opportunity structure, information requirements to characterize problem(s) or opportunity(s), problem or opportunity level at which intervention is appropriate, suitability for ready-made solutions and links between problem(s)/ opportunity(s), and context (Bardwell 1991; VanGundy 1988). Often problem/opportunity definition will require several iterations. Particular care should be taken to ensure that problems or opportunities are not defined too narrowly (Quade 1975) and that potential solutions are not introduced too early (i.e., stave off solutions) (Bardwell 1991). Implicit assumptions and overly narrow and superficial problem/opportunity definition are less likely with broad stakeholder involvement and explicit, systematic problem definition procedures. EIA practitioners should exhibit a heightened sensitivity (i.e., reflection-in-action, metacognition) to the assumptions and preconceptions that guide actions during problem/opportunity definition (Brown and De Loche 1978; Schon and Rein 1994). The output from problem/opportunity definition should be a logically structured problem/opportunity characterization (preferably a consensus across stakeholders) that will, in turn, provide a touchstone for the identification of goals, objectives and criteria and for the generation and evaluation of alternatives.

Goals, Objectives and Criteria

The tendency in the EIA planning process is to move directly to criteria formulation. This tendency should be resisted. Evaluation goals should logically flow from problem definition. Once the problem is characterized it should be possible to identify, initially in broad terms, the major aspirations (i.e., the goals) for addressing the problem. The objectives provide more specific direction and the criteria are used to assess if and the extent to which objectives can be achieved by potential and proposed actions (Stauth, Sowman and Grindley 1993). The objectives guide the process (McAllister 1980). The criteria structure the screening and comparison of alternatives.

Goals, objectives and criteria should be clear, should encompass issues raised through public and agency consultation and should focus on sensitive and significant environmental components (VEC, VSC) (Lichfield, Kettle and Whitbread 1975). Criteria should be favoured that directly address potentially significant impacts over indirect and partial measures, even if the latter are more readily obtainable and /or are at a higher measurement level (Quade 1975).

The tendency in planning, and to an even greater extent in the EIA planning process, is to formulate a single list of goals, objectives and criteria, subdivided by environmental component. This approach begs the question - whose goals? Different segments of society are not likely to be equally affected by alternatives. A consensus across stakeholders regarding both criteria and the ranking of criteria may also be difficult to achieve. It then becomes necessary to decide how best to address value differences and inequities in the distribution of positive and negative impacts. These issues, although often not explicitly addressed in the EIA planning process, have been considered in plan evaluation. Possible approaches to address these issues include: attempting to reach a consensus across stakeholders (possibly with the use of conflict resolution procedures); formulating separate criteria for each stakeholder (each alternative would be successively evaluated against each stakeholder groups' criteria); formulating separate social equity criteria; preparing a composite list of criteria and then addressing different perspectives through alternative criteria rankings (to be used as sensitivity analyses); disaggregating criteria (by time period, by spatial division, by groups) so that tradeoffs across groups could be explicitly identified and addressed (Voogd 1983); and formulating alternatives that specifically address the perspectives and priorities of each of the major stakeholders. Stakeholder preferences should be a primary consideration in the determination of both the criteria and the means by which value conflicts and social equity concerns should be addressed.

A second problem area in the identification of goals, objectives and criteria concerns how best to address interactions among criteria. The tendency, in both planning and in the EIA planning process, is to produce lists of criteria with little if any reference to interactions. Some of the distinctions drawn in Chapter 7 are instructive. The problem definition can take the form of a conceptual or quantitative model. The model identifies and characterizes a need or opportunity (a shortfall between the present and a desired future) for which some form of public or private action appears warranted. The problem definition model identifies and characterizes the problem within a broader systems context. Goal, objective and criteria formulation extend the problem definition by identifying and characterizing ecological, social and economic system components that could potentially impinge on or be affected by any actions to meet the identified need or opportunity. Key interrelationships between the problem and environmental systems components and among environmental components could be identified and characterized, with a particular emphasis on concerns bearing on sustainability and identified through agency and public consultation as VECs and VSCs. To derive goals, objectives and criteria in this manner means that the process does not occur in the abstract. Boundaries (temporal, spatial, ecological, administrative) should be defined (as pointed out in Chapter 7). Regional, community, resource and ecological overview data should then be collected and analysed at a level of detail sufficient to identify and interpret broad characteristics, patterns and vulnerabilities over time and space. This overview data base can also facilitate the generation of alternatives, as described in the next subsection.

The goals and objectives provide a general structure to the process of counterbalancing the drive to resolve the problem and the need to maintain and enhance other related environmental components. The criteria represent the means of assessing the individual and collective repercussions to the system(s) of alternative means of resolving the problem(s). Both absolute (screening) and relative (comparative) criteria can be formulated. The absolute criteria would exclude alternatives that either fail to adequately address need and/or that result in unacceptable individual or cumulative impacts. The determination of unacceptable impact levels will become easier as our ability to derive and apply sustainability indicators is enhanced. The relative criteria could also stem from a systems level understanding, focusing on key potential impacts and interrelationships, again from a sustainability perspective.

The approach described above is admittedly conceptual. Further refinements will be required. Nevertheless, it should be possible to identify and structure evaluation criteria in a manner that is conducive to an understanding and consideration of critical environmental interrelationships. Not to do so would mean that such interactions are only considered, if at all, after the consideration of alternatives. Thus if serious system level impacts are identified for the preferred alternative, those impacts can only be addressed through mitigation and/or by turning down the proposal. Had such concerns be introduced early in the evaluation process, by means of criteria derived from an environmental systems perspective, it might have been possible to both avoid such impacts and to meet the identified need.

Generation of Alternatives

Alternatives identification tends to receive limited attention in the EIA planning process. The tendency is simply to list the obvious alternatives. In some cases the alternatives are defined and a brief rationale is offered. With many project types (e.g., highways, transmission lines, landfills) the alternatives considered are often drawn from a standardized list. Additional alternatives are added when identified by agencies and through public consultation.

This approach falls well short of what could and should occur (Patton and Sawicki 1993). As noted earlier in this chapter, evaluation activities in the EIA planning process tend to be staged. A different range of alternatives can be considered at each stage. At the first stage broad generic approaches to problem resolution are considered (Westman 1985). Once a preferred approach or generic alternative is selected locational alternatives are often considered next. The final stage involves the assessment of options available at the preferred location, usually associated with preventing or minimizing potential adverse impacts (e.g., mitigation, operations, closure, monitoring, afteruse). Although this staged approach to alternatives generation is an improvement over the simple listing of alternatives it is still too open ended regarding which alternatives should or should not be considered.

What is required instead is a staged, systematic exploration of the solution space, guided by an appreciation of system characteristics and key environmental components and interrelationships (VECs, VSCs) and informed by an active dialogue among stakeholders (Quade 1975). The search process can be focused by culling out potential alternatives that do not address need or cannot be implemented (Anderson 1979). A particular effort should be made to identify alternatives that are likely to satisfy need, reflect stakeholder values and interests and adhere to sustainability requirements. As in problem definition, a creative and experimental approach to alternative identification is preferred.

Screening of Alternatives

Screening involves the elimination of unacceptable alternatives using absolute or exclusionary criteria (Finsterbusch 1981). Screening helps focus the evaluation process on a small number of alternatives.

Alternatives should not be screened with just a brief summary rationale. Screening criteria should be defined and a clear rationale should be provided for each criterion. In this way screening criteria are consistently applied to each alternative. With screening criteria there should be a clear threshold for acceptability. Each alternative should clearly pass or fail the exclusionary test. Consideration should be given to mitigation potential before alternatives are dropped from further consideration. It is possible that an alternative might be modified in a manner that satisfies the exclusionary screening constraint but still meets the identified need. If there is any doubt the alternative should be retained and considered further. In view of the inherently arbitrary nature of screening, it is preferable if there is a consensus across stakeholders regarding both the screening criteria and their application. If circumstances change through the course of the planning process, it may become necessary to reconsider particular screening criteria or their application to specific alternatives. It is wise to select screening criteria and to apply them in a manner that is highly insensitive to such potential changes.

To this point the description of the screening of alternatives has proceeded as if the same approach, types of criteria and methods can be used regardless of context. Clearly contextual adaptations will be required. Environmental setting is likely to be especially important. Operating from sustainability principles and armed with sustainability criteria and a sound general knowledge of pertinent environmental systems and points of vulnerability, it should be possible to screen alternatives that, for example, may threaten the ecological carrying capacity, may lead to significant, irreversible impacts on VECs and VSCs or, more broadly, may detract from rather than contribute to sustainability objectives.

Impact Scaling and Criteria Ranking and Weighting

Once unacceptable alternatives are screened from consideration, there will often remain several alternatives.

A comparative evaluation will be required in order to select a preferred alternative. Usually there are many criteria. Sometimes these criteria are subdivided (e.g., indicators). The data by criterion may also be disaggregated spatially, by time horizon and by group. In most cases the criteria are measured in different ways and at different measurement levels. The criteria are rarely equally important. The amount of information requiring consideration can be intimidating, the issue of amalgamating incommensurables can be troublesome and variations in criteria importance can be problematic.

These issues can be addressed, to some degree, by creative approaches to data display and the consideration of tradeoffs. Summary tables and matrices can be used. Criteria can be screened out where there is no or the same impact for all alternatives. Criteria differences can be considered sequentially (e.g., by groups) as can alternatives (e.g., successive paired comparisons). Depending on the number of criteria and the alternatives, together with stakeholder preferences, these procedures may suffice to provide a systematic basis for comparing alternatives and justifying evaluation preference judgments. Often, however, the complexities resulting from multiple alternatives, criteria, stakeholders and a diverse array of qualitative and quantitative data point to the need for additional decision-making aids. It is at this point that impact scaling and criteria ranking and scaling may be helpful.

Impact scaling addresses the issue of data incommensurability. Scaling is the transformation of an attribute (a measures of impact) into a common measure of value (e.g., impact magnitude ratings) (Hobbs 1985; Hobbs and Voelker 1978). Scaling levels are derived through standardization (i.e., the transformation of impact levels, in different metrics, into a common measurement unit) (Maclaren 1985; Hobbs 1985; VHB *et. al.* 1985). An ordinal impact magnitude scale qualitatively defines scaling levels ranked in order of importance (e.g., major moderate, minor, negligible, low impact). A separate definition is provided for each scaling level for each criterion. Quantitative (i.e., interval or ratio data) scaling requires a quantitative mathematical transformation (e.g., a mathematical formula is applied that results in all impact magnitude levels falling between 0 and 1). Scaling helps to illuminate the underlying structure of data (Massam 1988b). It also reduces the likelihood of unsubstantiated and inconsistent interpretations regarding impact magnitude. There is a price attached to scaling - information loss. By focusing on scaling level differences the subtleties of raw data characteristics and differences are no longer considered. Moreover, although scaling leads to a greater level of consistency in evaluation, scaling procedures are, to varying degrees, inherently arbitrary.

Criteria ranking and weighting proceed from the appreciation that not all criteria are equally important (Cohen and Marks 1975; Voogd 1983; Canter, Atkinson and Leistritz 1985). Criteria, or groups of criteria, can, therefore, be ordered from most to least important (i.e., an ordinal level of measurement). Criteria weighting involves the application of mathematical procedures that derive criteria weights at a ratio or interval measurement level. Criteria ranking and weighting is advantageous because it helps ensure that impact importance differences are consistently addressed. There are, however, inherent (usually implicit) assumptions associated with criteria ranking and weighting. Such procedures tend to assume that facts (impacts) and values (impact importance) can and should be separated, values can and should be ordered in the abstract at the outset of comparative evaluation, stakeholders know their generic value preferences with precision, value preferences can be aggregated across stakeholders and value preferences will remain constant through the evaluation process. As with impact scaling criteria ranking and weighting are arbitrary and sacrifice information in the interest of consistency.

In determining if and how impact scaling and criteria ranking and weighting are to be applied, it is important to bear in mind the associated tradeoffs highlighted above. Additional assumptions tend to creep into the application of such procedures. The assumption tends to be made that a higher level of measurement is always preferred to a lower level of measurement. The choice of measurement level should reflect the data characteristics and the stakeholders' level of confidence and degree of consensus regarding value ordering. In some cases the application of impact scaling and criteria ranking and weighting procedures is driven more by the input requirements of comparative evaluation procedures, favoured by evaluation analysts, than by the requirement to help stakeholders reach sound evaluation judgments on their own terms.

The choice of whether and how to scale impacts will depend on a variety of considerations including the nature of the data, understanding by and preferences of stakeholders, availability of benchmarks and the number of criteria and alternatives (Canter, Atkinson and Leistritz 1985; Massam 1988b). Impact scaling represents a procedure for systematically addressing impact magnitude. With any form of impact prediction errors and uncertainty are inevitable.

Data standardization can add new errors and uncertainties as well as compound errors and uncertainties present in the data. Provision should be made for errors and uncertainty by, for example, the use of sensitivity analyses, impact prediction ranges, conservative assumptions, and the innovative application of techniques for addressing uncertainty, such as fuzzy logic in combination with computer based expert systems (Lein 1993; Massam 1988b). Reference should be made to the techniques for addressing complexity, risk and uncertainty.

Impact scaling and criteria ranking and weighting represent a potentially useful set of procedures for enhancing the comparative evaluation of alternatives. At the same time these procedures involve many explicit and implicit assumptions and the serious potential for information loss, distortion and the creation of barriers to stakeholder involvement. There is also a considerable danger that the choice of methods will be driven by a desire for an elegant "rigorous" (a questionable term in this context) evaluation rather than by a genuine desire for an open and informed evaluation procedure, operating within the context of a broader vision of a sustainable future.

Comparison of Alternatives

The comparison of alternatives generally follows the screening of alternatives, although exclusionary criteria may continue to be applied as the level of detail is progressively increased. The comparison of alternatives draws upon impact analysis, interpretation, and synthesis (as addressed in Chapter 7), applies criteria derived from goals and objectives and can be facilitated by impact scaling and criteria ranking and weighting procedures. The obvious purpose of alternatives comparison is to select a preferred alternative. Other less obvious, but often as important, purposes include the justification of and accountability for choices, the inclusion of stakeholder knowledge and preferences and the testing of the implications of different value and impact levels (Voogd 1983).

The comparative evaluation process is frequently staged by alternative type (e.g., generic approaches, locational choices, design and operational choices). Within each stage, especially with route and site selection, once unacceptable alternatives are excluded, alternatives tend to be sequentially evaluated at different levels of detail (McAllister 1980). A large number of alternatives may be evaluated at a broad level of detail. Alternatives that are clearly less desirable (i.e., dominated alternatives) are excluded and the remaining alternatives are subjected to a more intense evaluation (McAllister 1980). These procedures may be repeated several times, with each successive iteration undertaken at a greater level of detail.

Profound tensions exist in EIA literature between proponents of rigour and proponents of relevance. As demonstrated in Chapter 7, this dynamic tension is generally healthy but has lead to overstated positions and some degree of confusion on the part of both regulators and practitioners. The EIA evaluation literature is even more deeply divided but on the subject of qualitative versus quantitative evaluation. Once again positions have been overstated to the detriment of EIA practice. The various dimensions of the debate are explored by the writer in a previously published article (Lawrence 1993). The analysis points out the ascribed advantages and disadvantages of qualitative evaluation procedures, although, in both cases, arguments are overstated.

The writer concludes that, once criteria are identified, data are collected and compiled, and matrices prepared a variety of mechanisms are available to systematically, but qualitatively, move toward reasoned conclusions. It is, for example, possible to simplify the analysis by screening out unacceptable and dominated (i.e., an alternative that is less desirable than another alternative for at least one criterion and less desirable or equal to the other alternative for all other criteria) alternatives, common impacts, impacts where impact levels are negligible in all cases, and criteria that represent double counting. It may then be possible to decompose the analysis. In the case of impacts, for example, differences within and among impact disciplines, or study areas or goal groupings can be progressively addressed. It is also possible to address alternatives in a hierarchical fashion (i.e. address suboptions and variations of the same option separately before major options are compared) or two at a time (Hobbs and Voelker 1978).

Impacts, areas of uncertainty and alternative perspectives can be summarized with tables, maps and graphs. Interrelationships can be illustrated with network diagrams and use can be made of scenarios, analogies, and comparable situations. The basic process is one of systematically moving back and forth between summary materials and detailed data in a progressive review of all aspects of the alternatives and their impacts. As Dekema points out, *the process of resolving incommensurables involves discursive presentation and representation of the various aspects of that situation until the unity of an aspect is seen by the person who must choose. Second, those conditions that help or hinder the first order discursive process must be submitted to criticism that is itself discursive*. (Dekema 1981: 40).

Inasmuch as evaluation and, in turn, decision-making is sociopolitical and is not technical in nature these critical reflections, judgments and discourse should be both within study teams and among stakeholders. Thus small group meetings, workshops, and other public consultation methods can be employed to ensure a broad range of perspectives and insights. Ideally these forums can facilitate understanding, participation, and the resolution of conflicts and equity-related concerns. They would address context-specific values, impacts, tradeoffs and impact management measures.

Methods, such as the above, can address many of the limitations associated with more *ad hoc* qualitative procedures without succumbing to the shortcomings associated with formal quantitative evaluation procedures. The distinction between qualitative and quantitative evaluation procedures is not as sharp as might first appear. Criteria can, for example, be ranked and alternatives rated by impact without then combining the two mathematically. The rankings and ratings can instead be used as inputs to the systematic qualitative evaluation of alternatives.

It is also possible that formal methods can be used to supplement (but not substitute for) systematic qualitative procedures. They may, for example, assist in the identification of a non-inferior set of alternatives (Hollick 1981). They may also be useful for individuals and relatively homogeneous groups to facilitate their deliberations (Hobbs 1985), for analysis within disciplines and possibly as a cross check and a mechanism for undertaking sensitivity analyses. Although such procedures may be helpful in a supplementary sense, they should not be viewed as necessary for evaluation and should never be viewed as a sufficient basis for decision-making.

Many of the arguments between adherents to qualitative and quantitative evaluation procedures (See Lawrence 1993) parallel those between quantitative and qualitative methods (described in Chapter 1) and again between rationalism and the three other major planning theories, as described in Chapter 4. Once again there is merit in each position but the ultimate resolution goes beyond the discovery of middle ground. There is room for combinations and blendings of qualitative and quantitative evaluation procedures (if properly applied) within broader frameworks, shaped and directed by sustainability visions, principles and requirements.

Extending from the qualitative / quantitative debate, a few general principles can be identified regarding comparative evaluation in the EIA planning process. The comparative evaluation methodology should, from the outset, be clearly defined, understood and supported by stakeholders, and appropriate to the available data, the available alternatives and the decision-making context (Nichols and Hyman 1988; Hobbs and Voelker 1978; Hill 1985). The evaluation process and methods should be logical, explicit and no more complex, costly or time-consuming than is absolutely essential to providing a sound basis for decision-making (Hobbs and Voelker 1978; Shefer and Kaess 1990; Voogd 1983).

Evaluation is an inherently subjective, value-full process. The comparative evaluation should reflect the values of all the people potentially affected, rather than just the values and biases of the evaluation analyst (McAllister 1980; Quade 1975; Dekema 1981). The explicit acknowledgement of subjectivity and the likelihood of bias can contribute to an increased sensitivity to implicit assumptions and biases and unsubstantiated value judgments (Hollick 1981; Hobbs and Voelker 1978). Stakeholders need to be actively involved in the selection of a preferred alternative rather than diverted into, for example, protracted criteria weighting exercises (Nowlan 1974). Early and ongoing public involvement is crucial (Hobbs and Voelker 1978; Elliott 1981; Sager 1981).

The level of aggregation, and the ability to disaggregate, is an important concern. It should, for example, be possible to address differences in the distribution of effects over space, time and among groups (McAllister 1980; Litchfield, Kettle and Whitbread 1975; Lichfield 1996; Miller 1985). Care should be taken to avoid critical information loss, especially with reference to sensitive and irreplaceable environmental components (Hollick 1981).

As previously noted, error and uncertainty are inherent to evaluation. This necessitates numerous sensitivity analyses, the application of more than one evaluation procedure, an appreciation of the strengths and limitations of the methods employed (no method is without bias and flaws), the reappraisal of work undertaken and a generally precautionary approach to impact magnitude and effectiveness interpretations, with and without the consideration of mitigation potential (Hobbs and Voelker 1978; Dickert 1974; Quade 1975; Voogd 1983; Hobbs 1985; Maclaren 1985; Massam 1988b; VHB *et. al.* 1990; Patton 1987; VanGundy 1988).

A host of evaluation methods are available that can potentially be applied for comparative evaluation purposes. The detailed characteristics, strengths and limitations of these methods have been thoroughly addressed in other sources (Massam 1988; Hobbs and Voelker 1978; Maclaren 1985; McAllister 1980; Voogd 1983; Lichfield 1996) and should be carefully considered before individual techniques are applied. Many factors can and should influence the choice of individual evaluation method and method combinations. Table 30 identifies both general requirements for evaluation methods and several considerations that may have a bearing on the final choice of methods.

As with the previously described evaluation activities, comparative evaluation should be conducted in a manner that permits the consideration of interrelationships among impacts, interrelationships among values, interrelationships between impacts and values, cumulative environmental effects and the overall consequence of each alternative for sustainability objectives and priorities.

Proposal Acceptability

There is a tendency in the EIA planning process to assume that if a proposal is preferred over all reasonable alternatives and adverse impacts have been prevented or reduced to the extent practical, then the pre-approval component of evaluation is at an end. Such is not the case. It is still necessary to reach a final judgment regarding whether the proposed activity is acceptable, when compared to baseline environmental conditions (Lichfield 1996).

The obvious component of acceptability is compliance with traditional government requirements and policies (e.g., environmental quality). This element of a proposal acceptability evaluation should have been anticipated from the outset of the EIA planning process. The failure of a proposal to satisfy such requirements will usually demonstrate either a poorly designed and executed EIA planning process and / or government requirements that are too vaguely defined and instead take the form of a case-by-case assessment.

In addition to addressing compliance issues, it is necessary to consolidate the overall advantages and disadvantages of the proposed action, relative to baseline conditions (i.e., the null alternative), and present them in a form suitable for a final determination by decision-makers, with input from all stakeholders, regarding whether the proposed action should or should not proceed.

With public proposals it should also be necessary to assess the net advantages and disadvantages of the proposal, in light of public sector objectives and priorities, and relative to other potential public sector expenditures. This suggests the need for some form of social cost-benefit analysis.

For public and private proposals, ideally an integrated environmental management system should be in place, that can provide the basis for assessing proposal acceptability on such grounds as cumulative effects implications and

Table 30- Selecting evaluation methods

General Requirements

- comprehensive (all relevant factors) (Dickert 1974; Stuart 1978; Shefer and Kaess 1990; McAllister 1980)
- focused (on major tradeoffs, on major public issues, on VECs) (Stuart 1978)
- systematic (replicable, traceable) (VHB *et. al.* 1990)
- practical (feasible, ease of use, operable, quick) (Hobbs 1985; Stuart 1978; Shafer and Kaess 1990; Cohen and Marks 1975; Wallenius 1975)
- clear (explicit, transparent, understandable, intelligible outputs) (Hill 1985; Stuart 1978; Voogd 1983; Wallenius 1975; Shefer and Kaess 1990)
- efficient (not unduly expensive) (McAllister 1980; Stuart 1978)
- effective (valid, reliable, insightful, usefulness of information, provides sufficient basis for informed decisionmaking) (Voogd 1983; Cohen and Marks 1975; Wallenius 1975)
- open (conducive to public and agency involvement) (Hyman *et. al.* 1988; Won 1989)
- legal conformity (McAllister 1980; Won 1989)

Considerations Influencing Choice

- purpose to be served and problem type (Hobbs 1985; VHB *et. al.* 1990)
- economic or more than economic
- single or multi-objectives
- acceptability of options and/ or proposal an issue
- measurement level (nominal, ordinal, interval, ratio) for impacts and for criteria (Voogd 1983)
- spatial dimension (Voogd 1983)
- treatment of time preferences (Shefer and Kaess 1990; Hill 1985)
- number of alternatives (Voogd 1983)
- number of criteria (Voogd 1983)
- conducive to screening (McAllister 1980)
- conducive to dominance analysis
- number of steps (decision points) in planning process (Hill 1985)
- values vaguely or precisely defined
- values likely to change during planning process
- optimum seeking or satisficing (Shefer and Kaess 1990; Hill 1985; Nijkamp 1985)
- need for disaggregation (Voogd 1983)
- single or multiple decision-makers (Voogd 1983)
- number of stakeholders (Hill 1985)
- moral issues (e.g., equity) a concern (Shefer and Kaess 1990; Hill 1985; Stuart 1978; Westman 1985)
- internal or external evaluation (Voogd 1983)
- extent of political or public involvement (Won 1990; Hill 1985; Shafer and Kaess 1990)
- stochastic or deterministic (Voogd 1983)
- degree of uncertainty (Voogd 1983; VHB *et. al.* 1990)
- available resources (money, expertise, time) (Voogd 1983; McAllister 1980; Cohen and Marks 1975)
- available benchmarks
- results compared to other methods (Hobbs 1985)

implications for the realization of sustainability objectives. The longer the delay in constructing at least the semblance of such a system, the more likely that proposals will continue to be approved that further diminish the potential to realize such objectives in the future.

As noted early in the chapter, evaluation does not end with proposal approval. Post approval forms of evaluation (*ex post* evaluation), as expressed through, for example, monitoring and effectiveness auditing, are addressed in Chapter 9.

Lessons from Plan, Policy and Program Evaluation

Plan Evaluation

The preceding analysis, although focusing on evaluation in the EIA planning process, has drawn quite heavily on plan evaluation literature. Many of the same themes apply. However, the orientation in plan evaluation is somewhat different. The themes and issues raised in plan and program evaluation are especially topical for contemporary EIA, with the increased emphasis on the evaluation of policies, programs and plans (i.e., SEA).

The most obvious difference between plan and EIA evaluation is that much more attention is devoted in plan evaluation to problem definition, the formulation of goals and objectives, the generation of alternatives, plan acceptability and post approval refinement and adaptation (Stuart 1978). Other notable differences include the greater emphasis placed in plan evaluation on: the distribution of benefits and impacts by group (Hill 1968; Lichfield 1996); a vision of a desired future as an evaluation benchmark rather than on the selection of a discrete alternative that has the least negative impact; evaluation as a multi-stakeholder, value-full process, conducted in an inter-organizational setting (Voogd and Faludi 1985; McAllister 1980); the illumination of decision-making dimensions and conflicts rather than a single minded pursuit of the best alternative (Voogd and Faludi 1985; McAllister 1985); evaluation as a pervasive process rather than as a discrete activity (Lichfield 1996); problems as complex, multi-faceted and ill-defined requiring multi-layered, loosely defined and incrementally applied amalgams of policies, proposals, strategies and projects (Lichfield 1996; Hopkins 1984); and the application of certain evaluation procedures (e.g., planning balance sheet, goals achievement matrix) that are rarely applied in the EIA planning process.

The themes cited above have not gone unrecognized in the EIA planning process. However, because they have received greater emphasis in plan evaluation, the EIA planning process can apply many insights from plan evaluation that can further enhance the EIA planning process.

Policy and Program Evaluation

Policy and program evaluation has evolved as a largely separate field of analysis and application, distinct from both EIA and plan evaluation. Although these fields share much common ground there are important orientation differences that merit consideration. Program evaluation, for example, in common with plan evaluation, does not jump immediately to alternatives and criteria. A vital element of program evaluation is the reassessment of needs (Herman, Morris and Fitz-Gibbon 1987). Particular care is also devoted to an enhanced understanding of the implications of contextual factors before program objectives are either determined or assessed. The latent environmental and decision-making implications associated with the choice of program objectives is also appreciated.

Program evaluation tends to have a greater appreciation of the multi-causal nature of planning and decision-making. Environmental outcomes are not simply the result of the proposed action. A multiplicity of independent (intervening) variables will influence both the environmental outcome and the manner in which a program is executed (Talen 1996).

Program evaluation assesses program efficiency and effectiveness. It encompasses evaluation prior to implementation (both required and anticipated), during implementation (from the perspectives of participants and affected non-participants, as reflected in perceptions and as demonstrated in behaviour) and subsequent to implementation (through the analysis of documentation, perceptions and behaviour) (Talen 1996; Alexander and Faludi 1989). It also includes with and without comparisons and actual versus planned performance comparisons (Patton and Sawicki 1993). This multi-component, multi-phase orientation contrasts with the largely *a priori* orientation of EIA evaluation activities. Increased emphasis is now being placed in the EIA planning process on *ex post* evaluation, although largely with regard to monitoring and continency measures. The parallel to program evaluation is an auditing effectiveness analysis (both during and subsequent to approval), a necessary but rarely undertaken EIA evaluation activity (Sadler 1996).

Program evaluation tends to place a high premium on rigour and research. Boundaries are set, a formal study design is prepared, target populations are identified, a control study is established, formative research, pilot and feasibility studies are undertaken to address design and control gaps, and a monitoring system is established (Herman, Morris and Fitz-Gibbon 1987). Similar themes have been identified for EIA analysis (Chapter 7), most notably through the work of Beanlands and Duinker (Beanlands and Duinker 1983). Such themes are much less evident in EIA evaluation literature, except for the somewhat dubious references to rigour by the proponents of quantitative evaluation methods. Program evaluation would appear to have much to teach EIA evaluation regarding the balancing of rigour and relevance through the course of the evaluation process.

Program evaluation explicitly considers implications for and from related policy and program areas. It also assesses organizational process and structure implications resulting from programs (Dello 1985). The institutional arrangement implications for EIA is a largely neglected area (Smith 1993) that could greatly benefit from the insights of program evaluation.

Both plan and program evaluation have grappled with the difficult issue of defining success. The most superficial view of success is proposal approval. A somewhat broader perspective is the achievement of goals. This latter perspective is more evident in planning than in the EIA planning process because, as previously noted, goals and objectives are rarely formulated in EIA evaluation. Program evaluation assesses outcomes, both intended and unintended (Herman, Morris and Fitz-Gibbon 1987). In some cases there will be positive, unintended consequences (Alexander and Faludi 1989). These consequences can also be considered indicative of program success but should, in conjunction with negative, intended outcomes, result in program refinement. EIA evaluation can benefit from this broadened and more complex view of program consequences, success and failure.

Uncertainty is a major consideration in plan and program evaluation. EIA evaluation treatment of uncertainty tends to focus on method input uncertainties (i.e., impact magnitude and values). With program and plan evaluation, the consideration of uncertainty is broadened to address context, intervening variables, related decision-making areas and general societal and stakeholder values (Dello 1985; Hickling 1985).

Program evaluation employs numerous models. Examples include goal oriented, decision-oriented, responsive (e.g., to participants), evaluation research (e.g., focus on cause-effect relationships), advocacy and utilization-oriented (Herman, Morris and FitzGibbon 1987). The search for a single ideal evaluation model is still a pervasive EIA preoccupation. The appreciation, in program evaluation, of the merits of multiple perspectives, models and methods (the same theme is addressed in Chapter 4 with regard to planning theories) can be extended to EIA evaluation (Rossi and Freeman 1985).

Program evaluation directly addresses the question of program acceptability both prior to and after program approval (Lichfield 1985). EIA tends to have a single decision point (i.e., should the proposal be approved or not approved?). Program evaluation assesses the program during implementation and can significantly modify or even terminate the program (Herman, Morris and Fitz-Gibbon 1987). This recognition of the continuity of decision-making has potential implications for the EIA planning process, especially for SEA and for multi-component and multi-phase projects.

Lessons from Site Selection

Site Selection Approaches and Methods

Site selection has been a popular subject within environmental planning and management literature in recent years. There has been a tendency, in that literature, to advocate a single approach (e.g., volunteer communities) or a single method (e.g., a particular quantitative evaluation procedure) to the exclusion of all others. This section highlights the major conclusions of a previously published analysis of the subject by the writer (Lawrence 1996). The analysis addresses siting from a conceptual and from an applied perspective. Both site selection approaches and methods are considered. A siting approach is the broad strategy for designing and conducting a siting process. Methods are more specific techniques and procedures. Methods fit within the framework established by the approach. The conceptual analysis characterizes three major siting approaches and identifies a range of site selection methods. These methods encompass such site selection components as groundwork, site selection process, project characteristics, stakeholder involvement and implementation. The applied analysis uses a series of ten waste facility siting management examples to identify positive and negative lessons for using and adapting site selection approaches and methods.

The analysis begins by identifying a series of unacceptable siting approaches. Table 31 highlights these approaches and provides summary reasons for rejection. Three major siting approaches are identified - the environmental suitability approach (ESA), the social equity approach (SEA) and the community control approach (CCA).

The ESA is predicated on a rational planning process and model (as addressed in Chapter 4). Alternatives are progressively identified, screened and compared (Anderson and Greenberg 1982). An ESA seeks to minimize adverse and to maximize positive consequences. The ESA represents a marriage of rational planning (Altshuler 1965; Faludi 1973), land suitability mapping (McHarg 1969; Hyman 1984) and various qualitative and quantitative evaluation methods (McAllister 1980) (See earlier in this chapter).

The focus of the SEA is procedural and substantive fairness (Lang 1990; Morell 1984) - one of the major concerns of the socio-ecological planning theory model as described in Chapter 5. Procedural equity pertains to fairness in the planning process, especially for groups and interests traditionally under-represented in planning and decision-making. Substantive equity is concerned with the fair distribution of facilities and of benefits and costs among stakeholders and over space. The SEA is a reflection of an ongoing concern in planning with social (Harvey 1973) and distributive justice (Rawls 1971), equitable service provision (Lucy 1985) and the application of equity-related principles (Krumholz and Forester 1990). It also encompasses the moral basis of site selection as land use and resource decision-making (Beatley 1994), the environmental justice implications of siting (Wenz 1988) and the environmental world views evident in site selection stakeholder perspectives (Marvin, Lodwick and Dunlap 1992).

The CCA is premised upon a high degree of process and outcome control by interested and potentially affected individuals, groups and communities. As such it demonstrates a similar orientation to the political economic mobilization planning theory discussed in Chapter 4. Outcome control embraces both facility location and facility characteristics and operation. The CCA falls within a long tradition in planning directed toward citizen empowerment. It is a tradition exemplified by advocacy (Davidoff 1965) and radical planning (Friedmann 1987) and by efforts to

Table 31 - Unacceptable Siting Approaches

Approaches	Reasons for rejection
Least resistant communities	It is unethical if a community is selected because it is likely to offer a low level of resistance. This approach may contribute to social, human health and environmental compromises and may burden a community already subject to severe social and environmental stresses and reduced levels of community control (Bullard 1990). This approach pertains to communities with minimal ability to protect their own interests. It is important not to patronize a community by undervaluing its ability and desire to decide what is in its own best interests.
Decide, announce, defend	A closed, top-down, process denies the public's right to be involved in the planning of projects which could significantly affect them. This approach is also technically biased. It fails to use local environmental knowledge or to acknowledge the central role of values and judgement in planning and decision-making.
Do nothing	If there is an established need, there can be serious environmental consequences associated with no action, especially if "proven" alternatives are available with significant environmental benefits. Do nothing is environmentally and socially unacceptable if it means environmentally problematic sites must remain open, facility upgrading is inhibited and regulations cannot be tightened (Kasperson 1985; Gerrard 1995).
Indefinite deferral	This approach is the same as the do nothing approach if prospects for a more suitable alternatives are limited (e.g., premised upon fundamental societal restructuring) and there is a high degree of uncertainty regarding if and the extent to which possible future alternatives will meet or diminish need. This approach can lead to "false hopes" and to the perpetuation of environmentally unsuitable or marginal methods.
Ad hoc	An unstructured, untraceable planning process is procedurally unacceptable. A process is unacceptable if there are basic inconsistencies or biases or if the selected site is less suitable than rejected areas and sites (Massam 1993). Interpretation, conclusions and the public role must be clear and substantiated.
Environmentally unsuitable	A siting process is unacceptable if it results in an environmentally unsuitable site. In such cases minimally acceptable environmental conditions must be well defined and consideration must be given to mitigation potential before a final decision is made. Environmental requirements must not be traded off. Such sites are unfair to the environment and to the host community. They also have negative implications for environmental sustainability and represent a potential risk to present and future generations.
No environmental siting criteria	A siting process lacking in environmental siting criteria is unacceptable if there is significant potential for adverse environmental effects associated with the facilities to be sited. Unless environmental criteria are included, it will be unclear if minimum environmental and social requirements are satisfied.
Unnecessary facilities	Unnecessary facilities are those that fail to serve a well defined public purpose or private market opportunity and which can result in significant adverse environmental effects. Such facilities should not be considered where other alternatives are available (e.g., *demand control, regulatory requirements, more effective enforcement*). Unnecessary facilities result in avoidable environmental effects and unwarranted intrusions on communities.
Blueprint siting process	A blueprint siting process involves the rigid application of a standardized approach, stages, activities, criteria and methods, notwithstanding contextual differences. Such approaches fail to recognize that the siting process must be designed to suit facility characteristics, environmental characteristics and public and agency concerns and preferences. To do otherwise is likely to result in unnecessary environmental and social consequences. An inflexible approach fails to recognize that the site selection "state of the art" is evolving rapidly, involves a large number of possible approaches and has not identified proven "preferred" approaches for all contexts.
Detailed site investigations of all possible locations	It is not economically viable to conduct detailed site investigations for all potentially suitable areas and sites within a regional study area. Any site search process requires a procedure for screening out areas with limited likelihood of being suitable and/or of identifying areas and sites with a high likelihood of being desirable if the process is to be completed in a timely manner. This approach may be acceptable if there are a narrowly defined set of siting opportunities.
Abandonning the responsibility	Cooperative arrangements with other jurisdictions can be a reasonable solution if appropriate environmental control are in place, if sites are environmentally suitable and if there is community understanding and consultation. However, if such is not the case (e.g., ocean disposal, disposal in third world countries), such approaches are unethical.

more explicitly address the roles of power (Arnstein 1969; Forester 1989) and politics (Meyerson and Banfield 1955; Benveniste 1991) in planning.

There are numerous subsets associated with the three approaches as highlighted in Table 32. There are many positive and negative tendencies associated with the three site selection approaches, as detailed in Appendix Tables A-15 and A-16. The identification of tendencies, rather than absolute advantages and disadvantages, is necessary because of subset and contextual variations. It is also possible to deliberately avoid and reduce such tendencies. The three siting approaches can be combined and integrated, as illustrated conceptually in Figure 21. Although many siting combinations are possible, not all combinations are appropriate. Site selection approaches should be designed to suit different classes of situations and further modified to reflect individual decision-making conditions. The characteristics and the positive and negative tendencies of each approach should be recognized, as well as the means to enhance positive and to offset negative tendencies. Table 33 highlights good and poor matches of approach and context for these approach types.

The implicit assumption to this point has been that facility siting success or failure depends on the approach or approach combination, the match between approach and contextual characteristics and adjustments to offset negative tendencies and to enhance positive tendencies. However, site selection approaches are applied and refined through the filter of site selection methods. Site selection methods, as highlighted in Table 34, include: the groundwork that precedes the siting process; the siting process steps; the interactions between process and project characteristics; public, political and agency organizational and involvement procedures; and implementation. The characteristics and application of site selection methods can strongly influence both the site selection process and its outcomes.

Appreciating that each siting experience is, in part unique, ten siting experiences were reviewed. All ten involve major public waste facilities in Canada. Positive and negative lessons regarding the potential role of site selection approaches and methods were highlighted.

Implications and Lessons

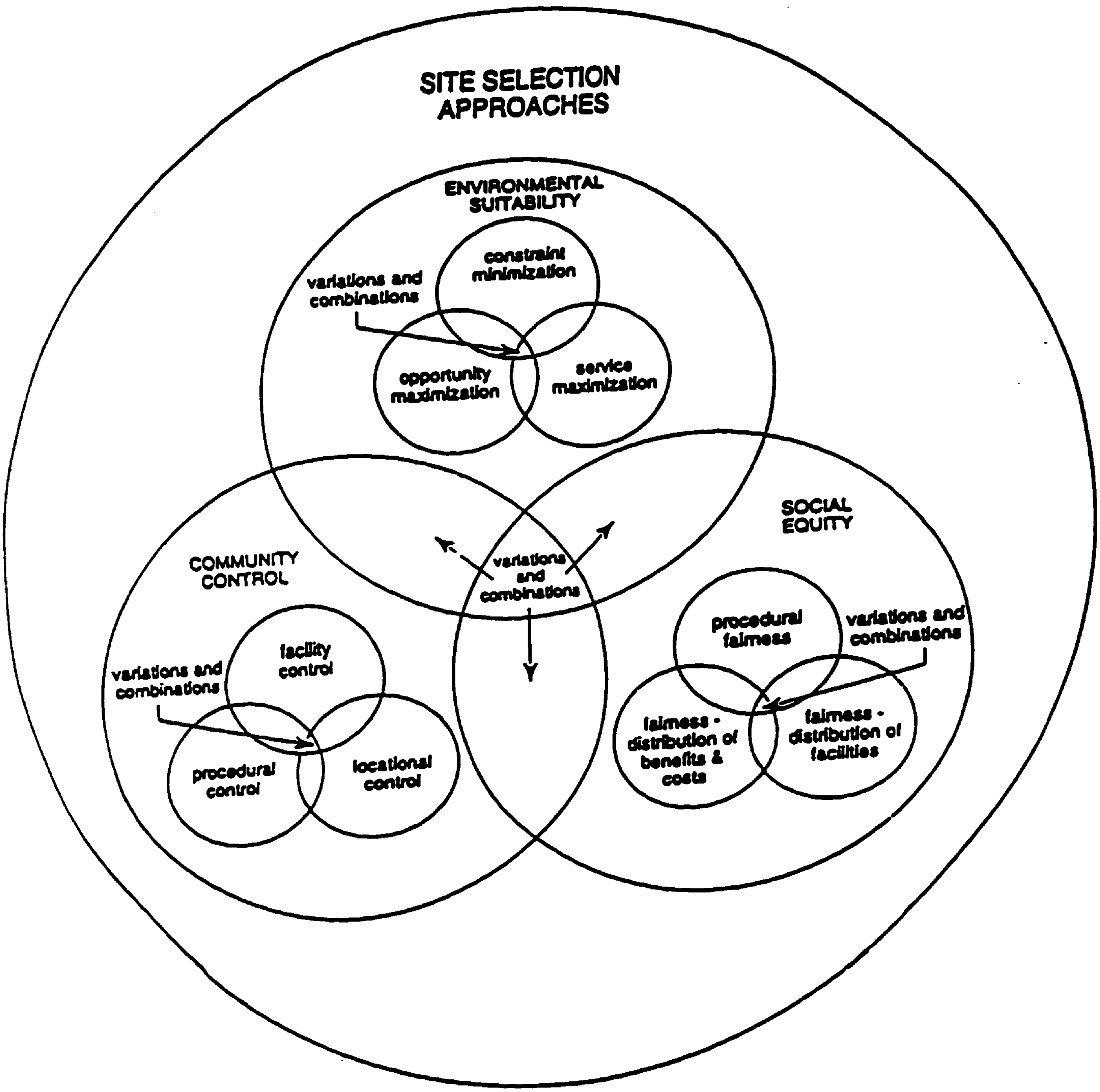
The ten examples do not provide a basis for selecting a single preferred approach. Collectively they are

Table 32 - Major Siting Approaches and Subsets

Environmental suitability	**Social equity**	**Community control**
Constraint minimization • area screening/identification • site screening/identification • site comparison	*Fairness - distribution of facilities* • unfair locations • fair locations	*Locational control* • voluntary communities/local veto • voluntary site vicinity • voluntary sites • voluntary access routes • combinations of above
Opportunity maximization • physical suitability • existing facilities • site rehabilitation • compatible land uses • available lands • performance standards - private bids	*Fairness - distribution of costs and benefits* • avoid imbalances • redress imbalances • redistribute to more than redress imbalances	*Procedural control* • citizen siting authority • siting partnerships • citizen advisors • use of third parties
Service maximization • service to facility • service from facility	*Procedural fairness* • participant/intervenor funding assistance • conflict resolution/ consensus building • community involvement	*Facility control* • needs analysis • policy/program options • alternative technologies • systems characteristics • facility characteristics • facility management
Variations and combinations • evaluation methods • project type • proponent type • impact management methods • environmental context • siting requirements • combinations	*Variations and combinations* • procedural fairness & location distribution fairness • location distribution fairness & and fairness in distribution of benefits & costs • procedural fairness & fairness in distribution of benefits & costs	*Variations and combinations* • locational/procedural control • procedural/facility control • locational/ facility control • locational/procedural and facility control

(Lawrence 1996)

Figure 21 - Site Selection Approaches



(Lawrence 1996)

Table 33 - Matching Approach and Context - Site Selection Approaches

Match	Environmental suitability	Community control	Social equity
Good match	The ESA tends to be especially suited to regulatory environments that require the rigorous evaluation of alternatives and to a political environment that favours such siting approaches. The ESA is particularly conducive to settings where significant environmental effects are likely without the systematic evaluation of physical constraints and opportunities. The ESA is appropriate when significant environmental differences among siting choices are likely.	The CCA tends to be more suited to situations where environmentally acceptable sites are readily available within voluntary communities, where a range of voluntary communities are likely, where environmental differences among shortlisted communities and sites are likely to be limited and where a central location is not essential. It is helpful if community support within the voluntary community is consistent and if access route and community effects are likely to be limited.	The SEA is highly suited to situations where social equity is a primary political and public concern. It is appropriate in situations where adverse impacts can be offset through compensation and where bargaining is a practical strategy. With multiple facilities it is helpful if adverse environmental effects can be readily avoided or mitigated, if convenient service is essential, if approvals can be readily obtained, if there is a low level of political or public opposition and if there are no major cost penalties associated with multiple facilities.
Poor match	The ESA is less appropriate in homogeneous environments, especially those where significant environmental effects can be readily avoided. The ESA tends not to work well where social equity, community acceptance and local control are the primary political and public concerns and where a highly technical approach is not a regulatory expectation or requirement.	The CCA can be more problematic if the range of environmentally suitable areas and sites is likely to be limited and if the environmental differences among shortlisted areas and sites are likely to be significant. The application of a CCA can be greatly hampered when there are major divisions within potential host communities or when regulatory authorities expect a highly technical approach.	The SEA is less suited to situations where health risk concerns dominate, where basic value conflicts are evident and if it is difficult to compensate for potential effects. A multiple facility system is not conducive to situations where major environmental effects and differences are likely, where service, transportation and equity are minor concerns, where future market and service conditions are highly uncertain, where significant cumulative effects are likely, where community opposition is likely to be high and where the approval process is onerous.

Table 34 - Site Selection Methods

Ground work	*Legacy*	• procedures to overcome negative associations with past processes and existing facilities • methods to build upon positive siting experiences and facilities • efforts to reconcile political conflicts that may hamper the siting process
	Need	• initiatives, preferably at the planning and policy level, to determine if facilities are required
	System and institutional planning	• planning of the institutional systems that will implement and regulate potential facilities • procedures for determining the type, number, role and regional distribution of potential facilities • procedures for designing and adapting the siting process to suit the ecological, social, cultural, economic and political context
	Alternatives to project	• methods to identify, screen and compare generic alternatives for meeting the identified need (e.g., non-structural alternatives)
	Design of process	• procedures for designing the major stages and components of the site selection process; should involve all major stakeholders • procedures for scanning ahead to consider potential implications of decision rules and to reconsider previous decisions on the basis of new data, positions, values and assumptions
Site selection process	*Study area identification*	• methods for determining the area within which the site search process will be conducted • procedures for incorporating community and natural system level concerns into subsequent siting processes
	Site and area screening	• procedures for progressively excluding unsuitable and less suitable areas and sites • procedures for progressively identifying and assessing areas and sites with high siting potential (i.e., siting opportunities)
	Site comparison	• methods for systematically considering the advantages and disadvantages of siting choices • procedures for incorporating the consideration of uncertainty and conflicting interpretations and positions into the siting process
	Impact management	• procedures for incorporating broad impact management principles and commitments into the siting process
	Site assessment	• methods for determining whether the absolute environmental impacts at the preferred site are acceptable and whether previous site selection stages should be reconsidered
Project characteristics	*Choice of technologies*	• procedures for screening and comparing technologies on the basis of generic and site-specific characteristics
	Mitigation	• procedures for addressing whether and in what ways the site selection decision-making basis changes when the potential for preventing or reducing negative effects is considered

Table 34 - Site Selection Methods

Project characteristics (continued)	*Design and operations choices*	•	methods for identifying, screening and comparing mitigation options and for integrating such analyses into the siting process
	Facility characteristics	•	procedures for establishing the facility characteristics assumptions to be used at various stages in the siting process
Stakeholder involvement	*Public involvement*	•	methods for involving various publics in the siting process
	Institutional arrangements	•	the design and modification of institutional structures and procedures to facilitate the execution of the siting process
	Political involvement	•	procedures for involving elected representatives in the siting process
	Agency involvement	•	methods for conducting technical review and participation by agency representatives for each level of government
Implementation	*Approvals*	•	procedures for anticipating and incorporating approval requirements into the siting process
	Pre-construction and construction	•	methods for considering pre-construction and construction implications of siting choices
	Operations	•	procedures for considering operational implications of siting choices
	Closure/post closure	•	procedures for considering the monitoring and contingency planning implications of siting choices

(Lawrence 1996)

suggestive of positive attributes for composite site selection approaches providing it is appreciated that any siting process should be designed to suit the regulatory, political, social, economic and ecological context (Bolton and Cultis 1990).

An increased emphasis on non-structural alternatives and a clear enunciation of the minimum environmental conditions required by regulators is, for example, essential from the outset (Lake 1993; Heiman 1990; Mazmanion and Morrell 1994; Zeiss and Lefsrud 1995; Lober 1994). The characterization of need (i.e., status quo is unacceptable and facility will improve over the status quo) is crucial (Zeiss and Lefsrud 1995, 1996) and it should be viewed from a broad perspective (e.g., societal, national, regional, community). The view that the preferred solution is to not locate facilities has validity, to the extent it places greater emphasis on alternatives to facilities. However, if a genuine need remains notwithstanding such actions, the alternative is the impacts associated with not meeting the need (Gerrard 1995).

Spatial boundaries should be broadly defined bearing in mind the desirability of including communities and areas likely to volunteer, a diverse array of physically suitable areas and siting opportunities such as heavy industrial areas, surface mining areas requiring rehabilitation, unpopulated areas and major land assemblies. Allowance should be made for the possibilities of inter-jurisdictional, joint public - private and private sector solutions. An environmental overview of the study area can be helpful in focusing the site search on low constraints areas and siting opportunities and in excluding clearly unsuitable areas.

Rather than searching for ideal, least constrained areas and sites, a more realistic combination might be siting opportunities and volunteer communities and sites, located within environmentally suitable areas (Richards 1996; Gerrard 1995). Communities, with a potential to meet more than one need (e.g., co-use, site clean-up) may be especially advantageous. It is preferable not to locate new facilities in areas where social equity concerns (e.g., existing, poorly operated and controversial facilities) are paramount and unresolvable. A screening and selection of communities whose values match the facility type and its effects may be helpful (Zeiss and Lefsrud 1996). The screening of voluntary communities and sites for environmental suitability and a parallel process to identify siting opportunities and low constraint areas may help to reduce the uncertainties associated with a CCA. Social factors, including attitudes, can also be mapped and combined with environmental suitability mapping (Lober 1995). Care should be take to ensure the financial support for and long term economic viability of any proposed facilities. Impact prevention should be stressed over control, mitigation and compensation (Zeiss 1991; Zeiss and Lefsrud 1996; Lant and Sherrill 1995; Lober 1996). A clear set of impact management commitments, including a compensation package for the host community and facility neighbours, is also desirable (Zeiss and Lefsrud 1995, 1996). The aim should be a win-win solution for the proponent and for the community (Craig 1992). General commitments should be defined at the outset and then refined in direct discussions with the local community and facility neighbours (McGee 1992).

A concerted effort to build and maintain trust among proponents, facility neighbours and the host community is required (Richards 1992; Lober 1996). The involvement of all potentially affected parties should also be facilitated, especially parties unable to effectively represent their interests. Innovative perspectives (e.g., co-operative discourse) and approaches to public involvement (e.g., round tables, stakeholder task forces, panels, focus groups, mediation) are worth considering although care must be taken to avoid structural and procedural pitfalls (Webler, Kastenholz and Renn 1995; Richards 1992). An explicit effort should be made to offset imbalances in the distribution of benefits and costs over space and among population groups (Mazmanion and Morrell 1994; Brion 1991; Zeiss 1991).

Siting success or failure can be strongly influenced by the choice and application of site selection methods. Groundwork deficiencies, such as a failure to enhance the operations of current facilities, to carefully build a rapport with the community and to reconcile political divisions, can undermine any siting effort. If decision-makers and consultants lack credibility public trust will be impossible to obtain (McGee 1992).

The successful execution of the siting process can be stymied by such avoidable site selection process deficiencies as: artificially defined study areas and screening thresholds; inconsistently applied criteria; insensitivity to siting opportunities and to impact management and approval requirements; and a failure to reconsider previous decisions in response to changing assumptions. The effective integration of project characteristics into the siting process can be hampered by: inadequately defined facility characteristics; poorly substantiated technology and facility characteristics choices; limited consideration of the siting implications of mitigation potential and changing facility characteristics; and a failure to keep abreast of technological innovations.

Site selection is inevitably and necessarily a collaborative effort among jurisdictions, between the public and private sectors and among proponents, the public and review agencies (Dear 1992). Although the need for an open and responsive planning process was appreciated in each of the site selection examples, stakeholder involved was inhibited when: the role, structure and conflict resolution procedures of advisory bodies were poorly defined; when responses to rumours and misconceptions were not prompt and thorough; when condescending attitudes and defensive postures were adopted; when insufficient attention was devoted to the pivotal role of local political and community leaders; when unrealistic and arbitrary time schedules were applied; when communications among parties was distorted by misinformation; and when a dialogue with the community was not maintained through the approval process (Bryson, Crosby and Carroll 1991; Richards 1996; Lauria and Soll 1996).

There was a tendency across the siting examples to neglect implementation. Given the significant financial and other resources required to undertake a major siting exercise, more attention should be devoted to such basic implementation considerations as: authority to implement; likelihood of technical approval; economic viability; and senior government political support. Approval requirements should be a central consideration in siting process design. All factors bearing on implementation potential should also be assessed at the outset and periodically reassessed at key decision points in the siting process.

The siting methods lessons highlighted above largely pertain to avoidable pitfalls. Positive experiences can also be adapted and applied in other settings. Circumventing the pitfalls and drawing upon the positive experiences of others should reduce the likelihood of a siting process foundering because of inadequately designed and applied siting methods.

A site selection process is a marriage of approaches and methods adapted to the proposal and to contextual characteristics. It should both draw upon and contribute to the theoretical and empirical bases of the field. Siting can often be facilitated if placed within the framework of broader environmental management strategies that can, at least, partially address such issues as need, alternative systems and major locational preferences. A siting process is influenced by past events and experiences. It is also interdependent with the proposal and proponent type, political and institutional structures and processes, the geographic setting, and natural, social, economic and political forces and systems.

Given the complex nature of these interrelationships, a single ideal siting process neither can nor should emerge. At best, the promise is for a better match between siting approach and method combinations and various settings and setting types. Simplistic solutions and recurrent pitfalls should also be more readily avoidable. Continuing initiatives to formulate and refine conceptual frameworks, to systematically analyse siting experiences and to test, derive and fit approach and method combinations to setting types will be required. As with the other EIA components, the full realization of the potential for enhanced site selection necessitates the integration of siting within broader environmental management frameworks, driven by sustainability objectives and requirements.

EIA Guideline Evaluation

The guidance provided by EIA regulators is an important factor in determining the treatment of evaluation in EIA practice. Appendix Table A-17 lists criteria for guideline evaluation for selected evaluation activities. The criteria were derived from a review of previous sections of this chapter. Appendix Table A-18 defines scaling levels for criteria application. Appendix Table A-19 applies the scaling levels to generic and project specific guidelines for Canada and for the ten provinces. Appendix Tables A-20 and A-21 provide a qualitative application of the guideline evaluation criteria. The major themes resulting from the criteria application are described below.

Overall, the treatment of evaluation in the eleven jurisdictions is anything but consistent. Much of the guidance provided in project-specific guidelines could be elevated to generic guidelines. Consistent with EIA literature, the guidelines are, with a few exceptions, weak on problem definition and on the systematic determination of goals and objectives. Limited methodological advice, with the exception of Ontario, is provided, especially with regard to impact scaling, the ranking and weighting of criteria and concerning screening and comparative evaluation procedures. Ontario, although providing more specific guidance regarding methodology, goes too far with regard to waste management guidelines, by suggested a specific list of criteria, a specific site selection process and a limited range of evaluation and site selection methods. Although specific guidance is desirable, in a performance standards sense, guidance that inhibits innovative approaches and local adaptations may do more harm than good, especially in rapidly evolving subfields such as evaluation and site selection.

Problem definition, with most jurisdictions, is limited to requirements that the project purpose be explained, that a project rationale or justification be provided and that the need or opportunity for the project be addressed. Often these terms are used interchangeably. There are scattered references to broader contextual and policy considerations. Guidance varies regarding factors to include in these analyses. There is only one project-specific guideline (Federal) that directly addresses the need to characterize the problem is a systematic manner.

For the most part the guidelines move directly to criteria, although there are a few scattered references to objectives. There are no references to goals. These references, with the exception of the Quebec guidelines, seem to view objective(s) as a synonym for either project purpose or criteria. Most of the guidelines identify the major disciplines that should be encompassed by the criteria. In several cases reference is made to explaining why the criteria were chosen and, in a smaller number of cases, it is suggested that criteria be defined. A useful approach, applied in a few project-specific guidelines, is to identify specific environmental issues that must be addressed by criteria. Listing examples of criteria may be useful. Providing the criteria that should generally be used, as is the case with one Ontario guideline, is generally inappropriate. With one exception there are no references made to placing goals, objectives or criteria within a broader context. No guidelines refer to to ensuring that criteria reflect stakeholder values or suggest that interactions among criteria should be addressed.

The guidelines generally identify the major types of alternatives to consider. In several cases specific examples of alternatives that must be considered are identified. Worthwhile impact management guidance is provided in a few cases by identifying project components and/or environmental issue areas where alternatives should be considered. In most cases proponents are expected to explain why they identified particular alternatives to consider. With one exception minimal guidance is provided regarding a systematic procedure for identifying alternatives.

Screening of alternatives is acknowledged as an evaluation step by most jurisdictions. In a few jurisdictions examples of screening criteria are identified and the need for substantiation is stressed. In only two jurisdictions, Ontario and Quebec, is slightly more detailed guidance provided regarding the screening process.

Some reference is made to systematically addressing impact magnitude differences by a few jurisdictions when referring to impact predictions associated with the proposed activity. However, impact scaling for an alternatives analysis is only discussed in one jurisdiction (Ontario) and only for one project type (public waste management facilities).

Criteria ranking and weighting, for an analysis of alternatives, is only identified as a possible evaluation aid in three jurisdictions. In all three cases (Saskatchewan, Ontario - waste management projects, Quebec) a rationale for the rankings or weighting is required. There is no mention of interrelationships among impacts.

All jurisdictions assume some form of comparative evaluation of alternatives, although the focus tends to be alternative methods. In all cases there is the expectation that a broad range of environmental criteria will be used for various types of alternatives and that the methods employed and the basis for choice will be substantiated. Further guidance is more variable with scattered references to such matters as an equivalent levels of detail, the consideration of direct and indirect impacts, staged site selection procedures, an analysis on the basis of net or residual effects, and the use of sensitivity analyses to address areas of uncertainty. In one case (Quebec) reference is made to the consideration of alternative futures and to a particular concern with inevitable, irreversible effects. In another (one Federal project guideline) the possible use of comparable experience is identified as a means of refining the analyses. Collectively, these suggestions, if placed in a performance standards format and if coupled with provisions regarding the distribution effects and a general sustainability orientation, would provide proponents with a more systematic basis for proceeding. Care should be taken not to, as is the case with the waste management site selection guidelines in Ontario, define too narrowly the methods that might be used.

Coming to an overall conclusion regarding project acceptability may well be an expectation in all jurisdictions. However, by not stressing the point sufficiently in some jurisdictions, the impression may be left that the issue is more a case of how the proposal may proceed rather than whether it should proceed. The issue is partially addressed through references to such matters as a comparison against the null or do nothing alternative, addressing the implications of residual impacts and adherence to government policies. A few jurisdictions take the matter somewhat further by explicitly referring to project acceptability, stressing the need for public involvement, focusing on harmony with the biophysical and socioeconomic environments and by noting that overall costs and benefits will need to be considered at both the local and broader (e.g., provincial) levels. In only one case (for one Federal project) are details provided regarding the matters that would need to be addressed with regard to overall costs and benefits. Collectively, these guidelines could provide a reasonable basis for assessing proposal acceptability if combined with sustainability requirements and if refined through project specific advice.

All jurisdictions stress the desirability of early and ongoing public involvement. In a few cases types of methods are highlighted in general guidelines. Specific methods to be used are identified in several project-specific guidelines. There are very limited explicit references to public involvement in specific evaluation activities.

The various jurisdictions all, to varying degree, make the point that the evaluation analysis should be clear, focused and substantiated. Although there are some scattered references to sustainability and sustainability type concerns, there is only one case (a project in Manitoba) where the point is made that the proposal will have to adhere to the Province's sustainability policy.

EIA Proposal Evaluation

This section applies evaluation criteria to the ten EIAs. Appendix Table A-22 lists criteria for proposal evaluation for the selected evaluation activities. The criteria were derived from a review of the previous sections of this chapter. Appendix Table A-23 defines scaling levels for criteria application. Appendix Table A-24 applies the scaling levels to the ten EIAs. Appendix Tables A-25 and A-26 provide a qualitative application of the proposal evaluation criteria. The major themes resulting from criteria application are described below.

Overall, there is a considerable gulf between theory and practice. Only one of the ten EIAs considered comes close to thoroughly addressing the criteria. For the most part the EIAs are especially weak in the screening of alternatives, in the use of systematic comparative evaluation procedures and in addressing project acceptability in a coherent manner.

The general tendency is to move directly to purpose, need or opportunity and project rationale. Little attention is devoted to exploring and defining the problem in a systematic manner. Several EIAs do place needed interpretations within a broader context, with specific links to regulatory requirements, general policies, previous studies and related projects and activities.

No EIAs provide a systematic series of goals and objectives. There are a few examples of varying levels of detail for criteria (e.g., criteria groups, criteria, indicators). With many evaluations, especially screening analyses, criteria are informally buried in text. There is also a tendency to list criteria without explanation. Criteria are defined in a few cases and in one case a definition and a rationale is provided for each criterion. Explicit links are not made from criteria to stakeholders nor are interrelationships among criteria addressed.

The generation of alternatives tends to be informal, with the exception of one EIA and for certain site and route selection steps in three other EIAs. The tendency is to list and briefly discuss the alternatives considered. This approach generally begs the question - might there be other possible alternatives that have not been considered? There are many instances, especially with regard to impact management, where there appears to be a possibility of additional options.

Again, with the exception of one EIA and certain constraint mapping route and site selection steps in other EIAs, screening tends to be superficial and informal. The most common practice is to briefly identify a few alternatives, provide a few sentences explaining why the alternatives are unreasonable, and then focus exclusively on impact prediction and management. Even with EIAs containing route and site selection steps (e.g., landfills, transmission lines) the prevailing practice appears to be to skip right through the initial decisions in order to focus on route and site comparison.

Scaling, for the evaluation of alternatives, is only undertaken for three EIAs, with a very limited form of scaling for some suboptions in a fourth EIA. The same three EIAs use criteria ranking and weighting. In only one case is a clear and consistent rationale provided for the rankings.

Several EIAs compare alternatives, although the pattern is often to provide a crude qualitative procedure that mixes screening and comparative evaluation. Only one EIA undertook the comparative evaluation of alternatives in a consistent and systematic way. Curiously, there are three EIAs that contain some relatively consistent and systematic evaluation steps but also contain other more *ad hoc* comparisons. The most common pattern is a qualitative discussion that explains why alternatives are retained or rejected. Occasionally, summary tables are used to support the text but the tables tend to be partial and very abbreviated. The relationship between the text and the tables is also often difficult to discern. It is impossible to determine if these discussions evaluate alternatives in a consistent and systematic manner.

The most common pattern, with regard to project acceptability, is first to address regulatory compliance, then to identify benefits in one place (usually under need and /or under economic impacts) and finally to summarize net adverse effects. The expectation seems to be that if there is a rationale for the project, it is acceptable providing there are benefits and providing adverse impacts have been ameliorated. There are no examples of a systematic trading off of benefits and costs nor are residual impacts linked to carrying capacity or sustainability.

Most EIAs document extensive political and public involvement. However, with the exception of one EIA and certain route and site selection steps with three other EIAs, the tendency is to focus on predicted impacts and their management during public consultation.

Summary and Conclusions

Evaluation and related concepts are defined. The various steps in the evaluation process are described. Lessons from plan, policy and program evaluation and from site selection are presented. Evaluation activity criteria are applied to Canadian generic and project-specific guidelines and to ten EIA examples.

Evaluation is defined as an open, learning process (facilitated through the application of methods) for assessing (analysis, valuation, integration) choices (both absolute acceptability and relative desirability) as a basis for informed (through an enhanced appreciation of social, economic and ecological consequences) judgements on the part of interested and affected parties about proposed and implemented actions (policies, programs, projects, technologies).

The evaluation process encompasses problem definition, the establishment of goals, objectives and criteria, the generation of alternatives, the screening of alternatives, impact scaling and criteria ranking and weighting, the comparison of alternatives, and the determination of project acceptability. The evaluation process should be open, iterative, conducted at several levels of detail and occur both prior to and after decisions. Components of the evaluation process requiring further attention include problem definition, goal and objective setting, the systematic generation of alternatives, the assessment of distributional implications and the consistent and systematic treatment of impact magnitude, importance and uncertainty. Care should be taken to appreciate the positive and negative tendencies of qualitative and quantitative evaluation procedures, together with appropriate approaches for blending methods. Criteria, screening procedures, comparative evaluation procedures and proposal acceptability decisions should be consistent, explicit and substantiated.

Plan, policy and program evaluation can provide useful insights concerning evaluation activities that have been neglected in EIA evaluation. Most notably, these other forms of evaluation point to the complex, uncertain, value-full and multi-faceted nature of decision-making environments and the consequent need for multi-layered, loosely defined and incrementally adjusted responses. Plan, policy and program evaluation also demonstrate that evaluation is an ongoing activity (that continues after initial decisions), that is closely linked to institutional arrangements and that requires suites of blended methods adjusted to context.

The overview of site selection approaches, methods and experiences demonstrates: the danger of ideal models, uncritically accepted and unadjusted to local circumstances; the importance of blending theories and methods; the need to draw upon empirical analysis to identify positive experiences and potential pitfalls (a pragmatic perspective, consistent with pragmatism as a planning theory); the central role of interorganizational institutional arrangements and shared decision-making with affected parties; the need to place greater emphasis on "front end" planning, especially with regard to the issues of need and non-structural alternatives; the importance of risk perceptions and of procedural and substantive equity; and the value of a proactive and positive EIA approaches and methods as a counterbalance to technical impact minimization procedures (a further illustration of the planning theory debates addressed in Chapter 4).

EIA guidelines in Canada provide a very uneven, and frequently limited, framework for evaluation analyses in EIA. For most of the criteria groups, a pooling of the guidance provided, restructured in a more systematic, performance standards format, augmented in a few key areas, and extended through project specific guidelines, would greatly enhance the treatment of evaluation in EIA practice.

The EIAs tend to contain an uneven mix of explicit and implicit, substantiated and unsubstantiated assumptions and judgments. The assumptions tend to be especially weak with regard to alternatives generation, alternatives screening and the comparison of alternatives. It is often difficult to identify bias or distortion with such muddled evaluation approaches. Sustainability is rarely a consideration. There are no examples of the full integration of a sustainability perspective.

It is not surprising, given the limitations regarding EIA guidelines, that the EIAs fare so poorly against the evaluation criteria. The only example of an EIA where evaluation is undertaken systematically is in Ontario. Ontario provides more systematic guidance regarding the evaluation of alternatives than do other jurisdictions. Unfortunately, Ontario offers very limited guidance regarding impact prediction, interpretation and management. These discrepancies reinforce the need for a greater pooling of EIA expertise at the regulatory level, at the applied level and between the regulatory and applied levels.

Further refinements in evaluation activities can build upon planning theory insights (Chapter 4) together with perspectives, frameworks and methods derived from EIA analysis, significance interpretations, cumulative effects assessment (Chapter 7) and a range of efforts to derive practical approaches to apply sustainability principles (Chapter 5). Ultimately, the most important role for EIA evaluation activities will be to evaluate the EIA field. Difficult questions need to asked and answered regarding if and in what form the EIA planning process should be applied to address environmental, and more broadly, sustainability problems and issues. Are there more efficient or effective instruments available to further sustainability? How might EIA be reconstructed within broader environmental management frameworks? EIA can potentially provide valuable evaluation insights and methods for addressing these fundamental questions.

REFINING IMPACT MANAGEMENT ACTIVITIES

Introduction

This chapter refines impact management activities in the EIA planning process. Impact management encompasses mitigation, compensation, monitoring, auditing, public involvement and conflict resolution. EIA implementation is also addressed. As in Chapters 7 and 8, the analysis provides the basis for criteria that are then applied to Canadian EIA guidelines (both generic and proposal specific) and to ten EIA examples.

Impact management can help prevent, reduce and offset negative impacts and enhance benefits. Potential contributions to the EIA planning process include more accurate forecasts, reduced uncertainty, a more complete evaluation of alternatives and proposed actions, improved decision-making and an increased likelihood of regulatory and community understanding and acceptance (Wlodarczyk 1990). Effectively applied impact management measures should result in more efficient resource use, a better fit between proposed actions and the environment and a higher level of environmental protection and enhancement. Table 35 lists and defines major impact management terms used in this analysis.

EIA impact management activities fall well short of their potential. Practitioners, when asked to assess the adequacy of the institutional framework for EIA, provided the following poor / very poor ratings: legal/policy basis (22%); scope of application to development activities (22%); requirements for compliance (29%); procedures established for conduct of assessment (34%); technical guidelines (50%); provisions for public scrutiny and participation (32%); consistent impartial administration (33%); links to decision-making (35%); enforceable terms and conditions (36%) and requirements to undertake monitoring (45%) (Sadler 1996).

As if evident from the above, although the basic regulatory requirements are in place in most jurisdictions, more detailed implementation-related EIA activities tend to be much more poorly performed. This pattern is also reflected in responses regarding influence on decision-making, where the following marginally influential and no influence ratings were assigned: establishing terms and conditions for development approval (24%) and ensuring appropriate arrangements in place for verifying implementation (57%), monitoring effects (57%) and managing unanticipated impacts (73%). The preceding suggests that the norm tends to be little to no post approval control and

Table 35 - Definitions of Impact Management Terms

Components		Definitions
Mitigation	•	measures to prevent, avoid, reduce or rectify potential adverse impacts (ELUCS 1980; Armour 1987)
Compensation	•	payments in cash or kind to redress or offset negative impacts that occur despite mitigation (Armour 1987; ELUS 1980)
Monitoring	•	repetitive measurement of environmental values to detect changes caused by external influences (Duinker 1985; Beanlands and Duinker 1983; Krawetz 1981; Wlodarczyk 1990)
Contingency Measures	•	aid in detecting and providing timely responses to potential problems and unanticipated impacts (Armour 1987)
Auditing	•	a systematic, documented, periodic and objective review of monitoring results (EPA 1986a)
Post Audit Analysis or Evaluation	•	determination of actual impacts relative to objectives and forecasts for the purpose of EIA enhancement (Culhane 1993; Munro, Bryant and Matte-Baker 1986; Bisset 1984)
Community Involvement or Participation	•	effective, two-way communications and joint problem-solving, involving the proponent and interested and affected parties, to identify and resolve concerns and issues (Armour 1987; Praxis 1988)
Impact Management	•	all of the above

enforcement, especially with regard to the management of unanticipated impacts (Sadler 1996).

The same survey reinforces the view that the state of practice leaves much to be desired in monitoring cumulative changes on an ecosystem or regional basis (55% - very limited) and in the performance of monitoring (56% - poor / very poor), the surveillance of terms and conditions (56% - poor / very poor), impact management (44% - poor /very poor) and environmental auditing (47% - poor / very poor). (Sadler 1996). A further 30% had no opinion regarding environmental auditing because of an insufficient basis of experience on which to judge. Overall, with the exception of mitigation, which fared somewhat better (27% - poor / very poor performance ratings), the state of EIA impact management practice is not nearly what it should be. The performance of impact management activities appears especially problematic during the post approval period. Impact management activities in the EIA planning process clearly warrant further attention.

This impact management analysis begins with an overview of mitigation and compensation objectives, types, processes, principles and priorities. A similar overview is then presented of monitoring and auditing activities and then of public involvement and conflict resolution activities. The integration of individual impact management activities within impact management plans and environmental management strategies is next addressed together with a brief review of the obstacles to and strategies for facilitating EIA implementation. As with Chapters 7 and 8, criteria are formulated and are applied to both EIA guidelines (for Canada and the ten provinces) and to ten examples of EIA reports.

Mitigation and Compensation

Objectives

Mitigation and compensation are directly concerned with avoiding, reducing and offsetting negative impacts (Wlodarczck 1990; Armour 1987), although sometimes reference is also made to enhancing benefits. If properly undertaken, mitigation and compensation facilitate monitoring, enhance facility design and operations, reduce inequities, improve the evaluation of alternatives (through the consideration of net effects) and ensure that the overall benefits associated with a proposed undertaking exceed its costs (Halstead *et.al.* 1984; Erickson 1994; Wlodarczyk 1990). Without the adequate consideration of mitigation and compensation, good environmental proposals may be stymied and environmental impacts associated with approved proposals will be greater than necessary (Halstead *et.al.* 1984; Portney 1985).

Types

The definitions presented in Table 35 distinguish between mitigation and compensation. Occasionally in EIA literature compensation is referred to as a type of mitigation. Mitigation and compensation are treated in this analysis as separate but complementary impact management activities.

Mitigation and compensation methods can be required through government standards, regulations and policies or can be identified during the EIA planning process (CEARC 1988c; Armour 1987). Mitigation and compensation measures are largely determined on a project - environment specific basis during the EIA planning process. Precedents in other jurisdictions and comparable project experience are also important considerations. Mitigation and compensation measures can be applied pre-impact (*ex ante*) or post-impact *(ex post)* (Zeiss and Lefsrud 1995; Hurst and Blank 1992). The U.S. EPA differentiates among measures that avoid (does not take place), minimize (limits magnitude), rectify (repairs, rehabilitates, restores) and reduce (eliminates over time through preservation and maintenance) impacts (Bass and Herson 1993). Other useful mitigation measures distinctions include: structural (e.g., stream improvements) and non-structural (e.g., floodplain zoning) measures (Erickson 1994); measures that involve the modification of facility design, careful site design and layout, environmentally sound construction and operations and closure and post closure modifications (Armour 1987); and on and off-site measures (Armour 1987) (a further distinction can be drawn between measures instituted between the source and the receptor and at the receptor).

Examples of mitigation measures, often associated with projects involving large workforces and significant spin-off impacts (e.g., a major factory or power plant), include project phasing and scheduling and the direct provision of (or funding for) utilities, road improvements, housing, social services and land use planning (Moore 1985).

There are impact-related (community no worse off than before facility), equity-related (redresses unfair distribution of costs and benefits) and financial security or liability compensation measures (Armour 1987; White *et. al.* 1988). Compensation measures can be applied to individuals or to the community. These categories may overlap in practice. The same measure (e.g., a tipping fee) might make the community no worse off, may help redress inequities and may provide funding for emergency response measures. The issue is less one of categorizing measures than of identifying the appropriate mix of measures to match project and environmental characteristics, regulatory requirements and proponent and community preferences.

The appreciation of mitigation and compensation measures depends on project characteristics, area characteristics and proponent, regulator, individual and community preferences. It is generally preferable to: avoid impacts rather than rectify impacts; rectify impacts rather than minimize or reduce impacts (Morris and Biggs 1995; Wlodarczyk 1990); modify the design before making on-site adjustments; institute non-structural rather than structural measures; mitigate at source rather than between the source and the receptor or at the receptor (Morris and Biggs 1995); mitigate direct impacts before mitigating indirect impacts (Armour 1987); mitigate rather than compensate (Armour 1987); mitigate prior to an impact rather than after an impact; exceed regulatory requirements through accepted practice and negotiation rather than simply complying with regulatory requirements; and reach an agreement with potentially affected parties regarding mitigation and compensation measures rather than simply issuing a final position.

Mitigation and Compensation Process

Ideally the mitigation and compensation process should begin with clear direction from EIA regulations and guidelines (Johnston and McCartney 1991; Skaburskis 1988). Guidelines should draw useful distinctions, identify key principles, define regulatory requirements and provide ample examples. Sufficient flexibility should be retained to allow for contextual adjustments.

It is generally best to formulate a mitigation and compensation plan or strategy (Wlodarczyk 1990; Moore 1985). The plan can encompass such matters as objectives, principles, planning process, roles and responsibilities, minimum requirements and potential measures (Wood 1995). Each project and environment is unique. Any mitigation and compensation plan should begin in very broad terms. It then can be progressively refined through the EIA planning process. The final plan should be the product of discussions and negotiations (ideally a consensus) among stakeholders (Wlodarczyk 1990; Moore 1985). Mitigation and compensation are neither independent from nor a single stage within the EIA planning process. Mitigation and compensation considerations and analysis should instead be integrated into each EIA activity (Wood 1995).

Further actions, directed toward the identification, refinement and implementation of mitigation and compensation measures, include: determine the need for mitigation and compensation; identify mitigation and compensation options; screen and compare mitigation and compensation options; select preferred options and determine division of responsibilities; incorporate selected mitigation and compensation options into the analysis of EIA alternatives and into the analysis of the proposed undertaking; clearly define commitments and implementation plan and schedule; integrate individual measures within an overall impact management plan; obtain final formal agreement and approvals; enforce and monitor effectiveness of individual measures; adapt and adjust measures as needed; and audit the mitigation and compensation experience (CEARC 1988c; Moore 1985; ELUS 1980; Wlodarczyk 1990; Wood 1995; White *et. al.* 1985; Erickson 1994; Simpson and Shaheen 1992; Johnston and McCartney 1991).

Principles and Priorities

As highlighted at the beginning of this chapter, monitoring and enforcement tend to be the weakest components of impact management. Measures for the monitoring of mitigation and monitoring effectiveness should be clearly defined, implemented and effective (Johnston and McCartney 1991). Vague language in EIAs, along the lines of "consult with", "study further", "prepare a plan", "strive to protect", "monitor the problem" and "submit for review", often signals likely ineffectiveness (Bass and Herson 1993).

Monitoring of mitigation and compensation effectiveness is essential because of the difficulty in both predicting future conditions and in estimating the likelihood of effectiveness. It is generally best to adopt a conservative approach (i.e., the precautionary principle), select resilient strategies, focus on major causal pathways and stress the protection of human health and the minimization of impacts on the most vulnerable and most significant environmental components and interactions (Elliott 1984; Morris and Biggs 1995; Beanlands and Duinker 1983; Erickson 1994). Facility design should be undertaken with mitigation and monitoring in mind (Glasson 1995). Responsibilities should be clearly defined, consistent with the polluter pay principle. Absolute limits and requirements should be specified and adhered to (e.g., no net loss of natural capital, safe minimum standards, in-kind compensation for resource loss) (Sadler 1995). Community-developed approaches to formulating and implementing mitigation and compensation measures can be especially effective (Baxter 1996).

The valuation of the future (e.g., inter-generational equity), the extent to which mitigation and compensation measures can address perceived impacts and the division of responsibility for the mitigation of cumulative effects on an area-wide basis (ELUS 1980) require further attention.

Monitoring and Auditing

Objectives

Monitoring and auditing can: establish a baseline conditions data base, distinct from impacts (Wlodarczyk 1990; Spellerberg 1991; Woodley 1996b); test impact predictions and contribute accurate impact predictions (Tomlinson and Atkinson 1987; Duinker 1985; Sadler 1996; Culhane 1993; ECE 1990; Marcus 1979); warn of unanticipated adverse impacts, sudden changes in trends and environmental conditions reaching critical levels (Marcus 1979; Krawetz, MacDonald and Nichols 1987; Duinker 1985; Wlodarczyk 1990; Sadler 1996; Walker and Bayliss 1995); ascertain whether mitigation measures have been implemented and determine their effectiveness (Marcus 1979; ECE 1990; Bass and Herson 1991; Sadler 1996; Duinker 1985; CEARC 1988c; Wlodarczyk 1990; Culhane 1993); provide a basis for compliance enforcement against regulator requirements and terms and conditions (Krawetz, MacDonald and Nichols 1987; Allison 1988; Sadler 1996; Bass and Herson 1991); assess the need for compensation and determine the validity of compensation claims (ECE 1990; Armour 1988; Duinker 1985); assess the efficiency and utilization of impact management administrative procedures (Sadler 1995); contribute to decision-making by staff and politicians (Bass and Herson 1991; Culhane 1993); enhance community credibility (public assurance) by, for example, demonstrating that commitments have been met and impacts have been maintained at acceptable levels (Krawetz, MacDonald and Nichols 1987; Culhane 1993); provide data for area-wide monitoring efforts, especially with reference to the assessment of cumulative environmental effects and sustainability implications (Sadler 1996; Morris and Biggs 1995); and contribute to enhancing the EIA planning process (Kravetz, MacDonald and Nichols 1987; Sadler 1996; Culhane 1993; Munro, Bryant and Matte-Baker 1988).

Monitoring is usually necessary because it is difficult to predict impacts or mitigation measure effectiveness, recognizing, however, that monitoring and feedback arrangements are no excuse for a weak impact prediction effort (Armour 1988). Without monitoring, requirements may not be enforced, unanticipated impacts may not be detected or managed, the public and decision-makers may not be informed regarding project environmental performance, impact forecasts may be vague and inaccurate, ineffective mitigation measures may be implemented, administrative arrangements for impact management may be flawed, system-wide impacts and objectives may be neglected, compensation claims may go unverified and the general state-of-the-art and practice of EIA will advance far more gradually than is necessary (Armour 1988; Kakonge 1996; Walker and Bayliss 1995). Notwithstanding the many good reasons to monitor, the very breadth of potential monitoring and auditing objectives underlines the need to select appropriate objectives, establish priorities among objectives and focus the overall monitoring effort (Kakonge 1994).

Types

EIA monitoring and auditing terminology is far from clear or consistent. Monitoring and auditing are, for example, often used interchangeably. Appreciating this lack of consensus, the following distinctions are drawn for the purposes of this analysis: baseline monitoring - the monitoring of environmental conditions prior to and in the absence of impacts from the proposed undertaking (Sadler and Davies 1988); source monitoring - the monitoring of facility activities that generate impacts (e.g., sources of emissions, effluents, noise) (Duinker 1985; Culhane 1993; EPA 1986a; Wood 1995); effects or impacts monitoring - the monitoring of the environmental impacts resulting from the undertaking (Duinker 1985; Sadler and Davies 1988; Munro, Byrant and Matte-Baker 1986; Wood 1995); integrated or systems monitoring - addresses multiple cause-effect relationships across a range of media and sources; structured on a hierarchical basis (i.e., nested networks), defined at an ecosystem level and oriented toward the determination of ecosystem health (Hicks and Brydges 1994; Woodley 1996; Cairns and Schalie 1980; Singh 1992); sustainability monitoring - similar to integrated or systems monitoring but guided by sustainability principles and requirements (Sadler 1996); and environmental evaluation and hindsight evaluation - compares monitoring results against monitoring objectives as a means of enhancing EIA practice (Munro, Bryant and Matte-Baker 1986; Wood 1995).

Management or contingency measures are the actions taken in response to changes detected through monitoring (Armour 1987). Monitoring can be differentiated from emergency planning. It can be either comprehensive or targeted (Canter 1993). Other useful distinctions include monitoring roles, institutional arrangements for monitoring, monitoring reporting requirements and monitoring funding arrangements (Wood 1995; Krawetz, MacDonald and Nichols 1987).

Monitoring and Auditing Process

Ideally monitoring should be framed within policies, should represent a natural extension of social and environmental indicator systems and areal and program planning and should draw upon experiences obtained with comparable projects and environments (Munro, Bryant and Matte-Baker 1986; Hicks and Brydges 1994; Johnston and McCartney 1991).

There is no standard monitoring or auditing methodology (Wood 1995). Culhane identifies the management model (explicit project objectives, mandatory requirements, impacts to be monitored, on-site management, comparison of outcome against objectives), the adversarial / litigation model (external pressures ensure a satisfactory level of environmental intrusion) and the scientific model (experimental design, hypothesis testing, formal cause-effect linkages, post-approval monitoring to test hypotheses) (Culhane 1993). Woodley refers to the reductionist approach (system broken down into components with each component monitored separately), the threat-specific approach (focused on major potential sources of impact), hypothesis testing (preconceived cause and effect relationships) and the integrated approach (assessment of threats to the emerging properties of the system) (Woodley 1996). Monitoring can also be viewed as an administrative process (clearly defined process steps), an organic form of planning (full integration of environmental principles within decision-making), a technical procedure or a sociopolitical process (Munro, Bryant and Matte-Baker 1986; Krawetz, MacDonald and Nichols 1987). Biophysical impact monitoring models or approaches may not be suitable for socio-economic impacts. The monitoring of social and economic variables may be approached better as an issue oriented, socio-economic process that relies on human intuitive capabilities to sense significant changes (Armour 1988).

Collectively these varying approaches illustrate the need for monitoring to: balance rigour and relevance; ensure an open planning process, respond to external pressures and perceptions; move iterative back and forth between analysis and synthesis; make contextual adaptations (e.g., social as compared to physical variables); focus on VECs and VSCs; and appreciate the administrative - political characteristics of the EIA planning process.

Once a basic framework and general monitoring approach is in place, monitoring objectives can be formulated and a monitoring plan prepared (Spellerberg 1991; Krawetz, MacDonald and Nichols 1987; Johnston and McCartney 1991). The monitoring plan will evolve through the EIA planning process. It can address the design and conduct of activities such as: scoping the analysis (e.g., variables and boundaries); determining data requirements (involves a comparison between an ideal and what is realistic); determining data collection methods; deciding on the location and frequency of data collection; designing monitoring systems and studies; determining how data are to interpreted, presented and approved; and ensuring logistical support (Sadler 1996; Canter 1993; Spellerberg 1991; Marcus 1979). The monitoring system should be designed, with due allowances for uncertainty and natural variation (as established through baseline monitoring), to reflect the anticipated temporal and spatial distribution of impacts (Holling 1978).

The scope of monitoring depends on the type of monitoring to be undertaken (e.g., compliance only, compliance and effectiveness monitoring) and on whether a selective or comprehensive approach is adopted. Other considerations include: legal requirements; significance and sensitivity of environmental receptors; extent of uncertainty associated with environment, proposed actions and mitigation measures; and degree of controversy (Sadler 1996).

A shift in orientation is necessary during the transition from baseline surveys to the main monitoring program

(Spellerberg 1991). With biophysical data such issues as sampling collection and analysis, the conduct of laboratory analyses and data storage and interpretation must be addressed (Canter 1993). Public involvement assumes a more prominent role in the collection and interpretation of socio-economic monitoring data (Armour 1987).

Surveillance, often by regulators or by independent third parties, is necessary to ensure that commitments are adhered to and that mitigation is undertaken as intended (Sadler 1996). Management and contingency measures must be able to respond to unforeseen conditions and events (Sadler 1996). Criteria or thresholds should be identified, where possible, for establishing when management will occur. Consideration should be given to the best way to integrate monitoring data into the EIA planning process, into facility operations, into integrated / systems / sustainability monitoring and into environmental or hindsight evaluation.

Environmental or hindsight evaluation is a relatively recent phenomenon. Environmental evaluation approaches vary. As in monitoring a technical or a scientific approach can be adopted (Munro, Bryant and Matte-Baker 1986). Serafin, Nelson and Butler identify three approaches - 1) descriptive analysis (experts make practical judgements based on objective data analysis); 2) interactive interpretation (not possible to know directly but can make ever improving approximations with the aid of direct experience and reflection-in-action); 3) adaptive evolution (links past and current resource conditions with institutional capability and willingness to address and cooperate) (Serafin, Nelson and Butler 1992). These approaches echo planning theory debates described in Chapter 4 and point to the desirability of systematic yet flexible approaches.

Many evaluation systems have been constructed for evaluating EIA effectiveness (Sadler 1986, 1996; Munro, Bryant and Matte-Baker 1986; Winder and Allen 1975; Krawetz, MacDonald and Nichols 1987; Lee and Colley 1991; Spaling, Smit and Kreutzwiser 1993; Malik 1995; Malik and Bartlett 1993). These systems address, through specific criteria, such concerns as cost effectiveness, goals achievement, suitability of institutional arrangements, scientific rigour, quality of the EIA planning process (overall and by stage), choice and application of methods, decision-making quality, document quality, adequacy of agency and public consultation provisions, quality of environmental outcomes and, most recently, contribution to environmental sustainability (Sadler 1996; Hicks and Brydges 1994; Beanlands and Duinker 1983; Ortolano 1993; Munro, Bryant and Matte-Baker 1986; Wood 1995; Leu, Williams and Bark 1996; Hart

1984; Johnston and McCartney 1991; Winder and Allen 1975; Krawetz, MacDonald and Nichols 1987; Duinker 1985; Day *et. al.* 1977; Gibson 1993).

Principles and Priorities

Monitoring and auditing, to be effective, must be carefully planned and systematically executed. Less of a consensus exists regarding whether monitoring should be planned as a scientific experiment (Rose and Smith 1992; Culhane, Friesema and Beecher 1987; Beanlands and Duinker 1983) or as a planning or management activity (Culhane 1993). A blended approach (rigorous, systematic, practical, context-specific) will likely be appropriate in most cases, although a delicate balancing act may be required.

Monitoring and auditing can be rigorous by treating variables as hypotheses to be tested, by making assumptions explicit, by defining boundaries (temporal, spatial, ecological, administrative), by undertaking both pre-project (baseline) and project / post-project (source and impact) monitoring, by using control communities and environments, by keeping a comprehensive record of monitoring results, by designing field programs to meet statistical analysis requirements and by using systematic procedures to address error and uncertainty (e.g. probability analysis) (Schweitzer 1981; Power, Power and Dixon 1995; Munro, Bryant and Matte-Baker 1986; Duinker 1985; Canter 1993; Burdge 1995). A less rigorous, issue-oriented, approach may be more appropriate for social variables (Armour 1988).[1] Contextual adjustments (project-type, environment-type, impact-type) will always be necessary (Canter 1993; Kakonge 1994).

A management perspective (directed, cost conscious, practical, efficient, effective) can be maintained by using defined objectives (ordered by importance), by selecting reliable indicators, by clearly defining roles and responsibilities, by thoughtfully allocating available resources and by focusing on sensitive and significant environmental components, on environmental components that are most important to decision-makers and on environmental components that are most poorly understood but for which the magnitude of change can realistically be measured (Krawetz, MacDonald and Nichols 1987; Duinker 1985; Elliott 1984; Kakonge 1994). What needs to be known to be make reasonable inferences, the early detection of critical changes (e.g., through the use of indicator species) and understanding natural variability and systems dynamics should be stressed (Munro, Bryant and Matte-Baker 1986; Kagonke 1994).

Monitoring and auditing are more than a blending of management and scientific perspectives. They are also integral elements of the EIA planning process and must be understood by and relevant to decision-makers and other stakeholders, especially the public. Decision-makers and interested and affected publics should be involved in indicator selection and application. Key issues in environmental reporting include - Who does the monitoring (e.g., external evaluation or self-evaluation)? Who decides what is good and what is bad? What are the links to management actions? How shall the system be structured (e.g., units of analysis, scales, time horizons) (Woodley 1996; Wismer 1996a)? Monitoring and auditing results should be readily understood, widely available and directly linked to public and agency concerns and priorities (Krawetz, MacDonald and Nichols 1987; Munro, Bryant and Matte-Baker 1986; Duinker 1985; Wood 1995).

Whenever practical, project monitoring should be nested within integrated monitoring systems (preferably structured on the basis of systematic suites of indicators but also enriched by anecdotal and best available data) and should be directed toward and structured by sustainability perspectives and imperatives (Hicks and Brydges 1994; Sadler 1996; Walker and Bayliss 1995; IJC 1992; Woodley 1996; Wismer 1996a).

The record of undertaking monitoring, in even its most basic forms, is not a good one. Examples of hindsight evaluation are even more rare. There are significant barriers to monitoring and auditing. Some of these barriers, such as knowledge limits, theoretical weaknesses and disciplinary boundaries, can only be addressed incrementally, although the lag between knowledge and practice is often the greater impediment (Krawetz, MacDonald and Nichols 1987; Armour 1988; Wood 1995)[2]. Other obstacles, such a failure to share data, insufficient funding for EIA research, administrative inertia and insufficient resources for monitoring are more directly attributable to poorly developed implementation strategies and a lack of political commitment (Krawetz, MacDonald and Nichols 1987; Duinker 1985; Walker and Bayliss 1995; Acres International Limited 1986). The issue of EIA implementation is addressed later in this chapter.

Public Involvement and Conflict Resolution

Objectives

Many reasons can be advanced in favour of public involvement in the EIA planning process. Arguably, the public has an ethical right to be involved in decisions that interest and affect them, consistent with democratic principles (Howell, Olsen and Olsen 1987; Grima 1977; Hadden *et. al.* 1981; Freudenberg 1983; Priscoli and Homenuck 1986; Gibson 1975). Public involvement also has a value in its own right (i.e., the development of human potential and as an intrinsic experience). Public consultation can lead to greater public understanding, encourage self expression, contribute to self-confidence and competency, foster environmental sensitivity, assist leadership development, facilitate a greater level of interest and involvement in public life and enhance community development (Pateman 1970; Hadden *et.al.* 1981; Gibson 1975; Priscoli and Homenuck 1986).

Instrumental values (i.e., means to achieve another good), potentially furthered by public involvement, include: incorporates the substantive knowledge possessed by the public (Praxis 1988); helps identification of public concerns and values (Priscoli and Homenuck 1986; Hyman *et. al.* 1988); contribution of the more efficient project management by focusing on key issues (Praxis 1988; Hadden *et. al.* 1981; Hyman *et.al.* 1988; Creighton, Chalmers and Branch 1983); broadening of the basis for EIA interpretations and judgements (Freudenberg 1983; Howell, Olsen and Olsen 1987; Hanchey 1983a); contribution of the evaluation of alternatives and to the determination of proposal acceptability; facilitation of communications between proponents and other stakeholders (Howell, Olsen and Olsen 1987); provision of a check on government and on private actions (Hadden *et. al.* 1981); facilitation of better and more effective decision-making (Praxis 1988; Freudenberg 1983; Priscoli and Homenuck 1986); facilitation of consensus building and conflict resolution (Priscoli and Homenuck 1986; Praxis 1988; Hadden *et. al.* 1981; Creighton 1983a; Hanchey 1983) ; and enhancement of political legitimacy (Creighton 1983a; Howell, Olsen and Olsen 1987; Praxis 1988; Priscoli and Homenuck 1986; Grima 1977; Creighton, Chalmers and Branch 1983).

Public involvement is especially vital when important value choices must be made, when the public interest is affected, when people perceive that they have something to win or loose, when the subject is controversial or when agency and public support are desirable or necessary (Praxis 1988). Public involvement can be costly and time consuming. It may even, in some cases, reduce levels of community satisfaction and exacerbate conflicts (Maynes 1989). Nevertheless, it is difficult to imagine circumstances in EIA practice where some level of public involvement would not be warranted. Citizens may, however, make the valid decision not to become involved in EIAs that lack a legitimate sponsor, where decisions have already been made (distorted information or the absence of two way information) or that are characterized by serious procedural weaknesses (Maynes 1989).

The decision about whether to employ conflict resolution procedures is more difficult. The appropriate application of conflict resolution procedures can provide a forum for addressing divergent perspectives, contribute to greater procedural and substantive equity, reduce costs (e.g., hearings and litigation), resolve concerns and disputes, lead to better decisions, facilitate approval and enhance support (Harashina 1995; Campbell and Floyd 1996).

Conflict resolution procedures can be either inappropriate or unlikely to succeed when; there are value or principle differences, when there are a large number of interests involved, when important public policy precedents may be set, when a balance among parties can not be achieved, when important parties, or their representatives, have not or cannot be identified, or when significant parties to the process have neither the desire nor need to negotiate (Amy 1990; Cormick 1987; Sadler 1990b; Armour and Sadler 1993; Jeffery 1990; Emond 1990). Explicit criteria for determining if and when conflict resolution should be instituted are preferable. Examples include: parties and representatives have been identified (Rodwin 1982; Shrybman 1986; Jeffery 1990); limited number of affected interests (Armour and Sadler 1990); all parties are legitimate stakeholders (Creighton and Shorett 1988); process and potential outcomes supported by decision-making authority (Rodwin 1982; Armour and Sadler 1990); balance among parties (may require financial support) (Rodwin 1982; Amy 1987; Emond 1990); adequately trained third party support (e.g., facilitator, mediator) and the potential, where warranted, to train participants (Emond 1990); some, preferably all, parties need to and are willing to negotiate (Coughton, Burkhart and Fulton 1993; Armour and Sadler 1990; Creighton 1983d); all representatives have bargaining authority (appreciating that a ratification procedure may be required for larger groups) (Shryman 1986; Creighton 1983a); issues have crystallized and there is potential for tradeoffs and compromises (Shrybman 1986; Jeffery 1990); possible to address technical and non-technical issues (Creighton and

Shorett 1988); process can be confidential (Emond 1990); a final agreement, reached through negotiation, can be written and signed by each representative (Creighton 1983a; Emond 1990); potential outcomes can be implemented (Jeffery 1990; Shybman 1986); legal challenges are unlikely (Rodwin 1982); does not involve major public policy precedents, and; not likely to lead to environmentally unacceptable or unsustainable compromises.

Types

Public involvement approaches that distort information or manipulate the public are unacceptable. Such procedures are variously characterized as persuasion, manipulation, therapy, coercion, placation and co-option (Arnstein 1969; Praxis 1988; Parenteau 1988; Nagel 1987). Limiting the public consultation process to public education and / or to a one way flow of information is unacceptable. Public information and education are valid forms of public involvement if undertaken in conjunction with other procedures that involve two-way communications, consultation and negotiation.

Extending from the distinctions first drawn in Chapter 6, major public involvement types include; public information (output only), information feedback (two way flows of information), consultation (formal dialogue), extended involvement (joint planning), delegated authority and self determination or control (Arnstein 1969; Parenteau 1988; Hyman *et. al.* 1988; Praxis 1988; Maynes 1989; EPA 1986a, 1988; Nagel 1987). Public consultation measures can be applied either pre or post approval (Bush 1990; Armour 1987; Praxis 1988; Johnston and McCartney 1991).

The choice, design and application of methods will depend on proposal characteristics, environmental characteristics, EIA planning process stage and activity and type of public. Examples of types of public include: concerned and interested individuals; directly affected individuals (proximity, economic, social, values); citizen and public interest groups; special interest groups (by type- local, regional, national, international); community leaders, key informants and local experts; owners and operators of businesses and institutions; the media; and general members of the public (both those who choose to become to become involved and those who choose not to) (Praxis 1988; Creighton 1983c; Hyman *et. al.* 1988; Priscoli and Homenuck 1986; Aggens 1983). These publics can be subdivided or grouped using such distinctions as - informed - uninformed, hostile - apathetic, divided - united, local - provincial, history of involvement, maturity of conflicts (Praxis 1988). Other stakeholders in the EIA planning process include the proponent, government staff, politicians, expert advisors and authorities or individuals with public consultation responsibilities (Parenteau 1988; Priscoli and Homenuck 1986; Hyman *et.al.* 1988; Aggens 1983). The design and execution of a public consultation program will require the careful consideration of how best to involve each stakeholder and public type. It also necessitates bringing parties together in forums conducive to consensus building and conflict resolution.

Conflict in the EIA planning process can be about process or substance. Procedural conflicts can occur regarding the ground rules for dispute resolution, the design and execution of the EIA planning process overall and by step, public and agency consultation procedures and the process by which the impact management strategy, and all its elements, will be designed, approved (e.g., public hearings) and implemented (Percival 1992; Carpenter 1982; Sadler 1986; Manring, West and Bidol 1990; Jeffery 1990).

Substantive conflict can concern facts (e.g., data to be collected, boundaries), values (e.g., significance of environmental components, interpretations of change), perceptions (regarding what has, is and may occur), interests (i.e., what each party has "at stake" in the process), relationships (among individuals and among the various stakeholders) and behaviour (individual and collective) (Dorcey and Riek 1990; Armour 1986; Armour and Sadler 1990; Percival 1992; Campbell and Floyd 1996; Manring, West and Bidol 1990; Amy 1987). Substantive conflicts can pertain to such matters as resource use, ownership and jurisdiction, public policy and investment, route and site selection, project development, treaties and agreements, environmental regulations and guidelines and environmental management (Westman 1985; Dorcey and Riek 1990; Susskind, Richards and Hildebrand 1978; Campbell and Floyd 1996; Stern 1991; Schneider and Tohn 1985).

Conflict can be characterized in many ways. Sager, for example, distinguishes among: perceived - latent (whether or not parties conscious of); manifest-potential (whether taking place); real - displaced (whether actors correctly conceive); system dependent - independent (generated internally or externally); zero sum - variable sum (win -lose or win-win potential); cooperative - non-cooperative (can information be exchanged and coalition building take place); means oriented - ends oriented (objectives or instruments); formal or informal; and institutionalized or *ad hoc*

(Sager 1994). Further distinctions can be drawn concerning the number of parties involved (e.g., bilateral or multi-lateral) and the types of parties (Dorcey and Riek 1990).

The types of alternative dispute resolution methods available range from direct discussions between proponents and directly affected publics, through progressively more structured forms of negotiation and mediation and ultimately to binding and non-binding arbitration and adjudication (Armour and Sadler 1990; Susskind and Madigan 1984; Campbell and Floyd 1996; Westman 1985). Outputs from alternative dispute resolution methods are often formalized in agreements. More specifically, the available alternative dispute resolution methods are: unassisted negotiation (parties work out differences without an intervenor); facilitated dialogue (small group discussions among representatives, typically brought together by a facilitator); passive or traditional mediation (conflict management often but not always facilitated by a neutral third party - mediator is concerned with process issues); active mediation or mediated negotiation (concerned with process and quality of outcome); not-binding arbitration (parties not bound by arbitrator's decision); binding arbitration (parties agree to live with arbitrator's decision); and adjudication (parties meet in an adverserial setting before an impartial judge) (Susskind and Madigan 1984).

Third party types, that can contribute to conflict resolution, include conciliators (assist the search for accommodation), facilitators (assist parties coming together but not fully involved in negotiation), fact finders (provide technical expertise to investigate and analyze issue), collaborative fact-finders and problem-solvers (work directly with negotiating parties), mediators (meet separately and then jointly with interests to help understand objectives, identify points of agreement and resolve differences through negotiation) and arbitrators (listen to arguments from disputing parties and then give them their conclusions) (Armour and Sadler 1990; Susskind and Madigan 1984).

The techniques available to support conflict resolution are largely a combination of analysis and public consultation methods (Carpenter and Kennedy 1988; Susskind, Richardson and Hildebrook 1978). Parties and party representatives can be identified through self (e.g., by groups, at public meetings, through surveys) or third party identification (e.g., monitoring of media, social profiles, participant observers, community leaders, advisory committees) (Creighton 1983a). The negotiation process can be scoped with the aid of technical advisors and reviews of comparable projects. Negotiations can be enhanced through the use of interactive techniques such as workshops, charrettes and nominal group process. The products of conflict resolution can be implemented with contracts, performance bonds, indemnification agreements and siting agreements (Creighton 1983d). Planners can assume such roles as process regulator, facilitator during pre-mediation and negotiation, advisor, fact-finder, "shuttle diplomat" or, with the appropriate training, mediator (Forester 1987, 1989; Campbell and Floyd 1996).

Public Consultation and Conflict Resolution Processes

The theoretical foundation of public consultation processes encompasses democratic (the public has a right to influence decisions that affect them), social mobilization (people can be mobilized for political involvement through participation in community activity) and social exchange (people engage in social activities to acquire benefits) theories (Howell, Olsen and Olsen 1983). The design of a public consultation process also reflects varying perceptions of the public interest (e.g., a common will, a higher will, a balancing of wills) (Schubert 1983) and different perspectives regarding communications mechanisms (e.g., diffusion, collection, interaction and diffusion-collection process) (Bishop 1983) and the evolution of issues (e.g., precipitating event, issue emergence and transformation, polarization and proliferation, spiralization and escalation, stereo-typing and mirror-imaging) (Creighton 1983a).

The major steps in the public consultation process tend to be: early consultation (initial background and preparatory analysis) (Praxis 1988; Howell, Olsen and Olsen 1987); initial planning (planning organization and the preparation of a draft consultation plan) (Howell, Olsen and Olsen 1987); public consultation planning (completion of the public consultation plan - objectives, target publics, approach and methods) (Hanchey 1983b); plan implementation (applying the plan, includes refinements and adaptations for each activity in the EIA planning process, up to and during decision-making) (Hanchey 1983b; Howell, Olsen and Olsen 1987); post approval involvement (public involvement in facility implementation) (Praxis 1988; Howell, Olsen and Olsen 1987); and *post hoc* assessment (evaluation of the effectiveness of the public consultation program).

The public consultation process should be merged with, rather than remain independent of, the EIA planning process. In this way full public involvement in every EIA activity is assured. This does mean that public consultation is the same as social impact assessment (SIA). SIA is an end in itself - the analysis and interpretation of human environmental impacts. Public involvement is one, albeit vital, means of realizing SIA objectives (Garcia 1983; Freudenberg 1983). Public involvement can be a social impact (Priscoli 1983). It can also serve other objectives as identified earlier in this section.

Value identification is especially important in public consultation. Public contributions should be analysed to identify underlying value issues and to link value positions to each type of public (Creighton 1983a). Ideally alternatives should be formulated that encompass the full range of public values. The evaluation of alternatives and of the proposed undertaking should address the distribution of consequences, by group and by value position (Creighton 1983a).

The theoretical basis for conflict resolution processes is similar to that of public consultation but with subtle but important orientation shifts. Traditional public involvement reflects a social systems image of society (structural functional theory). Conflict resolution is more consistent with a conflict theory view of society. Public involvement takes a consultative approach to decision-making to counterbalance authoritative decision-making approaches (Dorcey and Riek 1990). Conflict resolution views decision-making as a negotiation process (Dorcey and Riek 1990). Public consultation focuses on the evolution of issues. Conflict resolution is more concerned with the conflict development process (i.e., latent conflict - conditions, perceived conflict - cognition, felt - affect, manifest - behaviour) (Sager 1994).

The three major steps in the conflict resolution process are - 1) pre-negotiation; 2) negotiation and consensus building; and 3) post negotiation (Susskind and Madigan 1984). Pre-negotiation can include: team building, interests and spokespersons identification; mediator or facilitator selection; conditions bargaining; finalization of general negotiation rules and protocols; clarification of positions and issues; agenda setting; resource requirement identification and allocation; participant training; joint fact-finding and the generation of initial statements of concern (Susskind and Madigan 1994; Sadler 1990; Susskind, Richardson and Hildebrand 1978). The negotiation and consensus building step involves the preparation of a single negotiation text, the identification of underlying interests, the identification and evaluation of choices, consensus building, dispute resolution leading in agreement in principle and the construction and signing of a final agreement (Harashina 1995; Susskind, Richardson and Hildebrand 1978; Susskind and Madigan 1984). Post negotiation invents ways of binding the parties to a final agreement, monitors agreement implementation, modifies the agreement as needed and evaluates the negotiation process, including the role assumed by each participant (Sadler 1990; Susskind, Richardson and Hildebrand 1978). Post negotiation also involves assessing whether the conflict resolution process was successful (unconditionally successful, conditionally successful, unsuccessful) and in what sense(s) (product-oriented, politically-oriented, interest-oriented, responsibility-oriented, relationship-oriented) (Moore 1996).

Conflict resolution tends to be introduced at one or more strategic points in the EIA planning process. It is more common to use conflict resolution methods near the end of the process as a means of facilitating final approval and community acceptance. In theory conflict resolution can be valuable at any point in the EIA planning process. It may be especially appropriate for scoping purposes.

Taken a step further a conflict resolution perspective and conflict resolution methods could transform the entire EIA planning process from a technical (rational planning based) procedure to a joint fact finding - problem resolution procedure (more consistent with a blending of socio-ecological idealism and political-economic mobilization) (See Chapter 4). Arguably, public involvement is a partial means of reorienting the EIA planning process from rationalism to socio-ecological idealism.[3] Conflict resolution could shift the EIA planning process basis still further - in the direction of political-economic mobilization. The latter reorientation mirrors the community control site selection model described in Chapter 8.

Principles and Priorities

Planning and EIA experience, with both public consultation and conflict resolution, is extensive. Many sources detail basic principles, common pitfalls, practice insights and criteria for evaluating program effectiveness. Tables 36 and 37, respectively, highlight general principles for the conduct of public consultation and conflict resolution programs. Reference should be made to the sources cited for a more complete treatment of how best to design and execute such programs.

Notwithstanding the extensive experience with public consultation and conflict resolution, many difficult, as yet unresolved (and perhaps unresolvable), issues remain that require further attention. Examples include:addressing

Table 36 - Examples of Public Involvement Principles

- prepare a public involvement plan based on a clear understanding of context
- define objectives for each stage and provide for involvement in each stage
- ensure objectives linked to planning process and public consultation program integrated with planning process
- systematically seek to identify all interested and affected publics
- ensure all significant groups are involved (may require participant funding)
- seek a broad range of values
- clearly identify all decisions to be made
- ensure process is open and conducive to involvement
- use jargon-free language
- provide for early and on-going public involvement, especially prior to major decision points
- provide early and ample opportunities for conflict resolution
- facilitate public understanding of and involvement in all specialized areas (technical advisors, peer review)
- ensure sufficient time for material review and response preparation
- adjust program for different types of public
- inform publics early of direct communications channels and of responsibilities of each EIA team member
- clearly identify lines of authority and ensure that public can directly and readily contact authorities
- ensure two - way information flow and dialogue
- provide full information
- seek to identify values, beliefs, attitudes and perceptions
- seek out and make use of public knowledge
- clearly and frequently inform public of EIA progress
- be open and honest regarding what has and has not been decided
- ensure all information provided is complete, understandable, accurate and unbiased
- actively seek to build and maintain rapport with interested and affected groups and individuals
- ensure that there is adequate opportunity to raise and resolve concerns
- ensure limits of expertise not exceeded
- promptly and fully respond, in writing, to all questions, concerns and suggestions; indicate how and where addressed in EIA planning process and documentation
- demonstrate willingness to work together for joint fact-finding and for issue resolution
- provide for early consultation on need and facility characteristics
- involve public directly in objectives, criteria and alternatives generation
- ensure alternatives reflect a range of values and perspectives
- address distributional implications, by group, of alternatives and proposed actions
- involve public directly in interpretations of significance, in ranking of criteria and in evaluation of alternatives and impacts
- involve the public directly in the determination and refinement of overall conclusions
- involve public directly in formulation and refinement of each element of the impact management strategy
- provide for pre and post approval public involvement
- clearly identify and implement commitments made through the public consultation program
- fully document record of public involvement
- evaluate with public, by stage, effectiveness of public consultation program, adjust and supplement as needed

Sources: (Cuthbertson 1983; Bishop 1983; Bass and Herson 1993; Howell, Olsen and Olsen 1987; Maynes 1989; Priscoli and Homenuck 1986; Grima 1977; Wiesner 1995; Praxis 1988; Widditsch 1983; Freudenberg 1983)

Table 37 - Examples of Conflict Resolution Principles

- ensure all stakeholders involved
- facilitate representative selection
- ensure all parties have power to commit
- plan conflict resolution process, especially pre-negotiation
- ensure third parties (e.g., mediator) have adequate training and are acceptable to participants
- provide for adequate training for participants
- seek to uncover conflicting values and interests
- highlight underlying assumptions
- recognize and address obstacles to mediation (e.g., administrative inertia)
- ensure that there is agreement on rules and procedures
- ensure process is flexible and, where appropriate, experimental
- seek to maximize conditions for resolution
- stave off angry confrontation
- begin before an impasse is reached
- seek points of mutual agreement
- focus on options for mutual gain
- provide for information exchanges among groups
- facilitate both formal and informal communications
- use jargon-free language
- provide sound technical data and support to process and stakeholders
- keep public informed of progress
- ensure process is equitable and just; avoid "quick deals" that compromise principles
- ensure commitments observed
- ensure outcomes monitored and enforced
- periodically review effectiveness of process with participants and make necessary adjustments
- conduct *post hoc* evaluation of effectiveness

Sources: (Sadler 1993; Armour 1986, Ozawa 1992; Harashina 1995; Carpenter 1982; McGlennon and Susskind 1992; Smith 1993; Kartez and Bowman 1993; Sachs 1982; Manring, West and Bidol 1990; Finney and Polk 1995) fundamental value and ideological conflicts (Nagel 1987); reconciling the views of elected representatives and citizen groups; representativeness when involvement is based on self-selection (McKenney 1988); coping with highly disruptive individuals; the relative importance of different publics (Nagel 1987); the role of outside groups; organizational and institutional resistance to change (Smith 1993); addressing the concerns of groups that refuse to participate (Rosener 1983; McKenney 1988); when majority public views or agreements reached through conflict resolution are inconsistent with environmental and sustainability requirements and imperatives (Nagel 1987; Campbell and Floyd 1996; Emond 1990; Isaacs 1990); the role of science (requires redefinition away from the authoritative "expert") approach (Ozawa 1991; Cormick 1990); reconciling community control with decisionmaker responsibility and financial liability; and the difficulty in measuring the effectiveness of public consultation and conflict resolution (Rosener 1983; Smith 1993).

Other areas requiring further attention include the lack of codes of practice for public involvement and conflict resolution, limited systematic case studies of effectiveness, insufficient attention to citizen understanding of EIA documents, barriers to implementation and, in many cases, a lack of credibility with respect to public officials, private corporations and EIA as an environmental management tool (McKenney 1988; Cormick 1990; Carpenter 1982; Smith 1993; Sachs 1982; Sipe and Stiftel 1995; Sullivan, Kuo and Pabhu 1996).

Impact Management and Implementation

Overall Impact Management

Impact management addresses interrelationships among the various impact management components and integrates each component into an overall impact management strategy. Impact management is an on-going problem-solving and negotiation activity that should be fully integrated into the EIA planning process (Armour 1987). Near the beginning of the EIA planning process, there should be an initial formulation (as part of scoping) of the impact management plan. It should include broad principles, objectives and commitments. The plan can then be progressively refined through the balance of the process. Interconnections among impact management components (Elliott 1984) and between impact management and other EIA activities should be addressed.

Monitoring should address the implementation and effectiveness of mitigation measures. Mitigation and compensation measures should be complementary. Mitigation measures should generally receive first consideration (Portney 1983). Public involvement and conflict resolution measures are necessary for the formulation and refinement of individual impact management measures and the overall impact management plan. Effectiveness auditing should address all impact management aspects.

The overall impact management plan provides a foundation for addressing interactions among individual impact management measures (Armour 1987). The project impact management plan should be a natural extension of the proponent's mission statement and environmental management goals and policies (Wlodarczyk 1990). Major elements of the impact management plan can include mitigation and compensation measures, monitoring and contingency measures, public involvement procedures, conflict resolution mechanisms and financial security provisions. The impact management plan should identify general principles, define spatial and temporal boundaries, apply to both the pre and post approval periods and establish priorities among measures (Halstead *et. al.* 1984). Impact management commitments should be enforceable through approval terms and conditions and through impact management agreements with the community (White *et. al.* 1988; Glasson 1995). The impact management plan should be updated and refined during post approval.

The impact management plan measures should be consistent, mutually supportive, effective and equitable. The plan should build on knowledge acquired through baseline monitoring, public and agency consultation and reviews of comparable projects. Impact management plan priorities should reflect those established through the EIA planning process (e.g., focus on VECs and VSCs, critical pathways and potential impacts, major areas of uncertainty) (Halstead *et. al.* 1984; Henshaw 1984). Impact management responsibilities should be clearly defined. There should be a clear allocation of the financial resources necessary to implement the proposed measures (Armour 1987).

Impact management, at the project level, is more efficient and effective if nested within broader environmental planning, resource management and environmental management indicator systems and strategies (Dorney 1989; Eagles 1984; Mitchell 1986; Lang 1986; Smith 1993; Johnston and Madison 1994). The ideal model, as described in Chapter 7, is a flexible, tiered (different levels of aggregation each with normative, strategic and operational levels) systematic, informed and structured by sustainability ends and imperatives (Munro, Bryant and Matte-Baker 1986; Smith 1993). Such systems should be multi-purpose[4] and conducive to stakeholder involvement, consensus building and conflict resolution (Mitchell 1986; Lang 1986). The realization of the ideal will entail confronting significant implementation barriers.

Implementation

The focus of EIA implementation has tended to be expeditious project approval and the quality of EIA documents rather than the realization of EIA objectives (MacDonald 1996). EIA requirements are often treated as a decision implementation procedure rather than as a redefined decision-making process (Ensminger and McLean 1995). Symptomatic of these patterns is the increasing proportion of environmental assessments (EAs) as compared with environmental impact statements (EISs) prepared in the United States (Blaug 1992). An EA concludes that there is no significant impact after mitigation. EAs tend to be less comprehensive and have a lower level of public involvement. EIA findings are also often not reflected in planning documents and agency recommendations - a further indication that EIAs often have limited decision-making influence (Ginger and Mohai 1993; Sager 1995). Counterbalancing these negative patterns has been the appreciation that the EIA planning process has had positive political value by, for example, providing a forum for democratic debate and for educating the public about environmental issues and, in some cases, contributing to political mobilization (Novek 1995).

The obstacles to implementing EIA objectives are considerable. Implementation and coordination can be inhibited by segmented agency missions, patterns of institutional values and behaviour that resist change, a lack of political support, political priorities that bear little relationship to the "rational" weighing of costs and benefits, interest group domination of decision-making, the lack of follow-up authority, the limited integration of the EIA planning process with other forms of environmental management and a greater emphasis on other political - administrative priorities (Pressman and Wildavsky 1974; Hyman *et. al.* 1988; Ensminger and McLean 1993; Rickson *et. al.* 1995; Fearnside and Barbosa 1996a, 1996b). These political - administrative barriers are compounded by disciplinary divisions, a weakly developed theoretical foundation for the EIA planning process and a level of EIA practice that falls well short of its potential.

Enhanced implementation requires a higher standard of EIA practice at both the regulatory and applied levels (Doyle and Alexander 1996; Shillington and LeBlanc 1995; Bass and Herson 1993; Bendix 1984; Sadler 1990, 1993, 1995, 1996). This and the previous eight chapters are directed toward that end. Even with a higher quality of theory and practice, many implementation obstacles will remain. Effective implementation also requires an orientation shift by EIA practitioners. Rather than a primary emphasis on impacts and how they are to be managed, far more stress should be placed on understanding and influencing the actors and the systems that can impede or facilitate implementation (Miller 1984).

EIA practitioners tend to have a low level of knowledge and interest in implementation from either a theoretical (e.g., decision theory, policy analysis) or an applied (e.g., legal perspectives, control mechanisms, interests, institutional structures, functions, procedures, responsibilities) perspective (Benveniste 1987; Smith 1993; Gawthorpe 1983; Van Horn, Bauman and Gormley 1989; Ortolano 1993). Planning theory has addressed implementation issues by, for example, appreciating the role of information as a source of power (especially with regard to the dangers of and strategies for overcoming systemic communications distortions), by differentiating between normative (what is) and espoused (what is said) theory and by strategies for effective planning (e.g., empowerment strategies, error and uncertainty management) (Forester 1989; Argyris and Schon 1974; Bolan 1980; Benveniste 1989).

Enhanced understanding needs to be supplemented by direct action at the regulatory and applied levels. At the regulatory level, significant reforms can be integrated into EIA regulations and guidelines and into institutional arrangements, especially with regard to impact management requirements (Doyle and Sadler 1996; Ensminger and McLean 1993; Johnston and McCartney 1991). Many of these changes are administrative (e.g., guidelines, committee structures, practice principles for EIA practice), and do not require legislative changes (Sadler 1996). Both internal and external pressure will be required to alter priorities and to ensure that adequate resources are allocated to impact management. Follow-through at the applied level will require a higher degree of EIA networking, pro-active communications with actors affecting implementation and an overall commitment to more efficient, effective and sustainability-based EIA practice (Shillington and LeBlanc 1995; Miller 1984; Nixon 1980; Sadler 1996).

EIA Guideline Evaluation

As is evident from the previous subsection, the guidance provided by EIA regulators is a key determinant of if and how well impact management is addressed in EIA practice. Appendix Table A-27 lists criteria for guideline evaluation for selected impact management activities. The criteria were derived from a review of previous sections of this chapter. Appendix Table A-28 defines scaling levels for criteria application. Appendix Table A-29 applies the scaling levels to generic and project-specific guidelines for Canada and for the ten provinces. Appendix Tables 30 and 31 provide a qualitative application of the guideline evaluation.

As is evident from Tables A-29 to A-31, there are many inconsistencies across the eleven jurisdictions. Once again much of the guidance provided in project-specific guidelines could be elevated to generic guidelines. There is also considerable variation in the level of detail of the guidance provided. More specifically all jurisdictions refer to the use of mitigation measures, some for consideration in the analysis of alternatives, but more commonly for preventing and reducing effects associated with the proposed undertaking. There is a general expectation that mitigation measures should be explained and justified. Ensuring that effective mitigation measures are selected and applied is a common theme. There are several references to mitigation plans, to impacts from mitigation and to the specification of mitigation responsibilities, costs, timing and schedules. Although not consistent across the jurisdictions, subject areas are often identified in project guidelines, for which mitigation potential should be considered.

References to compensation are sparse and limited. Compensation is sometimes treated as a form of mitigation, or is equated with remediation or replacement or enhancement. There are a few examples where guidance is provided regarding types of measures and subject areas where compensation should be considered.

All jurisdictions refer to monitoring. In several cases detailed guidance is provided in both generic and project specific guidelines. Numerous references are made to baseline, compliance and effects monitoring and to the use of monitoring for assessing mitigation effectiveness. There are also frequent references to monitoring plans, to clear commitments, to comparing predicted effects against measured effects and to the dissemination of monitoring results to agencies and the public. Project guidelines vary considerably in the level of detail of monitoring requirements. In two case reference is made to ecosystem monitoring and in another monitoring is linked to VEC identification. In only one case is reference made to an audit of the assessment process. There are a few references to monitoring cumulative effects. Much more attention is devoted to the monitoring of biophysical as compared with socio-economic impacts.

Contingency plans, in response to effects identified through monitoring is a common theme, although there is considerable variation in the degree of precision of requirements. There are also frequent references to emergency response planning and measures to address accidents and other abnormal conditions. Emergency response capability, technical assistance and training are not as consistently addressed. Environmental management or remediation plans are required in two cases. There is only one case where reference is made to environmental liability insurance.

Conflict resolution and consensus building, within the context of public involvement programs, is a common theme. Reference is made to the possible use of mediation in five cases, although in two cases the mediation role would be assumed by a review panel or board. Mediation is only addressed in detail in the Federal EIA guidelines.

All jurisdictions require and encourage public involvement. Post approval public involvement requirements are not addressed as consistently. The level of detail for such requirements varies greatly. There are several references to public involvement in monitoring design and to the dissemination of monitoring results to the public.

All jurisdictions can attach terms and conditions to EIA approvals. Several guidelines outline approval authority and responsibility. The level of detail provided, regarding control and enforcement provisions, varies considerably. It is not possible to determine from the guidelines whether adequate resources are available for enforcement. Listing all applicable regulatory requirements is common. In one case commitments made during public consultation must be identified.

In several cases reference is made to applicable policies, strategies and guidelines from the various levels of government. There are also scattered references to sustainability and related themes and to the integration of mitigation, monitoring and contingency measures within environmental protection plans or implementation strategies. Integrated monitoring and the integration of project impact management within larger environmental management systems is only addressed in two cases.

EIA Proposal Evaluation

This section applies evaluation criteria to the ten EIAs. Appendix Table A-32 lists criteria for proposal evaluation for the selected impact management activities. The criteria were derived from a review of the previous sections of this chapter. Appendix Table A-33 defines scaling levels for criteria application. Appendix Table A-34 applies the scaling levels to the ten EIAs. Appendix Tables A-35 and A-36 provide a qualitative application of the proposal evaluation criteria. The major themes from criteria application are described below.

Overall, the mitigation of individual impacts, contingency measures and, to a lesser extent, monitoring are addressed by all projects. Not surprisingly the larger or more controversial projects devote greater attention to such matters. There is, however, a tendency to defer the detailed determination of mitigation, contingency and monitoring measures to post EIA approval mechanisms such as environmental protection plans. This begs the question - has an adequate decision-making basis been provided? Compensation, post-approval public involvement, conflict resolution, the auditing of EIA experiences and overall impact management are addressed less consistently and in less depth.

Mitigation is addressed in all the EIAs, although in some cases there is a tendency to dwell on how impacts are avoided or reduced through design and operations. Most of the EIAs identify individual mitigation measures for various impact types. The degree of impact reduction is rarely specified. More detail could have been provided, in most cases, regarding specific measures, the mitigation of cumulative effects, mitigation responsibilities, uncertainties, timing, location and the potential for associated impacts. There is only one example where mitigation potential is systematically incorporated into the alternatives analysis. Only one EIA includes a mitigation plan and one other incorporates mitigation measures into an impact management strategy.

There is considerable variation among the EIAs regarding compensation. The more common practice is either no compensation or a combination of facilitating a larger local share of project benefits (e.g., through local hiring and procurement policies, jobs training), damage and injury claims procedures, corporate donations and very specific impact-related compensation measures. There are only two examples of equity-related compensation programs and agreements.

Baseline, compliance and effects monitoring have or will be undertaken is most cases. There is a general acceptance of the need for monitoring to ensure compliance, test predictions, identify the need for impact management and to determine the effectiveness of mitigation measures. Monitoring tends to focus on major physical and biological impacts. A greater level of consistency could have been provided regarding such matters as the description of methods, parameter selection, sampling procedures, the identification of sampling locations and the timing and the treatment of uncertainty. There is a tendency to describe monitoring in general terms with the details to be resolved later, through, for example, terms and conditions and environmental protection plans. Greater attention could have been devoted to distinguishing natural variation from impacts, to institutional arrangements for monitoring, to peer review and independent monitoring, to pilot tests and demonstrations and to enforcement. The monitoring of social and economic impacts is addressed less frequently, in less depth and with even less consistency. In only two cases are individual monitoring measures drawn together under the umbrella of an overall monitoring program. There is only one case of a commitment to an audit of the EIA process.

Most EIAs describe potential emergency conditions and indicate how such conditions will be minimized and addressed through contingency plans. All the EIAs contain descriptions of how design and operational measures reduce the likelihood of unplanned events. Several EIAs provide an overview of emergency response planning and plans, including specific responsibilities, training, coordination procedures and community notification. Little detail is provided regarding thresholds for the introduction of such procedures. In only two cases are there specific references to financial security for environmental liability.

Most EIAs stress the importance of dialogue and the need for consensus building. There is only one case where a third party (a facilitator) was involved in conflict resolution. Public involvement in the EIA planning process tends to take place primarily prior to EIA approval. The continuation of public involvement during the post approval stages tends to be confined to larger, more controversial, projects. The major forms of post approval involvement are advisory committees, complaints procedures and community and community leader notification. There are several instances where there is a commitment to share mitigation and monitoring results. Provision is also made for continuing public involvement where compensation is or may be provided.

Most EIAs identify regulatory requirements and several identify, in general terms, implementation responsibilities. It is unclear from the EIAs whether the requirements are enforceable, whether they can be enforced (given available resources) and whether there are adequate penalties for non-compliance. In only one case are draft terms and conditions included. It appears that such implementation matters are addressed, if at all, after EIA approval but prior to implementation.

Most of the EIAs place the project within the context of regional conditions, historical activities, previous and related studies and resource and land use planning and management activities. There is only one case of an overall impact management plan, although in two other cases general objectives and principles are identified and interconnections among mitigation, contingency and monitoring measures are addressed. There are scattered references to sustainability objectives and priorities. Links to area-wide and integrated monitoring are rare and there are no examples of integration within broader plans or environmental reporting systems.

Summary and Conclusions

The analysis refines impact management activities in the EIA planning process. Impact management encompasses mitigation, compensation, monitoring, auditing, public involvement and conflict resolution. EIA implementation is also addressed. Impact management criteria are applied to Canadian generic and project-specific guidelines and to ten EIA examples.

Impact management is a critical EIA activity. Unless impacts are properly managed and preferably avoided, much of the effort devoted to EIA analysis, synthesis and evaluation, will have been wasted. Effective impact management is especially important to the task of ensuring that EIA experience and knowledge is fed back into the EIA planning process. The view is gradually being accepted, although a major push is still required, that impact management is not a task to be instigated at or near the end of the EIA planning process. Impact management is a perspective that should be instilled into every EIA activity.

Mitigation and compensation objectives, principles and procedures are now well defined, at least at the theoretical level. There are also many measures available. What is now required is greater precision, integration within broader strategies, greater emphasis on the monitoring of effectiveness and more stress on community-developed approaches. It is also evident that compensation is no substitute for effective mitigation. However, if adequate attention is devoted to impact avoidance and minimization, additional thought can be given to the use of compensation, especially to address inequities in the distribution of impacts and benefits.

Although a common theme in EIA literature, impact monitoring and auditing are plagued by conflicting terminology, approaches and methods. Greater attention needs to be devoted to consistency in language, to the formulation of frameworks that integrate and transcend different approaches and to the refinements needed to address different environmental components and settings. The implications of uncertainty also require further attention as does environmental or hindsight evaluation.

The importance of continuing public involvement during post approval has been clearly demonstrated. More attention can now be devoted to ensuring that public involvement mechanisms are in place during post approvals. Greater use can be made of conflict resolution methods, such as the use of facilitators and mediators, to address impact management issues. Public consultation and conflict resolution can assume an important role in reshaping the EIA planning process, consistent with the shifts in emphasis evident in planning theory debates. Many difficult issues for public consultation and conflict resolution activities remain and require further attention.

The weakest element of impact management is still integration - integration of individual impact management measures, integration within the EIA planning process and integration of project level impact management strategies within broader indicator systems and environmental planning and management frameworks. Once again the foundation for all forms of EIA impact management integration should be a sustainability perspective and sustainability limits and imperatives.

There are significant obstacles to the implementation of impact management measures and to the realization of EIA objectives. Areas requiring further attention include disciplinary divisions, political-administrative barriers and reform requirements, and enhanced EIA communications and networking.

The EIA planning process, with regard to impact management, has advanced to the point where a variety of useful concepts, frameworks, distinctions and lessons are available to practitioners at the regulatory and applied levels. The importance of impact management is reflected in EIA guidelines and documents through the stress placed on preventing and reducing impacts and on ensuring that compliance and effects monitoring and contingency measures are in place. The message has largely got through that effective baseline conditions monitoring is crucial in establishing a foundation for compliance and impact monitoring. The point has now been reached where a greater level of detail and a greater degree of consistency in the treatment of mitigation, contingency and monitoring measures can be achieved through a more standardized approach to methodology and to the presentation and analysis of data, appreciating that adjustments must be made to address socio-economic variables and to allow for project type and setting differences. A general tightening up of requirements is also necessary to ensure that impact management proposals are implemented.

The guidelines address mitigation, monitoring and contingency planning to a greater extent than the survey results at the outset of this chapter would suggest. There are several cases where very detailed mitigation and monitoring requirements are included. However, the scope and level of detail to which such matters are addressed varies greatly. Compensation, post audit evaluation, mediation and the integration of project-level EIA within broader management systems are addressed much less frequently and much less thoroughly. It is unclear from the guidelines whether enforcement is receiving adequate attention.

Impact management is addressed in the EIAs more systematically than the survey referenced at the beginning of the chapter would suggest, especially with regard to mitigation, contingency measures and some forms of monitoring. However, a much higher degree of consistency can be achieved, a greater level of detail is necessary and notable gaps need to be filled, particularly concerning implementation, conflict resolution and compensation. The greatest need is for the integration of individual measures within impact management strategies that are, in turn, directly linked to broader, sustainability-based indicator systems and forms of environmental planning and management.

The EIA guidelines and documents reviewed, although disappointing in the high degree of variability, contain many positive examples and insights. Collectively these resources have much to offer for advancing the EIA planning process. The substantial variability cannot be fully justified on the basis of jurisdictional, environmental and project differences. These differences underscore the need for more *post hoc* EIA evaluation and for additional networking among EIA professionals.

Endnotes

[1] Treating natural environmental and social variables separately maintains the false dichotomy between the social and natural environments. Also evident are the tensions between "modern" and "post modern" and between "scientific" and "management" perspectives in both social and environmental theory (Wismer 1996a). Once again there is a need for frameworks that integrate and transcend these dichotomies, by drawing upon important elements and insights from each perspective.

[2] Knowledge limitations can be viewed as a gift rather than a constraint. If we do not know enough and we are unlikely to be able to acquire such knowledge, we may be better off not making decisions (i.e., the precautionary principle) (Wismer 1996a).

[3] This reorientation process can be advanced by the application of such techniques as collaborative learning. Collaborative learning emphasizes experiental learning through systemic improvement and constructive discourse (Daniels and Walker 1996).

[4] Examples of potential objectives include; encouraging and clarifying environmental commitments by stakeholders, encouraging the use of sustainability indicators for assessing environmental performance, collecting and dessiminating reliable and useful enviromental data and assessing the successes and deficiencies of environmental pollution and rehabilitation efforts and the requisite responses (Gibson 1992b).

CONCLUSIONS AND FUTURE DIRECTIONS

Introduction

This chapter highlights and integrates the themes and insights provided in the previous nine chapters. The analysis revisits the EIA definition, objectives and planning process descriptions presented in Chapter 2 on the basis of the reforms, redesigns and refinements introduced in Chapters 3 to 9. The reconsideration of EIA objectives is based, in part, on an article by the writer (Lawrence 1997b). Major obstacles to the renewal of the EIA planning process are identified and priorities for future enhancements are outlined.

Redefining EIA

Chapter 2 describes EIA as a planning process, a transdisciplinary field, a normative - ethical field, a set of institutional arrangements, a socio-political phenomenon and an environmental intervention. The EIA planning process identifies, predicts, evaluates and manages the potential (or real) impacts of proposed (or existing) human activities on both the human and natural environments. Knowledge and application assumptions govern EIA practice. Several issues arising from this characterization are identified.

In reconsidering the EIA planning process, taking into account the contents of Chapter 3 to 9, it is evident that EIA is indeed a transdisciplinary and transprofessional field. If anything, the importance of spanning the boundaries between EIA and related fields of theory and practice is reinforced. Without interdisciplinary and interprofessional boundary spanning, EIA is likely to lose much of its purpose and much of its value in serving objectives that transcend EIA. EIA is also clearly a set of institutional arrangements, a socio-political phenomenon and an environmental intervention. EIA does not, however, operate in isolation. Unless integrated with other institutional arrangements, serving complementary functions, EIA is likely to be politically ineffective and of dubious and mixed value as an environmental and societal intervention.

The environment, as addressed through EIA, is and should be defined broadly. The importance of accommodating disciplinary perspectives and values in the design and application of EIA procedures and methods is clearly demonstrated. Concomitantly, interdependencies among environmental components and disciplines must be addressed and transcending frameworks should be formulated and applied.

EIA should address both potential and real impacts. Potential represents an anticipatory perspective. Real represents an analysis of impacts as they are occurring or as they have been experienced (a retrospective analysis). The importance of assessing historical and current impacts to improve impact predictions, allow for impact management adjustments and facilitate more efficient and effective EIA practice is demonstrated. The impact dimensions cited in Chapter 2 (e.g., positive - negative, over time, over space, direct - indirect, quantitative - qualitative, individual - cumulative, likelihood) are all valid. Greater attention, though, should be devoted to long term, regional, qualitative and cumulative impacts and to impact uncertainties.

The types of activities for which impacts should be predicted is more open to debate. Chapter 6 identifies the principal differences between EIA and SEA (strategic environmental assessment). Many adjustments are necessary to move from project level EIA to policy, plan and program level EIA (SEA). The barriers to SEA are considerable. Other environmental management tools may be equally or more effective in integrating environmental concerns into strategic level planning and decision-making. EIA should only be extended beyond the project level if the appropriate adjustments are made, if other environmental management instruments are not in place or are less effective, if SEA is complementary to other instruments and if SEA is integrated within broader environmental management frameworks.

Assessment in the EIA planning process should include each of the elements described in Chapter 2 under analysis, synthesis and management. In addition, as described in Chapters 6, 7 and 9 : scoping, screening, research and risk and uncertainty assessment should be added to analysis; integration with other forms of environmental management should be added to synthesis; and environmental auditing, conflict resolution, overall impact management and implementation should be added to management. Analysis, synthesis and management components are demonstrated to be ongoing activities rather than individual stages within the EIA planning process. Scoping and screening, the treatment of risk and uncertainty, impact significance interpretations, cumulative effects assessment, integration with other forms of environmental management, environmental auditing, conflict resolution, overall impact management and implementation all require further attention.

The knowledge and application assumptions, customarily associated with the EIA planning process, as listed in Chapter 2, are especially problematic. Difficulties in separating impacts from natural variation, identifying and predicting with accuracy cause and effect relationships, determining and aggregating values, combining values and data, assessing cumulative effects, determining probability and managing uncertainty all inhibit EIA planning process renewal. Many measures can be taken, and are described, to ameliorate these limitations. However, a more fundamental orientation shift is required involving, for example accepting and planning for the knowledge limits imposed by uncertainty, complexity and risk (e.g., the precautionary principle); stressing impact management and risk and uncertainty analysis over deterministic prediction; and favouring flexible, heuristic and open over rigidly defined, "expert"- driven, rational EIA planning processes.

The application assumptions, customarily linked to the EIA planning process, are equally troublesome. The EIA planning process has not been very effective in applying EIA institutional arrangements to all environmental impact sources, in obtaining the cooperation and support of relevant agencies and stakeholders, in applying the necessary knowledge base, in systematically screening and comparing alternatives, in effectively integrating information and interpretations into decision-making and in ensuring that effective post-approval impact management measures are instituted. Frameworks, concepts and insights are detailed that could contribute to enhanced EIA practice in each of these areas.

Notwithstanding such improvements, EIA application and implementation is likely to remain problematic without more fundamental reforms. Reform should start, as pointed out in Chapter 5, with the integration of EIA and sustainability. EIA should also be refined and modified using knowledge acquired through reflection-in-practice and hindsight evaluation. In addition, the EIA planning process should be nested within integrated environmental management systems, directed toward sustainability. These three principles are essential attributes of a renewed EIA planning process.

The EIA planning process is a potentially useful instrument for furthering sustainability. The extent to which that potential is realized will depend on how well EIA practitioners learn from EIA knowledge and experience base, draw upon and contribute to related fields of theory and practice, are guided by sustainability principles, limit and imperatives and effectively integrate EIA within broader environmental management frameworks and systems.

EIA Objectives

As described in Chapter 2, many direct and indirect objectives have been ascribed to EIA. The tendency is to assume or declare that the EIA planning process furthers all the identified objectives. Minimal effort has been made to ascertain whether such is the case or whether certain objectives are fulfilled to a greater degree than others. Also little or no effort has been made to rank the objectives.

As demonstrated in Chapter 8, when no consideration is given to the relative importance of objectives or criteria, an implicit ranking will emerge. The implicit ranking, that appears to exist within EIA practice, places selective direct planning / decision-making and organizational objectives at the forefront, most notably the early incorporation of better environmental information into project planning processes and the more explicit treatment of environmental concerns into documents (EIAs) placed before decision-makers. The remaining direct planning and organizational objectives and the direct and indirect environmental and societal objectives are then all expected to be advanced. If better information is provided, it is assumed it will be considered, organizational values, attitudes and behaviour will then change, environmentally appropriate decisions will be made, environmentally sound projects will result and society and the environment will benefit. The regulatory trappings associated with EIA (e.g., regulations and guidelines that require document disclosure and agency and public consultation) are assumed to contribute to the indirect planning and organizational objectives, leading, in turn, to further environmental and societal benefits.

The cause-effect sequence described above can and does occur to some extent. However, the path from better environmental information and EIA regulatory requirements to a better environment and society is a long and tortuous one, strewn with many obstacles. Three questions can be asked - Are there more direct routes for EIA to take? Can EIA reach the intended destination more quickly if linked to other instruments? Can, in some cases, the destination be reached more directly by other instruments? The answers to these questions may well be yes in all three cases.

The identification of more direct routes to environmental and societal benefits begins by ordering the EIA objectives into the following five levels (ranked from most to least important):

- *Level 1 - a sustainable environment.* The realization of a sustainable environment is the most highly ranked objective. Interdependencies among environmental components (e.g., economic and social dependency on natural capital) is a crucial consideration, as noted in Chapter 6. Integration of EIA with other environmental management instruments is necessary for the achievement of this objective. Sustainability is necessary and sufficient but it will require substantial attitudinal and behavioural changes and significant planning and organizational changes. Sustainability indicators will also be required to demonstrate to what degree we are moving toward or away from sustainability objectives. Moving further toward sustainability will likely contribute to the realization of many other EIA objectives.

- *Level 2 - other indirect EIA environmental and societal objectives.* In addressing EIA proposals, and more particularly alternatives to EIA proposals, it is essential to keep asking such questions as - To what extent does it preserve and enhance the natural and social environment? In what ways does it lead to greater harmonization among environmental components? Is it consistent with environmental ethical principles? What contribution does it make to the interests of future generations? Does it enhance our environmental understanding and does it lead to more environmentally conscious behaviour? These should be direct rather than indirect EIA objectives. Thus, if the contribution of EIA is limited, uncertain or very indirect (as determined through sustainability and environmental indicators), the question can also be asked - Are there better ways to achieve these objectives? The realization of these objectives is necessary but not sufficient. It is only through the application of sustainability-based thresholds that the truly difficult decisions can be made regarding the acceptability of current and the instigation of new human activities and environmental interventions.

- *Level 3 - direct environmental and societal EIA objectives.* There is tendency for the substance of EIA to be lost in the welter of paper and process. It is a sad commentary on EIA practice that it is often difficult to establish if and to what degree the projects that emerge from the EIA process are more environmentally sound than they would have been had EIA requirements not been in place. There should be tangible evidence, using hindsight evaluation, that EIA procedures are making a difference in the sense that environmentally unsound undertakings are not proceeding, that undertakings which do proceed are more environmentally sound than they otherwise would have been, and that significant environmentally enhancements are being integrated into existing environmental undertakings. These types of advances can be realized, to a far greater degree, if need and non-structural alternatives receive more serious attention that the more common cursory treatment. Limiting EIA to the environmental "polishing" of pre-determined capital projects raises questions regarding the opportunity costs associated with the significant current and continuing investment in the EIA apparatus. The realization of these objectives is necessary because many projects will proceed in any event. However, it is far from sufficient.

- *Level 4 - direct planning and organizational objectives.* Notwithstanding the above, broadening planning processes, decision-making bases and organizational attitudes and behaviour to encompass environmental and social concerns remains a necessary and worthwhile endeavour primarily because planning and decision-making processes and institutional arrangements can be significant impediments to the realization of higher order environmental and societal objectives. Removing these impediments involves much more than the provision of better environmental information. Although better environmental data and documentation are desirable, the focus instead should be on whether and to what degree the information provided makes a tangible difference at a decision-making level and in organizational behaviour. Brave pronouncements of environmental values may give the appearance of change but the true test (a test that requires hindsight evaluation of the environmental effectiveness of planning processes and institutional arrangements) is whether final decisions and organizational behaviour demonstrate the incorporation of environmental values and ethics. Planning and organizational objectives that bear directly on tangible behavioural changes are necessary. The remaining direct planning and organizational objectives, although often desirable, cannot be considered necessary. None of these objectives is sufficient. They must be integrated within and directed by higher order objectives.

- *Level 5 - indirect planning and organizational objectives.* The EIA planning process can help planning, decision-making and organizations more open, less partisan and more rational. It can also facilitate communications and coordination and contribute to the greater involvement of the professional and scientific community. Such roles are certainly a common theme when EIA is being promoted as a planning and decision-making tool. Fair enough. Arguably, however, such "benefits" are sometimes more a byproduct of EIA than objectives that require significant resources and attention. Certainly EIA requirements and procedures should be designed to facilitate public and scientific involvement and to contribute to decision-making accountability. As is evident from the Chapter 4 analysis, the objectives pertaining to more rational and objective planning and organizations are more questionable or, at best, of mixed value. There are also many other instruments available that are directed toward the same objectives. The indirect planning and organizational objectives can be considered as sometimes desirable but never sufficient. They are, moreover, only desirable to the extent that they do not detract from the realization of higher order objectives.

The ordering of EIA objectives, as described above, should lead to significant emphasis shifts in the EIA planning process. Sustainability and environmental harmonization could come to the fore. Greater attention could be devoted to discerning tangible evidence of environmental improvement and to changes in decision-making outcomes and organizational behaviour. Less emphasis would be placed on rational planning, on consensus building, on environmental data collection and on espoused environmental planning and decision-making as ends in themselves.

Realistically, not all the objectives at each level can be achieved or, in some cases, even addressed. Clearly, the higher levels (Levels 1 to 3) should receive the primary emphasis. Level 4 and 5 objectives should only be addressed to the extent that they directly contribute to the realization of Level 1 to 3 objectives. The measurement and evaluation of EIA effectiveness is necessary at all levels. The integration of EIA, within broader environmental management frameworks and systems, is essential. Difficult tradeoffs will need to be addressed. Is EIA, for example, likely to be more effective in contributing to higher order objectives by focusing on project-level evaluation and leaving strategic evaluation to other forms of environmental management or should EIA be broadened to encompass policies, programs and plans because it is the most appropriate instrument for addressing higher order objectives? If the latter is the case, as described in Chapter 6 and 9, appropriate adaptations must be made, EIA must complement other instruments and EIA must be integrated within a larger whole.

Reforming, Redesigning and Refining the EIA Planning Process

The previous nine chapters address the EIA planning process in considerable depth and from a variety of perspectives. Chapter 2 begins by presenting the EIA planning process in its most elementary forms (a basic process and a scientific variation). A composite process is then presented that adds numerous steps, a small number of ongoing activities and several interactions among steps and activities. Reference is also made to links among EIA types and links between EIA and other forms of environmental management. Although the tendency has been to view the planning process largely as discrete steps, one refinement to the scientific variation of the basic planning process (adaptive environmental assessment), recognizes that planning process components are better viewed as continuous, iterative activities that vary in intensity through the course of the EIA planning process. Untested at this point is the assumption that the EIA planning process can be applied regardless of context. Chapter 2 represents the point of departure for the treatment of the EIA planning process in the balance of the thesis.

Chapter 3 begins to reform the EIA planning process by identifying and describing key attributes of an ideal

EIA planning process. The chapter makes it clear that any designed planning process will necessarily be open, value-full, ethical, heuristic, political and evolving consistent with a complex, evolving, risky and uncertain environment. The EIA planning process is seen as necessarily pluralistic and contingent because of the multitude of values and contextual conditions encountered in EIA practice. A consciously reflective and critical practice and an emphasis on boundary spanning are identified as essential preconditions to the matching of process and context. The need to balance and transcend such familiar dichotomies as analysis and synthesis, rigour and relevance and constrained and opportunistic is also acknowledged.

Chapter 4 continues the reform process by first focusing on the rational planning model. The rational planning model parallels many of the characteristics of the EIA planning process. A detailed analysis of the origins, characteristics, subsets and variations, positive and negative tendencies and measures to offset negative tendencies of rationalism is presented. This analysis demonstrates that rationalism takes many more forms than are customarily assumed in EIA literature. The appreciation of negative tendencies and of the need for measures to offset negative tendencies can assist EIA theorists and practitioners in instituting further adaptations and refinements to the EIA planning process. A parallel analysis is presented of three competing, albeit partially overlapping, planning theories. These analyses demonstrate that the EIA planning process is much more than a preconceived series of steps or activities. The EIA planning process can also, be viewed as an administrative-political, incremental form of mutual adjustment and bargaining (pragmatism); as an iterative and experimental, interpersonal and social collaboration directed toward socio-ecological visions of an ideal future (socio-ecological idealism - SEI); and as a political and economic struggle for the distribution of power and resources in society (political-economic mobilization - PEM). The four theories have much to contribute to the reform of the EIA planning process providing it is appreciated that they are, both individually and collectively, flawed and incomplete.

Further insights and lessons are provided through a review of the relationship of postmodernism and planning theory. Postmodernism offers to the EIA planning process an enhanced appreciation of uncertainty, ambiguity and the multiplicity of meanings, perspectives and experiences. A multi-polar perspective for transcending dichotomies is especially applicable to EIA planning process design. The chapter concludes by identifying the need for and possible emergence of competing metatheories. Metatheories could provide a new theoretical core for both planning theory and the EIA planning process.

The Chapter 5 analysis further reforms the EIA planning process with the addition of sustainability frameworks and perspectives. Both the integration of sustainability into the EIA planning process and the potential contribution of the EIA planning process to sustainability are addressed. The redefinition of sustainability and the sustainability framework provide a context within which the integration of impact assessment and sustainability can be pursued. The Chapter 5 analysis illustrates, at a conceptual level, the integration of sustainability and impact assessment.

The redesign of the EIA planning process begins in Chapter 6. The analysis first demonstrates that, rather than a linear sequence of steps or stages, the EIA planning process is more properly viewed as a succession of progressively more refined probes into a decision space. Each probe in this cyclical analysis is more focused with a concomitant increase in detail. Each cycle is also composed of overlapping and interacting activities and tasks. The overall process is open and iterative. The Chapter 6 analysis also describes the need for planning process design at the regulatory level, the many ways in which the planning process can be adapted to context and how sustainability can be integrated into the EIA planning process at both the regulatory and the applied levels. The EIA planning process has evolved to the point that principles for the design and execution of the EIA planning process can be derived and applied at the regulatory and applied levels. The case is made that the EIA planning process should be viewed as a suite of processes designed to match different categories of contextual variables and adjusted further to suit individual circumstances. The further point is made that the differences, that provide the basis for the contextual categories, can also be transcended by identifying core EIA attributes and minimum requirements, by applying sustainability-based principles and criteria, and through the integration of EIA planning processes within broader conceptual frameworks and institutional arrangements.

The Chapters 7 to 9 analyses address individual EIA activities, within the EIA planning process, at a greater level of detail than the preceding chapters. These more detailed analyses identify additional activities, not described in Chapter 6, and reinforce the view of EIA activities as continuous through the EIA planning process rather than discrete steps.

The planning process refinements introduced in Chapter 7 include: the role of screening and scoping in shaping and structuring the EIA planning process; the need to balance rigour and relevance in baseline analysis and impact prediction; the value of both separating and integrating biophysical and socioeconomic analyses; the benefits of more effectively integrating risk and uncertainty considerations into the EIA planning process; the potential to more systematically address significance judgments in the EIA planning process; how cumulative effects assessment (CEA) perspectives, frameworks and methods can be infused into the EIA planning process; and how (at least conceptually) EIA can be integrated with other forms of environmental management.

The Chapter 8 analysis continues the refinement process by reviewing the various components of the evaluation process and by identifying lessons from policy, plan and program evaluation and from site selection. The evaluation process encompasses problem definition, the establishment of goals, objectives and criteria, the generation of alternatives, the screening of alternatives, impact scaling and criteria ranking and weighting, the comparison of alternatives and the determination of project acceptability. Common weaknesses in EIA evaluation activities are identified, with particular reference to problem definition, goal and objective setting, the systematic generation of alternatives, the consistent and systematic treatment of impact magnitude, importance and uncertainty differences and the assessment of distributional differences. Also pointed out is the need to blend qualitative and quantitative evaluation procedures, appreciating the positive and negative tendencies of each procedure and procedure type.

The review of plan, policy and program evaluation in Chapter 8 points to the need, in the EIA planning process, to recognize and match the complex, value-full and multi-faceted nature of decision-making. Reference is also made to emphasizing post-decision evaluation and to more closely linking process design to reforms in institutional arrangements. The overview of site selection approaches, methods and experiences demonstrates the danger of ideal models, the need for contextual adjustments, the importance of blending theories, methods and the lessons of experience and the benefits of a greater emphasis on basic value choices, local control and procedural and substantive equity.

The Chapter 9 analysis further refines the EIA planning process. Impact management activities addressed include mitigation, compensation, monitoring, auditing, public involvement and conflict resolution. Impact management is demonstrated to be both an ongoing activity and a perspective to be integrated into other EIA activities. The analysis shows that mitigation and compensation objectives, principles and procedures are well defined and can be more systematically applied. They can also be integrated within broader strategies and can place greater emphasis on effectiveness monitoring and community-developed approaches. Major monitoring and auditing distinctions and divisions are identified. The need for greater consistency, further refinements to integrating frameworks and additional hindsight evaluation are stressed. Public consultation and conflict resolution are demonstrated to be critical EIA planning process activities. They are also identified as potential instruments for a reshaping of the EIA planning process, in a manner more consistent with alternatives to rationalism (e.g., SEI, PEM). The review of overall impact management underscores the continuing need for integration - integration of individual impact management measures, integration of EIA planning process activities and, most especially, integration within broader environmental planning and management systems. Also identified are the substantial obstacles to implementation and the need to transcend disciplinary divisions, overcome political-administrative barriers and enhance EIA communications and networking.

The legislative analysis presented in Chapter 6, the guideline analyses provided in Chapters 7 to 9 and the example EIA analyses presented in Chapters 7 to 9 provide many positive examples of planning process reforms and refinements at the regulatory and the applied levels. These analyses also demonstrate the continuing gulf between the theory and the practice of the EIA planning process, the desirability of reducing inconsistencies unwarranted by approach or context in a manner that still leaves room for innovation and adaptation, and the necessity of a greater pooling of knowledge and experiences.

Contributions to EIA Practice

The preceding contribution to the renewal of the EIA planning process is more than a probe from theory toward practice. It offers immediate benefits for EIA practice as well providing a foundation for additional applied research. Starting from the premise that the EIA planning process, at both regulatory and applied levels, is often poorly suited to context and has failed to keep abreast of changes both within and external to EIA, the analysis presented here can help EIA practitioners to more self-consciously reflect upon, design and adapt EIA planning processes. It may also help them to resist the propensity to uncritically advocate and apply overly simplistic, standardized EIA planning processes.

The EIA characteristics and objectives (initially presented in Chapter 2 and reconsidered in Chapter 10) can provide a benchmark for evaluating (at the level of both individual and collective EIA examples and experiences) progress toward the environmental purposes of EIA. If, for example, the contribution of a proposed activity to higher order EIA objectives is unclear, serious questions can be asked regarding the desirability of the proposed activity and the effectiveness of the applicable EIA regulatory requirements. In a similar manner it should be possible to compare an EIA planning process, as envisioned in an individual EIA or in EIA guidelines, against the composite EIA planning process presented in Chapter 2. Although adjustments may be required in response to proposal and environmental conditions, the absence of particular activities and stages may be indicative of a failure to explicitly address key components of an EIA planning process. Also, it should be possible to draw upon the framework presented in Chapter 2 and the analyses presented in Chapters 7 and 9, to assess if and how well EIA requirements and documents have been integrated with other forms of environmental management.

The ideal planning process characteristics, as presented in Chapter 3, are primarily intended as one means of structuring future EIA theory building efforts but they can also be instructive for those responsible for designing EIA requirements and for preparing individual EIAs. An individual EIA planning process should, for example, have a clear sense of purpose, effectively conduct both analytical and integrative activities, bridge theory and practice, adapt to an evolving context, contribute to the EIA knowledge base and so on. The absence or neglect of particular ideal planning process characteristics may well represent weaknesses in the design or execution of an EIA planning process.

The planning theories, reviewed in Chapter 4, point directly to planning process limitations that are likely to be equally applicable to EIA practice. EIA practitioners should seek to incorporate, where appropriate, elements of each major planning theory. In addition to benefiting from the debate surrounding the rational planning model, EIA practitioners should systematically draw upon the lessons of practice (pragmatism), appreciate the collaborative nature of EIA and the need for social and ecological ideals and principles (SEI) and explicitly consider the political and economic dimensions and roles of EIA (PEM). A review of planning theory overlaps, interconnections and middle ground concepts, together with the lessons of postmodernism, can furnish further insights that can be directly applied in EIA practice.

The sustainability framework and the conceptual integration of sustainability and EIA in Chapter 5 lays the foundation for the specific measures suggested for integrating sustainability into EIA requirements and into the EIA planning process as presented in Chapter 6. These analyses, with some minor refinements, could be readily converted to performance standards for assessing if and how well sustainability has been incorporated into EIA practice at both the regulatory and applied levels. They could also provide the basis for guidelines to assist regulators and practitioners.

The suggestions for redesigning the EIA planning process, as presented in Chapter 6, are directly relevant to EIA practice. The discussion of reshaping the EIA planning process and the analysis of design at the regulatory level could be readily converted to planning process design principles, as demonstrated in an article prepared by the writer (Lawrence 1994c). The distinctions drawn in the adaptations to context discussion could provide the basis for adaptations to a generic EIA planning process for different types of environments, proposals, proponents, settings and publics. The means identified for transcending contextual differences could represent core principles that should be evident in any EIA planning process. Such principles could also facilitate the spanning of boundaries within EIA and between EIA and related fields - boundaries that often inhibit and distort EIA practice.

The overview of analysis, synthesis, evaluation and impact management activities, as presented in Chapters 7 to 9, provide numerous insights of direct value to EIA practice. The criteria and scaling levels applied to both EIA guidelines and examples could provide the basis for a generic description of desirable EIA planning process characteristics. They could also be used for assessing the adequacy of individual EIA requirements and documents, for facilitating the harmonization of EIA requirements among jurisdictions and for ensuring that context-specific adjustments are warranted on the basis of valid institutional and environmental differences. The Chapters 7 to 9 analyses also identify specific lessons from related fields (e.g., risk assessment, program evaluation, site selection, public consultation) of direct value to EIA practice and underline the importance to EIA practice of links between EIA and related fields of environmental management.

Although this thesis did not address EIA requirements beyond the federal and provincial levels in Canada, it is anticipated that many of the frameworks and interpretations, with appropriate adjustments, could be applied to other jurisdictions. EIA methods and intra-disciplinary analyses are also not discussed. However, as demonstrated in Chapter 7 (in the analysis of the differences between biophysical and socioeconomic impact prediction) and in Chapter 8 (in the analysis of lessons from site selection), the EIA planning process provides a framework within which individual disciplinary analyses and EIA methods are undertaken. Similarly, although institutional arrangements for EIA are not addressed, it is likely that the analysis of EIA legislation, regulations and guidelines can contribute to analyses of EIA institutional arrangements.

Overall, although the thesis has emphasized breadth over depth, it is the writer's contention that numerous practical insights for EIA practice have been provided. Perhaps more importantly the thesis contributes to a sounder conceptual foundation for the EIA planning process, which can, in turn, help to guide additional applied EIA research and further facilitate enhanced EIA practice.

Obstacles and Priorities

The list of obstacles to the renewal of the EIA planning process is a familiar one. It appears, and reappears, throughout the previous chapters. The major obstacles include limited knowledge (what we don't know and what we can't know), divided interests and values (fundamental differences regarding where we are and where we want to go), political resistance, administrative inertia and disciplinary divisions (it is difficult to move forward if our leaders are unwilling or unable to help us to get there, if our institutional systems resist change and if our principal sources/uses of processed knowledge are unwilling to work collaboratively), a poorly developed conceptual foundation for the EIA planning process (the knowledge base leaves much to be desired and is not well grounded in practice) and an underdeveloped state-of-practice (atheoretical, limited reflection in or after practice and limited knowledge sharing).

The preceding list both overstates and understates the problem. It overstates the problem because numerous positive examples and countervailing trends and patterns can be cited. It understates the problem because any catalogue of obstacles inevitably leads to discussions regarding how best to remove the obstacles. All of the obstacles will remain to some degree. The issue then is how best to ameliorate, circumvent or simply live with which obstacles under which set of circumstances. Any solutions will be partial, uneven and unclear. Resources must be used strategically and with great forethought.

The proposed renewal of the EIA planning process depicted here is far from complete. The redefinition of EIA and the reordered EIA objectives provide a useful point of departure. Further efforts can be made to reform the EIA planning process to more closely approximate the ideal planning process characteristics. A greater blending of the EIA planning process and planning theory and practice is needed, with a particular emphasis on metatheory construction. Further initiatives are required to better integrate the EIA planning process and sustainability, especially at the regulatory and applied levels.

The redesign of the EIA planning process could involve further experimentation with alternative EIA planning process designs and design principles, again at both the regulatory and applied levels, adjusted to context types and local conditions. Such initiatives could culminate in sets of performance standards for EIA regulatory requirements and guidelines with suitable adjustments for different context types. Such initiatives could culminate in sets of performance standards for EIA regulatory requirements and guidelines, with suitable adjustments for different context types. The implications and desirability of SEA require particular attention. The desirability of a greater blending of EIA and related fields of theory and practice has been demonstrated. Many more lessons can be acquired from planning theory, risk assessment and program evaluation, together with additional probes into such fields as social and natural science theory, philosophy (especially with regard to the treatment of values and ethics) and political, administrative and public policy theory. Additional lessons can also be drawn from related forms of environmental management (e.g., resource management, environmental planning and environmental management). A recurrent theme in this thesis, requiring further attention, is the need for practical approaches and institutional arrangements for integrating EIA with other forms of environmental management.

Analytic and integrative EIA activities, in need of further applied refinement, include scoping, impact significance interpretations, cumulative effects assessment and the treatment of risk and uncertainty. Evaluation activities, often neglected in EIA and warranting greater attention, include problem definition, the formulation of goals and objectives, the generation of alternatives, the integration of impact magnitude, importance and uncertainty considerations and proposal acceptability. Additional lessons for evaluation can also be acquired from related fields and from the siting of locally unwanted land uses. Further efforts in impact management are needed to achieve greater consistency in the treatment of mitigation, contingency and monitoring measures. Greater attention should also be devoted to compensation, conflict resolution, overall impact management and implementation activities. Finally, a significantly greater effort is needed to further the use of EIA effectiveness evaluation and to ameliorate and circumvent the many obstacles to the renewal of the EIA planning process.

APPENDICES

APPENDIX A

Detailed Tables - Chapters 6 to 9

Table A-1 - Overview of EIA Regulatory Scope in Canadian Jurisdictions

Characteristics	Jurisdictions (Y - yes, N - no, M - may be included, Pa - partial, Pr - proposed, G - guidelines)											Comments
	BC	ALB	SAS	MAN	ONT	QUE	NB	NS	PEI	NFLD	CAN	
Proposal Types • legislation and regulations	N	N	N	N	Pa	N	N	N	N	N	N	BC - certain physical activities(e.g., off-shore mining activity) ALB - technology a consideration in project designation SAS - proposal to apply to certain activities (e.g., some species introduction and habitat modification activities); development definition includes a new technology concerned with resource utilization with potentially significant environmental effects MAN - certain physical activities (e.g., certain habitat modifications); development includes resource utilization technologies that may induce environmental change; proposal for Sustainable Development Act - application of sustainability criteria or checklists to policies, programs, funding and budgets ONT - legislation, regulations policies and programs addressed under separate requirements (Environmental Bill of Rights); plans addressed in separate legislation but scope being reduced; some limited application of EIA requirements to plans and programs; class assessments now formalized in legislation QUE - recently extended to industrial and mining projects; rarely applied to policies and programs; considering separate requirements; applied to a limited range of programs and activities (e.g. aerial pesticide spraying) NB - proposal to tighten up project requirements; potential to apply to a limited range of programs and activities (e.g., species introduction); proposal to limit to projects NS - policies and programs in definition but not in undertaking list; certain physical activities (e.g., certain wetland disruption) PEI - some selected activities (e.g., certain fishing, forestry and trapping activities) NFLD - proposal to reduce to projects that may have significant harmful or negative environmental effects; applies to certain resource-based activities (e.g., pesticide spraying) CAN - projects and certain physical activities only; statements of environmental implications for new policies and programs; unproven technology a consideration in follow-up activities
• projects	Y	Y	Y	Y	Y	Y	Y/Pr	Y	Y	Y/Pr	Y	
• classes of projects	Y	N	N/Pr	N/Pr	Y/Pr	N	N/Pr	Y	N	N/Pr	Y	
• policies and programs	N	N	N	N/Pr	Pa	Pa / Pr	Pa / Pr	Pa	N	Pa / Pr	Pa	
• plans	N	N	N	N/Pr	Pa	N	Pa	Pa	N	Pa / Pr	N	
• activities and operational procedures	Pa	N	N/Pr	Pa/Pr	Pa	Pa	Pa	Pa	Pa	Pa/ Pr	Pa	
• technologies	N	N	Pa	N	N	N	N	N	N	N	G	

Table A-1 - Overview of EIA Regulatory Scope in Canadian Jurisdictions

Characteristics	BC	ALB	SAS	MAN	ONT	QUE	NB	NS	PEI	NFLD	CAN	Comments
	Jurisdictions (Y - yes, N - no, M - may be included, Pa - partial, Pr - proposed, G - guidelines)											
Proponent												
• public	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	ONT - only certain private waste management projects and as designated by Minister QUE - recently applied to certain industrial and mining projects
• private	Y	Y	Y	Y	Pa	Y	Y	Y	Y	Y	Y	
Need / Alternatives												BC - need and alternatives subject to project specifications ALB - includes alternatives to the proposed activity including not proceeding; focus in practice tends to be alternative means SAS - addressed in guidelines only MAN - Minister may require consideration of alternatives to the proposed development processes and locations; focus in practice on alternative methods ONT - full range of alternatives QUE - reference to options; guidelines refer to needs/problems and to alternatives to and alternative methods NB - need and scope of alternatives determined in project -specific guidelines and terms of reference NS - reference is to alternatives to the undertaking; focus tends to be on minimizing effects of the proposed undertaking PEI - general reference to reviewing alternatives in guidelines; scope determined by project specific guidelines NFLD - proposed streamlining of EIA requirements may lead to greater emphasis on design alternatives CAN - alternatives to project at the discretion of the government
• need / rationale	M	Y	G	N	Y	Pa	G	Y	G	Y	Y	
• alternatives to project	N	Y	G	M	Y	Pa/G	G	Y	G	Y	M	
• locational alternatives	M	Y	G	M	Y	M/G	G	Y	G	Y	Y	
• alternatives to manage impacts	M	Y	G	M	Y	M/G	G	Y	G	Y	Y	

Table A-1 - Overview of EIA Regulatory Scope in Canadian Jurisdictions

Jurisdictions (Y - yes, N - no, M - may be included, Pa - partial, Pr - proposed, G - guidelines)

Characteristics	BC	ALB	SAS	MAN	ONT	QUE	NB	NS	PEI	NFLD	CAN
Scope of Environment and Effects											
• physical	Y	Y	Y	Y	Y	M/G	Y	Y	Y	Y / Pr	Y
• natural	Y	Y	Y	Y	Y	M/G	Y	Y	Y	Y /Pr	Y
• social	Y	Y	Y	Y	Y	M/G	Y	Y	Pa / G	Y / Pr	Pa
• cultural and heritage and resource	Y	Y	Y	Y	Y	M/G	Y	Y	Pa	Y /Pr	Pa
• economic	Y	Y	Y	Y	Y	Pa/G	Y	Y	Pa	Y/Pr	Pa
• human health and well being	Y	Y	Pa	Y	Pa	G	Pa	Y	Pa	Pa / Pr	Pa
• built	Y	N	G	N	Y	M/G	Y	Y	Pa	Y /Pr	Pa
• interrelation-ships	N	Y	N	N/Pr	Y	G	N	Y	N	Y /Pr	Pa

Comments

BC -also refers to accidents, exercise of aboriginal rights, cross-boundary effects, cumulative effects and energy efficiency and conservation measures

ALB - also refers to cumulative, regional, temporal and spatial considerations and to plans for waste minimization and recycling

SAS- reference is made to human health in definition of "pollution" and built environment referred to in guidelines; social, economic and cultural insofar associated with natural and physical

MAN - health addressed as environmental health; scope basically determined on a project specific basis; focus on interrelationships in proposal for Sustainable Development Act

ONT - reference to human life considered adequate

QUE- refers to matters that may be included; "must include" in northern Quebec: economic in the sense of agricultural resources and resource use; interrelationships in the sense of cumulative effects

NB - human health in the sense of human life; social, economic and cultural insofar as related to natural and physical

PEI - social, economic, built and human health addressed, in part, by reference to "human life, and any feature, part, component, resource or element, thereof"; in practice is addressed

NFLD - human health addressed by factors that influence the life of humans; proposal that process would only be triggered for projects having a "significant and harmful or negative effect" on the environment

CAN-environment includes physical and biological environmental components and their interactions; social, economic, heritage, human health and cultural effects only addressed to the extent that they are caused by environmental changes

Table A-1 - Overview of EIA Regulatory Scope in Canadian Jurisdictions

Characteristics	BC	ALB	SAS	MAN	ONT	QUE	NB	NS	PEI	NFLD	CAN
	Jurisdictions (Y - yes, N - no, M - may be included, Pa - partial, Pr - proposed, G - guidelines)										
The Prediction and Interpretation of Effects											
• key issues (scoping)	G	Y	Pa/ G	N	G	N	N	Pa	N	Pa/Pr	G
• positive and negative	N	Y	G	N	Y	M	N	Y	G	Y	G
• distribution over space	G	Y	G	N	G	M/G	N	N	N	N/Pr	G
• distribution over time	N	Y	G / Pr	N	G	M/G	N	N	N	Y/Pr	G
• direct and indirect	Y	N	N	N	Y	M	N	N	N	Y	G
• magnitude	N	N	G / Pr	N	G	M/G	N	N	N	N/Pr	G
• significance	G	Y	Pa/ Pr	Y	G	M/G	N	Y	Y	Y	Y
• likelihood and uncertainty	N	N	G / Pr	N	G	M/G	N	N	N	N/Pr	G
• latent and reversibility	N	N	N	N	N	M	N	N	N	N	G
• cumulative	Y	Y / Pr	Pr	Pa	G	M	N	Pa	N	N	Y

Comments

BC - largely determined through project report specifications

ALB - proposal for greater consideration of cumulative impacts by review boards

SAS - key issues and significance indicated in definition of "development; methods and scope determined on a project specific basis; proposal for project-specific guidelines and project categorization may lead to more consistent requirements

MAN - can restrict or limit the number and types of developments that may cause adverse cumulative effects

ONT - scope largely defined through general guidelines

QUE - may deal with positive, negative, residual, latent, irreversible, indirect and cumulative effects; must address in northern Quebec; requirement - according to the scientific method

NB - scope defined through project specific guidelines and terms of reference; does note that terms of reference shall include methods that will use for assessing environmental impacts; proposes generic guidelines for project types

NS - issues and scope largely defined through a focus report; other projects in area a classification consideration

PEI -significance defined, in part, through definition of "undertaking" in regulation; scope largely defined by project proposal and screening process

NFLD - scope largely defined in draft terms of reference and environmental preview report; proposal to focus EIA on selected environmental inputs; proposal for generic standards for data collection and analysis; significance, spatial extent, duration, probability, magnitude and level of detail screening criteria proposed

CAN - scope largely addressed in detailed reference guides

Table A-1 - Overview of EIA Regulatory Scope in Canadian Jurisdictions

Characteristics	BC	ALB	SAS	MAN	ONT	QUE	NB	NS	PEI	NFLD	CAN	Comments
Links to Environment												
• triggered by setting	Pa	N	N/Pr	Pa	Pa	Pa	Pa	Pa	N	Y / Pr	Pa	BC - limited number of settings (e.g., major urban development in agricultural areas, offshore, for 2 river estuaries) SAS - proposal for limited number of settings for proposed screening list (e.g., certain pasture projects on Crown lands) MAN - can pass regulations to classify geographic areas by assimilative capacity; limited application (e.g., developments within provincial parks); plans amendments under proposed Sustainability Act ONT - at municipal level through new planning legislation
• area-wide assessment	N	N	N	Pa/Pr	N	Pa	N	N	N	N	G	QUE - refers to agricultural zone, particular watercourses and northern Quebec; some limited application to multiple related projects (e.g., watercourse improvements, major hydroelectric projects) NB - limited application - proposals affecting 2 ha or more of bog, marsh, swamp or other wetland NS - limited application - drainage basin transfers, proposal that disrupts 2 ha or more of wetland NFLD - designated if within a range of Special Areas; proposal to delete requirement and to address through land use planning CAN - limited number of setting (e.g., various parks and protected areas); provision for same EIA for related projects
Impact Management												
• mitigation and enhancement	Y	Y	G	Y	Y	Y	M / G	Y	G	Y	Y	SAS- proposals would improve monitoring and enforcement MAN- director may require details of proposed environmental management practices; auditing indirectly through indicators and reporting under the Sustainable Development Act QUE - reforms to address; guidelines refer to compensation
• monitoring and contingency	Y	Y	G / Pa	M	G	Pa/Pr	M / Pr	M	M	M	M	NB - may be required to address in draft guidelines and terms of reference; proposals for project proponents to submit annual compliance reports, joint monitoring programs with municipalities and local residents, and coordination of compliance monitoring among government departments
• auditing across projects	Y	Y	Pa	N	Pa	N	N	N	Y	N/Pr	Y	NFLD - explicitly refers to a proposed set of control measures, remedial measures and a proposed program to study toxic substances and other harmful impacts; proposal to monitor effectiveness mitigation measures and apply elsewhere; measures to improve follow-up evaluation and enforcement CAN - provides for a follow-up program to verify accuracy of EIA; agency reports on implementation and five year review

Jurisdictions: (Y - yes, N - no, M - may be included, Pa - partial, Pr - proposed, G - guidelines)

Table A-1 - Overview of EIA Regulatory Scope in Canadian Jurisdictions

Characteristics	Jurisdictions (Y - yes, N - no, M - may be included, Pa - partial, Pr - proposed, G - guidelines)											Comments
	BC	ALB	SAS	MAN	ONT	QUE	NB	NS	PEI	NFLD	CAN	
Public and Agency Involvement												BC - application must include public information activities and consultation activities and any program of public information and consultation activities; explicit reference to first nations, municipalities and other jurisdictions; executive director may establish a public advisory committee QUE - assessment review committees in northern Quebec ALB - may establish interdepartmental committees SAS - the minister may require a public information meeting; proponents urged to establish early and ongoing public involvement, including public involvement program; proposal for earlier public notification, required public involvement in project-specific guidelines and a required public consultation plan; proposals to expedite review process MAN - minister may establish advisory committees and require public meetings and issues public consultation guidelines; provides for Clean Environment Commission to act as mediator; provides for agreements with other jurisdictions and participant funding ONT - recent legislative changes; guaranteed public access, mediation and description of public consultation undertaken
• agency circulation	Y	Y	Y	Y	Y	Y	Y / Pr	Y	Y	Y / Pr	Y	
• project review committee	Y	M	Y	Y	Pa	N	Y	N	Y	Y	N	
• municipal involvement	Y	Y	G	Y	Y	Y	Y	Y	M	Y	N	
• public notification	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	

Table A-1 - Overview of EIA Regulatory Scope in Canadian Jurisdictions

Jurisdictions (Y - yes, N - no, M - may be included, Pa - partial, Pr - proposed, G - guidelines)

Characteristics	BC	ALB	SAS	MAN	ONT	QUE	NB	NS	PEI	NFLD	CAN
• public consultation	Y	Y	Pa / G/ Pr	M	G	N	Y / Pr	Y	M	Y	Pa
• public consultation program requirements	Y	Y	G / Pr	M	G	M	N	Pa	N	Y	N
• public advisory committee	M	N	N	N	G	N	N	N	N	N	N
• native and first nations involvement	Y	N	N	N	G	Y	N	N	N	N	Y
• other jurisdictions	Y	Y	N/ Pr	Y	Pa	Pa/G	N / Pr	Y	N	N	Y
• conflict resolution	Y	N	N / Pr	Y/Pr	G	Pa	N / Pr	Y	N	N	Y
• public hearing	Y	Y	Y	Y/Pr	Y	Y	Y / Pr	Y	Y	Y	Y
• participant and/or intervenor funding	Y	Pa	Pa	Y	Pa	Pa	Pa	Pa	Pa	Pa	Y

Comments

BC, ALB and MAN - harmonization agreements with Canada

ONT - separate agreement with federal government; recently allowed Intervenor Funding Act to lapse

QUE - provides for federal involvement in northern Quebec; sometimes Minister asks Board to hold mediation sessions

NB - requirement for a public meeting; scope determined in project guidelines and terms of reference; proposal - a public notification system, public screening input, more formal and informal public consultation; proposals to make process more efficient and effective, to eliminate duplication with federal requirements and to provide for mediation

MAN - proposal to consolidate approval boards and to include more conflict resolution; joint development review process with Indian Bands under proposed Sustainability Act

NS - requires public information program; scope largely determined in focus report and terms of reference

PEI - scope of public consultation activities determined in project proposal and through screening process

NFLD - requirement to meet with public during EA, provide information and record concerns; minister may prescribe public consultation requirements; scope of public consultation largely determined in project guidelines and in preview report; proposals to make review process more efficient and effective; public notification proposed for preview reports

CAN- agency has to consider public comments filed, information to be made publicly available (public registry); public involvement in screening at discretion of responsible authority; responsible authority may hold public meeting(s) for comprehensive study review; independent assessments involve a mediator or panel with extensive public participation including participant funding provisions

GEN - intervenor funding (except for BC, Manitoba and Canada) discretionary (e.g., cost awards by hearing panels)

Table A-1 - Overview of EIA Regulatory Scope in Canadian Jurisdictions

Characteristics	Jurisdictions (Y - yes, N - no, M - may be included, Pa - partial, Pr - proposed, G - guidelines)											Comments
	BC	ALB	SAS	MAN	ONT	QUE	NB	NS	PEI	NFLD	CAN	
Links to Sustainability	Y	Y	N/Pr	Pa/Pr	Pa	N	N	Y	G	N/Pr	Y	BC - addressed in purpose of legislation ALB - addressed in purpose of environmental assessment process SAS - identified as a consideration in proposed EA reforms MAN - essentially identified in purpose of legislation; reflected in definition of "development"; addressed in detail in a proposal for a Sustainable Development Act (e.g., sustainability criteria, requirement to assess project sustainability) ONT- not in EIA legislation but directly addressed in Environmental Bill of Rights and planning legislation which address environmental impacts of plans, policies and programs QUE - referred to in guidelines NB - not reflected in proposed reforms NS - specific sustainability principles spelled out in purpose of legislation; also included in definitions and in role definition for Round Table; no specific references in EIA requirements PEI- referenced in guidelines NFLD - implied, although not stated, in proposed EA goals; rationale for change does refer to sustainable development CAN - identified as basic objective of legislation; included in definitions and in purpose of legislation

Table A-2 - Integrating sustainability into environmental impact assessment requirements - Part 1

Components	Jurisdictions					
	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Principles and Priorities	- separate EIA legislation proclaimed in early 1995 - sustainability not explicitly addressed in Act but is considered in purpose and related proposals (e.g., environmental protection proposals, proposed land use charter) - proposal flexibility provided through distinction between full and class EIAs - environment flexibility to the extent that EIA requirements triggered if in Provincial parks or if involves off-shore activities -need and alternatives a possible consideration	- EIA requirements within Environmental Protection and Enhancement Act explicit references to sustainability in Act (e.g., integrating environmental protection and economic systems) - single process but proposal flexibility provided through screening procedures and through draft and final terms of reference - no EIA requirements triggered by selective settings -consideration of need and alternatives required	-separate EIA legislation; reform proposals under consideration - sustainability not referred to in Act but sustainability is the first principle of EA reform - single process but proposal flexibility through project proposals and project-specific guidelines; reform proposals provide for screening, 2 forms of review and class assessments -no EIA requirements triggered by selective settings; reform proposals trigger some requirements by setting (e.g., exploratory drilling on designated environmentally sensitive lands) -need and alternatives only addressed in guidelines	- EIA requirements within Environment Act - no explicit reference to sustainability in current legislation; addressed indirectly (e.g., purpose of Act refers to effects on future generations) -draft Sustainainability Act identifies principles and guidelines for sustainable development; would be enshrined in law -proposal flexibility provided through 3 classes of development and through proposals and screening procedures - limited EIA requirements by setting (e.g., certain activities with provincial parks); legislation allows for classifying geographic areas by assimilative capacity) -alternatives only a possible consideration	- separate EIA legislation and regulations -no explicit reference to sustainability in current requirements - explicit consideration of sustainability in related legislation (e.g., Environmental Bill of Rights, Ontario Planning and Development Act) - proposal flexibility provided through distinction between full and class EAs and through EA proposals; proposal for project-specific terms of reference - no EIA requirements triggered by selective settings; EIAs required under new planning legislation for new developments in or adjacent to significant natural features -need and alternatives must be considered	- regulations under the Environmental Quality Act - no explicit reference to sustainability in current requirements; referred to in guidelines - sustainability a general priority; currently working on sustainability guidelines for EIA practice flexibility through written instructions to proponent - single process for all projects -adaptation to environment types reflected by certain designated watercourses, agricultural zones and by special requirements for North East Quebec and for James Bay and Northern Quebec (e.g., focus on ecological effects, wildlife resources and social effects on native populations) -need (desired objectives) and alternatives a possible consideration

Table A-2 - Integrating sustainability into environmental impact assessment requirements - Part 1

Components	Jurisdictions					
	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Proposal Types	- applies to most major public and private projects; landfills largely addressed through other requirements - provides for class but not multiple-related projects - selective application to activities (e.g., dredging) and capability to apply to activities with significant effects - no application to programs, policies, programs, technologies or legislation although capability to undertake reviews of permitting procedures under other legislation	- applies to most major public and private projects no provisions for class or multiple related projects -no application to activities not associated with designated projects or to policies, programs, technologies, plans or legislation	- applies to most major public and private projects; proposed reforms provide for application to a wider array of major (class 2) and moderate (class 1) projects -no current application to classes of projects or to multiple related projects; class projects addressed in proposed reforms - no application to policies, plans or programs; considered during reform process but rejected by government -some limited application to activities (e.g., new species introduction) and technologies (e.g., new waste processing technologies) -proposal to add certain activities (e.g., habitat modification)	- applies to most major public and private projects although excludes waste disposal facilities - no application to classes of projects; draft Sustainability Act proposes category review -limited application to multiple related projects although may make regulations to classify geographic areas by assimilative capacity (has been applied) and to restrict developments that may have adverse cumulative effects(not applied) - selective application to activities (e.g., habitat modification, controlled burns, forest management, water basin transfers) - draft Sustainable Development Act would apply checklists to policies, programs, funding and budgets; sustainable development license encompasses land use review, lease requirements and sustainability assessment	- applies to major public projects; application to private projects limited to waste disposal - extensive use of class assessments; no application to multiple related projects; has now formalized class assessment in new legislation - although plans, programs and activities included in definition of undertaking few examples of application - Environmental Bill of Rights provides for explicit consideration of environment in acts, regulations, policies and programs -Planning and Development Act provides for explicit consideration of environment in areal planning	- applies to major public and some private projects; excludes public involvement in review of major industries and municipal landfills; recently extended to major industrial and mining projects - no application to classes of projects - multiple related projects includes watercourse improvement programs -; two project class system likely to be adopted in future; also expectation of a separate procedure for policy and program review

Table A-2 - Integrating sustainability into environmental impact assessment requirements - Part 1

Components	Jurisdictions					
	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Definition of Environment and Effects	- broad definition of environment and effects - explicit reference to indirect and cumulative effects - explicitly addresses trans-boundary effects	- definition of environment focuses on physical and natural environment but social, cultural and economic impacts only considered if induced by physical and natural environmental impacts - interactions addressed through references to interacting natural systems and to regional, temporal, spatial and cumulative considerations - explicitly addresses trans-boundary effects -proposal for greater consideration of cumulative impacts by review boards (Hegman and Yarranton 1995)	- broad definition of environment; social, economic and cultural where induced by natural and physical impacts - no explicit reference to interactions among environmental components and effects - proposals for reform include explicit reference to consideration of cumulative effects in regulations - no explicit reference to trans-boundary effects	- broad definition of environment and effects - no explicit reference to interactions among environmental components and effects; allows for regulations to restrict number and types of development that may cause cumulative effects - no explicit reference to trans-boundary effects -focus on interrelationships in draft Sustainable Development Act; draft legislation encompasses economic, environmental, human health and heritage effects	- broad definition of environment and effects - explicitly addresses interactions among environmental components and effects - cumulative effects only addressed through general guidelines - no explicit reference to trans-boundary effects	- broad definition of environment and effects -economic effects limited to resources - explicitly refers to the possible consideration of indirect, latent, irreversible and cumulative effects; a requirement for northern Quebec - no explicit reference to trans-boundary effects

Table A-2 - Integrating sustainability into environmental impact assessment requirements - Part 1

Components	Jurisdictions					
	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Impact Management	- explicitly refers to mitigative measures - explicitly refers to monitoring of effects and to a range of measures for monitoring enforcement - no explicit provision for joint monitoring among stakeholders and across projects - separate provision for state - of - the - environment report - currently developing sustainability indicators and considering state of sustainability reporting - no separate funding for environmental protection and enhancement	- explicitly refers to mitigative measures - explicitly refers to monitoring and contingency measures including monitoring enforcement - no explicit provision for joint monitoring among stakeholders or across projects - provides for state - of - the - environment report -provides environmental; protection and enhancement fund	- explicitly refers to mitigation and enhancement - explicitly refers to follow-up studies, monitoring and environmental audits - provides for monitoring and contingency measures and for monitoring enforcement - no explicit provision for joint monitoring among stakeholders or across projects - separate legislation for state -of - the environment report (every two years) - no separate funding for environmental protection and enhancement	- no explicit reference to mitigation and enhancement - explicit references to monitoring, the submission of environmental protection and management plans and to compliance and enforcement - no explicit provision for joint monitoring across stakeholders and across projects - provides for state - of - the - environment reviews (every 2 years) (not a technical document) - establishes Sustainable Development Innovation fund and environmental innovation grants -draft Sustainainability Act provisions for sustainability assessment; refers to emergency measures, contingency plans and plans for remedial actions; also includes enforcement requirements, appeals, penalties, fees, charges and costs	- explicitly refers to mitigative measures - enhancement, monitoring and monitoring enforcement largely addressed through guidelines and conditions of approval - no explicit provision for joint monitoring among stakeholders or across projects - no explicit provision for state - of - the - environment reporting although use of environmental indicators under consideration - no explicit provision for environmental protection and enhancement funding -new legislation focuses hearings	- explicitly refers to mitigative and enhancement measures - explicitly refers to monitoring and contingency measures including enforcement ; upcoming reform proposals expected to address further - no explicit provision for joint monitoring among stakeholders and across projects - separate provision for state - of - the - environment review - no explicit provision for environmental protection and enhancement funding

Table A-2 - Integrating sustainability into environmental impact assessment requirements - Part 1

Components	Jurisdictions					
	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Public Involvement	- public consultation program requirement - provides for establishment of public advisory committees, if required - explicit provision for conflict resolution (mediation) and participant funding - draft proposal (now on hold) for Bill of Rights within new Environmental Protection Act - extensive provisions for involvement of first nations - provides for a public hearing before an independent review board	- public consultation program requirement - no explicit provision for conflict resolution or for participant funding; addressed through hearing boards - no explicit provision for environmental rights - no explicit provisions for first nations involvement - provides for a public hearing before an independent review board	- public consultation program requirement; additional and more explicit requirements contained in reform proposals - no explicit provisions for conflict resolution ; explicitly addressed in reform proposals - intervenor funding available through separate legislation - no explicit provision for environmental rights - no explicit provisions for first nations involvement - provides for establishment of board of inquiry which could solicit public comments	- no explicit requirement for public consultation program; director may issue guidelines for class 2 and 3 projects - provides for Clean Environment Commission to act as mediator - draft Sustainability Act allows for director to require the provision of r participant funding - no explicit provision for environmental rights - provides for a public hearing before the Clean Environment Commission - consolidated hearing provisions in proposal for Sustainable Development Act; also includes provisions for more conflict resolution (e.g., mediator) and for a joint development review process with an Indian Band	- no explicit requirement for public consultation program; recommended in guidelines - no explicit provisions for conflict resolution although has been used on for some projects - recent legislative changes guarantee public access, make provision for mediation and require documentation of consultation - no longer separate legislation for intervenor funding; participant funding addressed informally; hearing boards can also award costs - separate legislation for environmental rights - no explicit provisions for first nations involvement; addressed through administrative procedures - provides for independent hearing panel	- no public consultation program requirement but requirement expected to be introduced - no explicit provisions for conflict resolution or for participant or intervenor funding; reference to mediation provision in guidelines; Board sometimes asked by Minister to hold mediation sessions - no explicit provision for environmental rights - special provisions for first nations involvement in North East Quebec, James Bay and in northern Quebec - provides for a public hearing; proposal to extend jurisdiction to make hearing panel less political

Table A-2 - Integrating sustainability into environmental impact assessment requirements - Part 1

Components	Jurisdictions					
	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Coordination and Integration	- explicit provision for inter-jurisdictional planning and agreements - CCEM member - provides for project committees -planning and management context through provincial land use goals and strategies (partially developed), regional land use planning (e.g., Greater Vancouver Regional District, Core plans in East Kootenays, Cariboo-Chilcotin, Vancouver Island), resource management requirements (e.g., Forest Practices Act, Agricultural Land Commission) and multi-level planning initiatives (e.g., Fraser Basin Management Program) and regional and local land use planning -Sustainability Act proposal under consideration; unlikely with termination of CORE -proposed provincial legislation (Growth Management Strategy) - energy, transportation or waste management strategies not subject to formal review requirements - waste management planning addressed by separate requirements	-explicit procedures for inter-jurisdictional planning and agreements; signed federal-provincial agreement - CCEM member - Sustainable Development Co-ordinating Committee - provision for project committee (EIA review group) - planning and management context established through integrated resource planning (on crown land) and local land use planning -regional planning commissions largely disbanded, "patchwork" system remaining - links to setting selectively addressed (e.g., tourist projects adjacent to ecological resources) - separate legislation, policies and programs in such areas as watershed, energy, transportation and waste management planning although EIA requirements address a wide range of projects in these areas	- no explicit procedures for inter-jurisdictional planning and requirements; provided for in EIA reform proposals - CCEM member -interdepartmental review panel s for EIAs - Saskatchewan's Environmental Strategy establishes broad environmental priorities (e.g., clean air strategy, integrated solid waste management strategy) - planning and management context partially established through Strategy, State-of-Environment reports a series of land use strategies and integrated resource plans in selected environmentally sensitive areas subject to development pressures ,separate legislation to preserve ecological reserves and through local land use planning -links to setting partially -selective references in EIA requirements to setting type - separate legislation, policies and programs in such areas as watershed, areal, energy, transportation and waste management planning although many designated project types in these areas and will be broadened with reform proposals	- explicitly provides for inter-jurisdictional planning and agreements; signed federal - provincial agreement; further coordination (e.g., joint boards) proposed for Sustainable Development Act - round table and sustainable development coordinating unit -CCEM member -provision for interdepartmental committees (Technical Advisory Committees) for review of Class 2 and 3 projects -draft Sustainability Act include provisions for sustainability development strategies, sustainability reports (including indicators), public sector operations (code of practice, budget and program evaluation using checklists, procurement and reporting); both development licensing and land uses decisions to be reviewed by Commission for Sustainable Development - regulations to classify areas based on assimilative capacity and to restrict development when potential cumulative effects a potentially useful management tool - local land use plans used in EIA review - limited links to setting in EIA requirements (e.g., in provincial parks) - separate legislation, policies and programs in such areas as watershed, resource, areal, energy, transportation and waste management planning although many designated projects in these areas	- no explicit provision for inter-jurisdictional planning and agreements; harmonization proposal in new EIA legislation -formal circulation process - round table and CCEM member - management context established through new planning legislation (e.g., provincial policy statements), international (e.g., IJC), provincial (e.g., NEC, Toronto Waterfront, Oak Ridges Moraine), regional (e.g., GTA) and watershed planning (e.g., subwatershed studies) - also allows for EIAs for development within or adjacent to environmentally sensitive areas and optional planning process subject to EAA requirements for infrastructure planning; now being reconsidered -overlapping approval requirements addressed through Consolidated Hearings Act - Environmental Bill of Rights incorporates environmental concerns into policies and programs (except finance) and requires ministries to prepare statements of environmental values - some limited application of EAA to programs (e.g., energy), plans (e.g., waste) & activities (e.g., forestry)	- no explicit provision for inter-jurisdictional planning and agreements -round table not functioning but expected to be replaced by a broader body -CCEM member, only attends at deputy minister level - proposal for inter-ministerial committee for sustainable development - no provisions for interdepartmental project committees although consultation takes place - planning and management context partially established through ecological reserves legislation and regional and local land use planning - limited links to setting (e.g., designated watercourses, agricultural zone; special EIA requirements for northern Quebec) - separate legislation, policies and programs in such areas as energy, transportation, resource management and waste management although many designated projects within these areas

Table A-3 - Integrating sustainability into environmental impact assessment requirements - part 2

Components	Jurisdictions				
	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Principles and Priorities	- a regulation under the Clean Environment Act; proposals for reform - no explicit consideration of sustainability - single process; some flexibility provided screening, guidelines and terms of reference - position paper refers to a 3 tier system EIA process with mandatory inclusions and specific exclusions - EIA requirements triggered if affects wetlands and any unique, rare or endangered environmental feature -need and alternatives only addressed in guidelines	- EIA within Environment Act - new legislation refers to a wide range of sustainability principles (e.g., precautionary principle, polluter pay) - adaptable process - 2 classes of undertakings and through screening, preliminary report, EIA report guidelines and Terms of Reference - EIA triggered for wetlands over a certain size -requirement to consider need and alternatives	- EIA requirements within Environmental Protection Act - no explicit consideration of sustainability - single process for all activity types ; flexibility through project proposals and screening process - EIA requirements if effect unique, rare or endangered features of the environment (not clear how applied) -need and alternatives only addressed in guidelines	-separate legislation and regulations - currently considering means of streamlining review and approval process - no explicit consideration of sustainability - single process for all activity type; flexibility through Environmental Preview Report and Terms of Reference - automatic project registration in designated areas -requirement to consider need and alternatives	- separate EIA legislation; proclaimed in early 1995 - sustainability explicitly considered in legislation (e.g., regeneration of renewable resources) - flexibility provided through screening provisions, class assessment provisions and varying procedures (e.g., foreign aid, finance for domestic commercial enterprises, Indian lands) - some special provisions for selective settings (e.g., national parks and protected areas, national historic sites) -each federal department is expected to establish sustainability goals, objectives and policies -requirement to consider need and alternatives; alternatives to at discretion of government
Proposal Types	- applies to major public and private projects - no provision for class projects; addressed in position paper - no application to multiple projects - only application to programs - programs introducing non-indigenous plant or animal species - partially addresses areal planning (e.g., all major residential developments outside incorporated areas) - selective application to activities (e.g., where affect unique, rare, or endangered features, bogs, marsh, swamps, wetlands)	- applies to major public and private projects - new legislation provides for class assessments - no application to multiple related projects - although policies, programs and plans included in definition of undertaking not in project list - minimal application to legislation or technologies although environmental impact definition refers to utilizing technologies that may induce environmental damage -limited application to activities (e.g., water transfers)	- application to major public and private projects - no applied to classes of projects or to multiple-related projects - not applied to policies, programs, plans, legislation, technologies or, with a few exceptions, activities	- applies to major public and private projects - not applied to classes of projects or to multiple related projects; proposal for class assessments - definition of environment includes policies, programs and plans but rarely applied; proposal that EAA not apply to government policies, plans and programs - selectively applied to various resource-based activities (e.g., agriculture, forestry, trapping, logging, forestry) - no application to legislation or technologies	- applies to a wide range of public and private projects; application limited to federal land, financing, regulations and federal proponents - provides for classes of projects - no direct provisions for multiple-related projects; some precedents - not applied to policies, programs or plans; separate limited process for policy and program proposals; statements of environmental implications and parliamentary review; wide discretion for if and when applied -selective application to activities (e.g., dredging, non-indigenous species) -environment is a consideration in Regulatory Impact Analysis Statements (RIAS)

Table A-3 - Integrating sustainability into environmental impact assessment requirements - part 2

Components	Jurisdictions				
	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Definitions of Environment and Effects	- broad definition of environment and effects; social, economic and cultural impacts and addressed to extent induced by natural and physical impacts - no explicit reference to interactions among environmental components and effects -no explicit reference to trans-boundary effects	- broad definition of environment and effects - reference to interrelationships in new legislation (i.e., interacting natural systems) - trans-boundary pollution effects addressed in new legislation -other projects in area a classification consideration	- broad definition of environment and effects - no explicit reference to interactions among environmental components or effects - no explicit references to trans-boundary effects	- broad definition of environment and effects; proposal that EAA would only be triggered in the event of significant and harmful negative effects; proposal to give attention to positive socio-economic impacts - explicit references to interactions among environmental components and effects - no explicit references to cumulative or trans-boundary effects - proposal for generic standards for data analysis and interpretation	- definition of environment excludes social and economic environment; effects definition only includes socioeconomic and health effects to extent induced by physical and natural changes - explicitly refers to interacting natural environment and to cumulative environmental effects - explicitly refers to trans-boundary (international and interprovincial) effects -for full project reviews must consider implications for sustainability for future generations of renewable resources
Impact Management	- no explicit reference to mitigation, enhancement and monitoring; addressed in guidelines and terms of reference; annual environmental compliance report requirement - reform paper provides for joint monitoring programs - Province, municipalities and local residents; refers to improved compliance monitoring among government departments -no explicit provision for state-of-environment report -separate legislation - Environmental Trust Fund Act	-mitigation, enhancement and monitoring addressed in regulations -new legislation provides additional monitoring and enforcement requirements -no state-of-environment reports to date; one in preparation - new Environment Act establishes Nova Scotia Environmental Trust	-no explicit consideration of mitigation, enhancement and monitoring measures -mitigation, enhancement and monitoring (including enforcement) addressed through project-specific guidelines -no explicit provision for monitoring among stakeholders and across projects -no explicit provision for state-of-the-environment reporting or for environmental protection and enhancement funding	-explicit reference to mitigation and to monitoring including enforcement -no explicit provision for joint monitoring among stakeholders and across projects -no explicit provision for state-of-the-environment reporting or for funding for environmental protection and enhancement	-explicit consideration of mitigation and monitoring included -no provision for joint monitoring among stakeholders or provision for monitoring across projects; except in the sense of statistical summaries and process evaluation by agency -provision for state-of-the-environment reporting; recently discontinued -funding to promote environment and state-of-theory and practice -has a Commissioner of the Environment and Sustainable Development (an environmental auditor)

Table A-3 - Integrating sustainability into environmental impact assessment requirements - part 2

Components	Jurisdictions				
	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Public Involvement	- no explicit requirement for public consultation program; terms of reference generally include public consultation opportunities - position paper for EIA report refers to requirement for early public consultation - no explicit reference to provisions for conflict resolution; position paper for EIA reform makes explicit reference to mediation and for government cost recovery - participant assistance regulations under Environment Act - provision for public meeting; reform paper refers to independent review bodies - no explicit provision for environmental rights or for consultation aboriginal peoples	- explicit requirement for public consultation plan in terms of reference - provides for alternative dispute resolution in Environment Act - no explicit provision for participant funding or for protection of environmental rights; experts retained by hearing panel available to public - new legislation provides for establishment of Nova Scotia Environmental Assessment Board - no explicit provision for contacts with aboriginal peoples; terms of reference provide for comments from affected cultural communities	- public consultation requirements may be addressed through project specific guidelines - no explicit provision for conflict resolution, participant / intervenor funding, protection of environmental rights or contacts with aboriginal peoples - provides for independent review board; Minister may appoint Board of Inquiry to hold public hearing	- public consultation proposal required in terms of reference - no explicit provision for conflict resolution, participant / intervenor funding, protection of environmental rights or involvement of aboriginal peoples -provides for independent EA Board review	- no explicit requirement for public consultation program - explicit provision for mediation and for participant funding - no explicit provision to protect environmental rights' possibility of environmental rights legislation under consideration - a range of special provisions for aboriginal peoples involvement; special procedural regulations - provides for review by independent review panel

Table A-3 - Integrating sustainability into environmental impact assessment requirements - part 2

Components	Jurisdictions				
	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Coordination and Integration	- CCEM member - position paper for EIA reform refers to joint planning and harmonization - provides for EIA review committee; includes provincial, municipal and federal representation - planning and management context through Clean Air Strategy, Committee on Land Use and Rural Environment policy statements (e.g., settlement, coastal zone, pits and quarries), local land use planning and provincial waste management planning; air quality (hot spots) -increasing use of environmental data (GIS) system in assessing proposals - triggered by water basin transfers, affects on unique, rare or endangered feature of the environment and if wetland affected - separate provision for protection of ecological reserves - energy, transportation, water and waste management strategies not subject to EIA requirements (Cabinet review)	- purpose of Act refers to working cooperatively with other jurisdictions - explicit reference to environmental agreements with Canada - CCEM member - Environment Act establishes Round Table on Environment - Minister may appoint committee to review EIA report - context established by a series of minister task force reports (e.g., air quality, sustainable development, hazardous wastes, protected areas) and by provincial solid and water management strategies, - EA triggered by transfers of water between drainage basins and if more than 2 ha of wetland affected - separate legislation for water and sewage works, resource management and waste management requirements -moving toward regional planning by area rather than by province	- no explicit provision for inter-jurisdictional planning and agreements - provides for interdepartmental review committee - CCEM member -coordination of areal planning through an interdepartmental land use planning coordinating committee - project list includes designated subdivisions, industrial parks and selected industries - planning and management context established through a sustainable development policy, a renewed conservation strategy, management plans in areas of provincial concern (e.g., areas subject to intense development pressure), a GIS system for natural features and resources and local land use planning - defines undertaking to include projects that affect unique, rare or endangered species - separate legislation for water projects - energy, transportation, water, resource and waste management planning not subject to EIA requirements	- provides for federal and provincial membership on assessment committees - provides for establishment of interdepartmental assessment committee - special areas that trigger EIA requirements include salmon rivers, seabird sanctuaries, wildlife resource areas, designated cottages and recreational projects on crown land; proposed that EA regulations will no longer be required *if* only land use issues are involved - special areas include various resource, archaeological and park areas - separate legislation - wilderness and ecological reserves, water and sewage treatment and special waste management	- new EIA legislation provides for joint review panels, harmonization and for agreements and arrangements with other jurisdictions - overall policy context established through Green Plan (now discontinued) a National Sustainable Development Strategy (under preparation) and various sustainability initiatives (e.g., climate change task force, biodiversity strategy, sustainable development strategy, pollution prevention discussion paper) - National Round Table on the Environment and Economy and a Standing Committee on Environment and Sustainability - links to ecological planning - selective activities in national parks and protected areas - mandatory projects must address effects on resource sustainability - separate watershed planning in north and for Fraser Basin -prepares State of the Environment report

Table A-4 - Examples of significance criteria - individual environmental components

Environmental Components	Criteria
Geology, Landforms and Soils	• Is the property within or in close proximity to a geological fault or in an area subject to fault activity? (Bass and Herson 1991; BC Environment 1988)
	• Is the project likely to expose people or structures to major geologic hazards? (Roberts 1974)
	• Is the project unlikely to comply with government slope stability requirements?
	• Is the project within an area susceptible to landslides, geologic fractures and land subsidence? (Kamath 1993)
	• Will the project change existing topography (ground contours, shorelines, river banks) or increase the instability of soils and/or geology of the site? (Kamath 1993; Roberts 1974)
	• Is the property subject to major slope failure or does it abut (within 100 m) an unstable area? (BC 1988)
	• Is the property subject to a major seismic risk- seismic impact zone (e.g., areas with a probability of 10% exceedence in 50 years of a peak seismic acceleration)? (BC 1988)
	• Does the project comply with government requirements regarding placement above water table and soil permeability?
	• Are there any major geotechnical hazards associated with the site? (BC 1988)
	• Is there substantial erosion or siltation potential associated with the project? (Bass and Herson 1991)
	• Are there requirements for the off-site disposal of extensive volumes of construction debris? (Kamath 1993)
	• Will the project displace or disrupt access to or viewing of unique physical features? (Kamath 1993)
Ground water	• Is effluent/ leachate from the property likely to contravene government standards?
	• Is effluent / leachate from the property likely to be inconsistent with government guidelines or objectives?
	• Is the property within a recharge area for high capacity wells? (BC 1988)
	• Is the property within a recharge area for wells supplying high capacity wells? (BC 1988)
	• Is the property within a recharge area for wells supplying fish hatcheries and other uses? (BC 1988)
	• Is current or future use of the groundwater for human consumption purposes likely to be impaired?
	• Is the project likely to substantially interfere with the water table or ground water discharge? (Bass and Herson 1991; Kamath 1993; Roberts 1974)
	• Does the project introduce pollutants to ground water due to the land application of wastes? (Kamath 1993)
	• Is current or future use of the groundwater for agricultural use likely to be impaired?
	• Are ground water resources likely to be substantially degraded or depleted? (Bass and Herson 1991; Kamath 1993)
	• Is the project likely to alter the rate or direction of ground water flow?
	• Is the project likely to make the property vulnerable to contamination (due to wells, boreholes, cracks etc.)? (Kamath 1993)

Table A-4 - Examples of significance criteria - individual environmental components

Environmental Components		Criteria
Surface Water	•	Is the quality of surface water runoff from the property likely to contravene government standards? (CEQ 1987; Principles and Guidelines 1983)
	•	Is the quality of surface water runoff from the property likely to be inconsistent with government guidelines or objectives?
	•	Does the project destroy streams? (Kamath 1993)
	•	Are substantial reductions in water quality likely? (Bass and Herson 1991; Kamath 1993; CEAA 1994)
	•	Does the project discharge waste water to potable water systems? (Kamath 1993)
	•	Are substantial water quantity impacts (alter the rate or direction of surface water flow) likely?
	•	Is the project likely to salinate water bodies?
	•	Is the project likely to contaminate a public water supply? (Bass and Herson 1991)
	•	Is the project likely to lead to the unsightly appearance of water bodies?
	•	Is the project likely to lead to substantial increases in eutrophication? (Kamath 1993)
	•	Is current or future use of the surface water from the property for human consumption purposes likely to be impaired?
	•	Does the project increase temperature and turbidity due to impoundment? (Kamath 1993)
	•	Is the property within a designated community water supply watershed? (Rau and Wooten 1980)
	•	Is current or future use of the surface water from the property for agricultural or recreational purposes likely to be impaired?
	•	Is the property within the 100 year floodplain? (BC 1993)
	•	Is the property within the 200 year floodplain? (BC 1993)
	•	Is the property within an area subject to tsunamis? (BC 1988; 1993)
	•	Will the project displace or disrupt a highly significant or sensitive wetland area? (BC 1988, 1988; Kamath 1993)
	•	Is the project unlikely to comply with agency requirements regarding precipitation and evaporation (e.g., monthly precipitation less than the combination of evaporation and soil storage capacity) (e.g., annual precipitation less than evaporation)? (BC 1993)
	•	Is the project likely to substantially alter the rate and direction of surface water flow? (Bass and Herson 1993; CEQ 1987)
	•	Is the project likely to affect wild and scenic rivers?
	•	Are project-related effluents likely to exceed the surface water assimilative capacity?
	•	Is the project likely to result in the diversion of water from one river basin to another? (Rau and Wooten 1980)
Air	•	Are air emissions from the project likely to contravene government standards? (Bass and Herson 1991)
	•	Are air emissions from the project likely to be inconsistent with government guidelines or objectives?
	•	Are air quality changes likely to exceed the assimilative capacity of the airshed? (BC 1995)
	•	Is the project likely to expose sensitive receptors to substantial pollutant concentrations? (Bass and Herson 1991)
	•	Is the project likely to lead to climate changes due to alterations in humidity, air movement or temperature?
	•	Is the project likely to substantially contribute to acid rain? (Kamath 1993; CEAA 1994)
	•	Is the project likely to lead to excessive fields and radiation (magnetic fields, electromagnetic radiation)?
Nuisance Impacts	•	Is the project likely to contravene government noise or vibration level requirements?
	•	Is the project likely to result in substantial noise or vibration level increases over ambient conditions for sensitive uses (e.g., residential development) or features? (Bass and Herson 1991; Kamath 1991)
	•	Is the project likely to contravene government dust level requirements?
	•	Is the project likely to result in substantial dust level increases for sensitive uses (e.g., residential uses) over ambient conditions?
	•	Is the project likely to contravene government odour level requirements?
	•	Is the project likely to result in substantial odour level increases over ambient conditions? (Rau and Wooten 1980)
	•	Is the project likely to breach public standards regarding solid waste or litter control? (Bass and Herson 1991)
	•	Is the project likely to interfere with the visibility of major landmarks?
	•	Is the project likely to adversely affect the aesthetic image of the surrounding area (i.e., decreased aesthetic appeal or changes in visual amenities)? (Bass and Herson 1991)

Table A-4 - Examples of significance criteria - individual environmental components

Environmental Components	Criteria
Natural Environment	• Are unique, rare, endangered or threatened species (national, provincial, regional), habitat or physical features likely to be displaced? (Canter and Canty 1993; Kamath 1993; BC 1995; CEAA 1994; CEQ 1987; Principles and Guidelines 1983; Beanlands and Duinker 1983) • Are unique, rare or endangered species (national, provincial, regional), habitat or physical features likely to be seriously disrupted? (Kamath 1993) • Is the property within or does it abut a designated wildlife management area? (BC 1988) • Is the property within or does it abut a critical wildlife area or wildlife sanctuary? BC 1988, 1995) • Is the property within or does it abut an ecological reserve? • Is the property within or does it abut a designated bird sanctuary? • Is the property within a designated wildlife area? • Is the project likely to displace or seriously disrupt an ecologically critical area? (BC 1995; Bass and Herson 1993; CEQ 1987) • Does the project cause substantial interference with the movement of any resident or migratory fish or wildlife species? (Bass and Herson 1991; CEAA 1994) • Is the project likely to impede the integrity, primary production or stability of ecosystems (i.e., complexity, diversity, stability, resilience) beyond tolerance limits? (CEAA 1994; Beanlands and Duinker 1983) • Is the project likely to impede the productive or carrying capacity or assimilative capacity of the ecosystem? (Canter and Canty 1993; CEAA 1994) • Is the project likely to appreciably reduce species diversity or abundance? (Barnes and Westworth 1994; BC 1995) • Is the project likely to disrupt food webs? (Kamath 1993; CEAA 1994) • Is the project likely to lead to a substantial loss of critical or productive habitat (including habitat fragmentation)? • (Bass and Herson 1991; CEAA 1994; Beanlands and Duinker 1983) • Is the project likely to result in appreciable population declines, particularly in top predators, large or long-lived species? (CEAA 1994) • Will the project obstruct the migration, passage or behaviour of wildlife? (Roberts 1974; CEAA 1994) • Is the project likely to substantially affect habitats that are ecologically fragile and that have little resilience to imposed stresses? (Canter and Canty 1993) • Is the project likely to change the diversity or productivity of vegetation? (Kamath 1993) • Does the project foreclose future habitat production? (Beanlands and Duinker 1983) • Will the project have substantial wildlife resource impacts as a consequence of increased hunting/road access? • Is the project likely to result in the introduction of exotics, parasites and diseases? (Kamath 1993) • Is the project likely to result in appreciable changes in hydrological, temperature or nutrient regimes? (CEAA 1994) • Is the project likely to cause a fish or wildlife habitat to drop below self-sustaining levels? • Does the project eliminate a plant or animal habitat? • Is the project likely to cause substantial emigration resulting from human-wildlife interaction problems?
Health and Safety	• Is the project likely to contravene government health and safety standards? • Is the project likely to adversely affect human health? (Kamath 1993; CEQ 1987; CEAA 1994; BC 1995) • Are potentially serious off-site human health risks likely in the event of an accident or spill? • Is the project likely to lead to a substantial increase in demand for health services? • Is the project likely to lead to altered health risks as a result of changes in socioeconomic status? • Are there substantial occupational health and safety concerns associated with the project? (Kamath 1993) • Are project-related health effects likely to be especially severe for certain population groups (e.g., gender, age)? • Is the project likely to create a public health hazard or expose people to hazards? (Bass and Herson 1991; Rau and Wooten 1980) • Is the project likely to interfere with emergency response plans or emergency evacuation? (BC 1995; Bass and Herson 1991) • Will the project increase the potential fire hazards of the site? (Roberts 1974; Bass and Herson 1991; Kamath 1993) • Does the project generate, transport, store or disposal of regulated hazardous waste? (Kamath 1993)

Table A-4 - Examples of significance criteria - individual environmental components

Environmental Components	Criteria
Social, Cultural and Built Environment	• Is the property within or does it abut a national, provincial, regional or municipal park? (BC 1988) • Does the property comply with government buffer zone and setback requirements? (BC 1988) • Will the project displace major existing uses? (Kamath 1993) • Will the project be sited on public land? (Rau and Wooten 1980) • Is the project likely to conflict directly with adjoining existing uses? (Kamath 1993) • Is the project in direct conflict with designated planned land uses for the site? (Carter and Canty 1993; Kamath 1993) • Is the project in direct conflict with designated planned land uses adjoining the site? • Is the project inconsistent with regional or community strategic, land use, transportation or watershed planning for the area encompassing the site? • Is the project likely to substantially change the social structure or demographic characteristics of the surrounding area? (Kamath 1993) • Will the project have a substantial impact on housing supply and / or price? • Does the project conflict with community goals? (Bass and Herson 1991) • Is the project likely to induce substantial growth or concentrations of population? (Bass and Herson 1991; CEAA 1994) • Will the proposal have significant aesthetic effects or adversely affect areas of unique interest or beauty? (Roberts 1974; CEAA 1994) • Is the project likely to significantly increase traffic or affect traffic networks, facilities or hazards? (Kamath 1993; Roberts 1974) • Will the project adversely affect cultural resources? (Bass and Herson 1991)? • Does the project extend a sewer or water truck line with capacity to service new development or pass through a substantial undeveloped area? (Bass and Herson 1991; Rau and Wooten 1980) • Is the project likely to generate significant solid waste and / or significantly impact existing landfill capacity? (Kamath 1993) • Will the project substantially impair human well being or quality of life? (Barnes and Westworth 1994; CEAA 1994) • Will the project cause a substantial displacement of land or people? (Rau and Wooten 1980) • Will the project reduce the quality or quantity of recreational opportunities or amenities or activities? (Kamath 1993; BC 1995) • Is the project likely to alter existing cultural or lifestyle patterns? • Will the project substantially affect wilderness and open space qualities? (Kamath 1993) • Is the project likely to interfere with the reasonable use and enjoyment of property? (Nova Scotia 1994) • Is the project likely to result in serious social distributional effects (e.g., housing availability and affordability, wage levels, unemployment, gender impact issues)? (Kamath 1993) • Will the project represent a barrier to vehicular or pedestrian movement? • Will the project cause a traffic increase that is substantial in relation to existing street traffic load and capacity? (Bass and Herson 1991) • Will the project impede access to or delivery of community or social support services? (Kamath 1993; CEAA 1994) • Is the project likely to disrupt community stability and cohesion? (BC 1995) • Is the project likely to adversely affect the current use of lands and resources for traditional purposes by aboriginal persons? (CEAA 1994) • Is the project likely to adversely impact aboriginal sustenance and traditional activities? (BC 1995; CEAA 1994) • Is the project likely to lead to adverse aboriginal community and social effects? (BC 1995; CEAA 1994) • Will the project have negative effects on the preservation or enhancement of historical, archaeological, palaeotological, traditional use or architectural resources, sites or landscape features? (Kamath 1993; BC 1995; CEAA 1994; CEQ 1987; Rau and Wooten 1980) • Will the project eliminate important examples of major periods of history or prehistory? • Is the project likely to displace or substantially impair access to or use of resources and features of scientific or educational or cultural value? (Bass and Herson 1991)

Table A-4 - Examples of significance criteria - individual environmental components

Environmental Components	Criteria
Resources	• Does the project displace high capability (Classes 1 to 4) or prime agricultural land? (Bass and Herson 1991; Kamath 1993; BC 1995; CEQ 1987) • Does the project displace or seriously disrupt existing agricultural operations? • Does the project displace high capability (Classes 1 to 4) forestry land? (Kamath 1993; BC 1995) • Does the project displace or seriously disrupt existing forestry licensees operations? • Does the project displace high capability (Classes 1 to 4) recreation land? • Does the project displace or seriously disrupt existing recreational uses or facilities? (Kamath 1993; Beanlands and Duinker 1983) • Is the project likely to impair tourism capability and development opportunities? (Kamath 1993; BC 1995) • Does the project displace or deplete high potential mineral resources, potential or claims? • Is the project likely to displace or deplete or or disrupt petroleum and natural gas reserves and leases? (Kamath 1993) • Is the project likely to displace, deplete or disrupt aggregate or quarry resources? (BC 1995; Kamath 1993) • Is the project likely to impede mining and oil gas exploration, development and production? (BC 1995) • Is the project likely to impede access to subsurface resources? (BC 1995) • Does the project displace or seriously disrupt existing mining uses? • Is the project likely to greatly impair hunting or trapping activities? (Kamath 1993) • Is the project likely to disrupt aboriginal, commercial or sports fishing activities? (Kamath 1993; Beanlands and Duinker 1983) • Is the project likely to impair aquaculture capability and existing operations? • Is the project likely to change the abundance and diversity of fish? • Does the project necessitate the irreversible commitment of any significant amount of any other non-renewable resource? (Bass and Herson 1993; CEAA 1993; CEAA 1994; Canter and Canty 1993) • Does the project pre-empt the use or potential use of a significant natural resource for any other purpose? (Bass and Herson 1993; CEAA 1994) • Is the project likely to impede the sustainable use of renewable resources (i.e., to meet the needs of current and future generations)? (CEAA 1994; Canter and Canty 1993) • Is the project likely to use large amounts of fuel, water or energy or to use such resources wastefully? (Bass and Herson 1991; Kamath 1993)
Economic	• Does the project displace or seriously disrupt any existing businesses? (Rau and Wooten 1980) • Does the project preclude the establishment of any businesses? • Is the project likely to result in serious public service and finance impacts (e.g., over taxing of existing community services, infrastructure requirements)? (Kamath 1993; CEAA 1994) • Will the project lead to unemployment or shrinkage in the economy? • Are there potentially serious impacts associated with project-related direct and indirect employment, sales and income? • Is the project likely to reduce an area's standard of living? (Kamath 1993)

Table A-5 - Criteria for Guideline Evaluation - RefiningAnalysis and Synthesis Activities

Activity	Criteria
Scoping	• encourages and provides specific scoping guidance
Data Collection and Analysis	• suggests and provides guidance for bounding process • indicates need to explain and substantiate data collection and analysis methods • stipulates that data sources must be recorded • provides guidance regarding management of data and data uncertainties
Baseline Conditions and Analysis / Research	• indicates need to explain and substantiate baseline analysis methods • points out that natural variability should be considered • points out that historical, current and likely future environmental conditions should be considered • indicates need for public involvement in baseline analysis • points out need to identify sensitive and significant environmental components • encourages review of comparable proposals and use of control communities
Impact Identification	• provides guidance regarding range and types of impacts that should be considered • indicates need to explain and substantiate impact identification methods • indicates need to define and substantiate impact criteria • points out need to involve public in impact identification
Impact Prediction	• indicates need to explain and substantiate impact prediction methods • indicates the need to clearly distinguish between environmental conditions with and without proposal • specifies types of distinctions that should be drawn in impact predictions (e.g., direction, spatial distribution, temporal distribution, reversibility, by population group) • encourages quantification of impacts, where appropriate, and use of up-to-date conceptual and quantified models
Uncertainty and Risk	• indicates need to assess sources, nature and implications of uncertainty • suggests examples of procedures for managing uncertainty • indicates need to address probability of impacts including the establishment of confidence limits • encourages the consideration of human health and ecological risks and the use of probabilistic risk assessment where appropriate • points out need to involve public in the consideration of risk and uncertainty
Impact Interpretation	• indicates need to explicitly and consistently address impact significance • indicates need to place significance interpretations in broader context • specifies types of distinctions that should be made in significance interpretations (e.g., public policies, public preferences, impact magnitude, reversibility, sensitivity and significance of receptors, uncertainty, cumulative effects)
Interrelationships and Cumulative Effects	• points out need to address interrelationships among proposal activities and environmental components • points out need to address indirect impacts • points out need to address cumulative effects of proposal • points out need to address cumulative effects of proposal in conjunction with other activities and proposals • provides guidance regarding what concerns should be addressed and how they should be addressed in cumulative effects assessment
Overall Rigour	• encourages experimental approach to EIA • provides study design guidance • points out need to identify institutional constraints • indicates that all assumptions should be explicit and substantiated • points out importance of avoiding bias • indicates that scientific and technical terms should be defined • encourages use of peer review
Sustainability and Environmental Management	• encourages interpretation of impacts within a broader environmental management context • suggests explicit consideration of sustainability impacts • provides guidance regarding the treatment of sustainability concerns

Table A-5 - Criteria for Guideline Evaluation - RefiningAnalysis and Synthesis Activities

Overall Process	• indicates importance of succinct and understandable analysis • points out importance of early and on-going public involvement

Table A-6: Scaling Levels - Refining Analysis and Synthesis Activities - Guideline Evaluation

Scaling Levels	A	B	C	D	E
Scoping	-generic scoping guidelines and procedures address general principles and matters to address -further, more detailed, guidance provided in project-specific guidelines	-scoping formalized through project - specific guidelines with provision for full stakeholder involvement	-scoping formalized through project-specific guidelines but limited public involvement	-general references to focusing process and documentation	-no scoping procedures
Data Collection and Analysis	- generic guidelines address need to substantiate boundaries, sources , methods and uncertainties -further, more detailed, guidance provided in project specific guidelines	-project guidelines generally address need to substantiate boundaries, sources, methods and uncertainties	-general or project guidelines refer to two or three of boundaries, sources, methods and uncertainties	-general or project guidelines refer to need to address one of boundaries, sources, methods and uncertainties	-no guidance provided
Baseline Conditions and Analysis / Research	-generic guidelines address general standards and principles (e.g., scientific methods, focus on VECs, allowance for natural variability, basis for prediction and monitoring) -further, more detailed, area and project-specific guidelines provided in project-specific guidelines	-project guidelines provided detailed direction regarding methods and standards -specific reference to VECs and VSCs should address	-project or generic guidelines provide direction regarding methods or standards but no reference to VECs or VSCs	-project or generic guidelines only provide partial or very general references to the need to describe baseline conditions	-no guidance provided
Impact Identification	-generic guidelines point out need to explain and substantiate impacts to consider and to involve public in impact identification -project guidelines provide more detailed guidance regarding potential impacts should consider	-project guidelines provide detailed direction regarding impact identification procedures, potential impacts should consider and procedures for public involvement in impact identification	-project or generic guidelines provide direction regarding impact identification methods, including the need for public involvement, but no guidance provided regarding potential impacts that should consider or selectively identifies impacts but no guidance regarding impact identification	-project or generic guidelines only provide partial or very general references to the need to explain how impacts identified	-no guidance provided
Impact Prediction	-generic guidelines explain need to rigorously predict impacts and to substantiate methods ; identify key distinctions that should be drawn (e.g., spatial distribution, temporal distribution, direct - indirect) -project guidelines provide more detailed guidance regarding methods and impacts for which predictions should be prepared	-project guidelines provide detailed direction regarding methods, including key distinctions and impacts for which predictions should be prepared	-project or generic guidelines either provide direction regarding methods or identify impacts for which predictions should be prepared but not both	-project or generic guidelines only provide very general or selective references to the need to predict impacts and to explain methods employed	-no guidance provided

Table A-6: Scaling Levels - Refining Analysis and Synthesis Activities - Guideline Evaluation

Scaling Levels	A	B	C	D	E
Risk and Uncertainty	-generic guidelines identify general principles and describe general approaches for addressing risk and uncertainty concerns (e.g., confidence limits) -project guidelines provide more detailed direction regarding specific areas where risk and uncertainty are a particular concern	-project guidelines provide detailed direction regarding risk and uncertainty concerns and methods for addressing such concerns	-general or project guidelines either provide direction regarding risk or uncertainty concerns or methods but not both	-generic or project guidelines only include general references to the need to address health risk concerns and /or uncertainty	-no guidance provided
Impact Interpretation	-generic guidelines include how impact significance should be addressed, including examples of criteria -project guidelines provide more detailed direction regarding area specific considerations that should be taken into account in significance interpretations	-project guidelines provide detailed direction regarding impact significance criteria and area-specific concerns that should be addressed in impact significance interpretations	-project or generic guidelines either provide direction regarding impact significance criteria and methods or identify area-specific concerns that should be addressed in impact significance interpretations but not both	-generic or project guidelines only include general references to the need to interpret significance	-no guidance provided
Interrelationships and Cumulative Effects	-generic guidelines define and describe cumulative effects; also describe methods for addressing cumulative effects -project guidelines provide more detailed guidance regarding the types of cumulative effects that should be addressed	-project guidelines provide detailed direction regarding the types of interrelationships and cumulative effects that should address and methods for addressing	-generic or project specific guidelines either make specific reference to cumulative effects but provide no to minimal guidance regarding methods and types of cumulative effects to address or identify interrelationships and cumulative effects to address but provide no guidance regarding methods	-generic or project specific guidelines only include general references to the need to address interrelationships such as direct and indirect effects	-no guidance provided
Overall Rigour	-generic guidelines identify general principles for scientific approach (e.g., experimental approach, explicit study design, explicit assumptions) -project guidelines provide more specific guidance regarding the rigorous application of methods for specific impact types	-project or generic guidelines provide detailed direction regarding procedures for ensuring rigorous analysis procedures	-generic or project guidelines provide general or selective advice regarding methods for ensuring a rigorous analysis	-generic or project guidelines include general reference to need for rigorous analysis	-no guidance provided

Table A-6: Scaling Levels - Refining Analysis and Synthesis Activities - Guideline Evaluation

Scaling Levels	A	B	C	D	E
Sustainability and Environmental Management	-generic guidelines identify general principles and policies for addressing sustainability and broader environmental management concerns -project guidelines identify specific sustainability and broader environmental management concerns to address	-project guidelines identify specific sustainability and environmental management concerns and policies to address	-generic or project guidelines identify specific environmental management concerns to address	-generic or project guidelines only make general reference to the need to address environmental management or planning	-no guidance provided
Overall Process	-generic guidelines provide general principles and examples of methods for ensuring succinct, understandable documentation and for involving public through process -project guidelines provide more detailed advice regarding documentation and concerning publics to involve and public involvement procedures	-generic or project guidelines provide detailed advice regarding documentation and concerning publics to involve and public involvement procedures	-generic or project guidelines provide general or selective advice for clear documentation and /or involving the public	-generic or project guidelines only include general reference to the need for an understandable analysis and / or for public involvement	-no guidance provided

Table A7 - Application of Scaling Levels - Refining Analysis and Synthesis Activities - Guidelines Evaluation

Criteria	BC	ALB	SASK	MAN	ONT	QUE	NB	NS	PEI	NFLD	CAN
Scoping	B	B	B	C	D / B (P)	C	B	B	B	B	B
Data Collection and Analysis	C	D	D	E	C	C	D	D	D	C	C
Baseline Conditions and Analysis / Research	B	B	A	C	D	A	B	B	B	B	B
Impact Identification	A	C	C	C	C	A	C	C	C	A	A
Impact Prediction	A	B	A	C	D	A	A	C	B	B	B
Risk and Uncertainty	C	B	A	C	D	C	B	B	B	B	A
Impact Interpretation	D	C	D	D	D	C	B	C	B	C	A
Interrelationships and Cumulative Effects	C	A	C	D	C	C	C	D	C	D	A
Overall Rigour	C	C	C	C	E	A	D	C	A	C	B
Sustainability and Environmental Management	C	B	C	B	D	B	E	C	C	C	C
Overall Process	A	C	A	B	B	A	C	C	C	A	A

Scaling Levels A to E

Table A-8- Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Scoping	-provides for scoping through draft and final project report specifications -general guidelines refer to tailoring study requirements to project circumstances and to focusing on stakeholder issues and concerns	-provides for scoping through disclosure documents for public screening and through draft and final terms of reference	-provides for scoping through project proposals and project-specific guidelines -points outs need for early identification of critical environmental issues and public involvement in "scoping"	-provides for scoping through project guidelines	-potential for scoping with EA proposals; guidelines for EA proposals; new legislation formalizes scoping process	-provides for scoping through project guidelines -project guidelines stress description only when directly required for assessment
Data Collection and Analysis	-generic guidelines point to need to summarize status of relevant data; provides general references and typical data collection categories	-terms of reference point out need to identify and provide a rationale for study areas	-project specific guidelines provide study area guidance	-no specific references	-EA proposal guidelines include suggestion to describe study area(s) with reasons -general EA guidelines indicate that study areas should be described, with rationale -general reference to focusing on data likely to be of key significance -selective references to data collection methods and sources (e.g., heritage) and to planning period (e.g., waste management projects)	-project guidelines detail data collection and analysis method requirements; also provide guidance regarding the treatment of data uncertainties

Table A-8- Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Baseline Conditions and Analysis / Research	-generic guidelines stress the need to contact government departments regarding the design and methods of baseline data collection -points to need to draw upon baseline monitoring data and to describe existing characteristics and conditions -project report specifications provide detailed environmental information requirements and specify reference baseline monitoring requirements	-terms of reference provide detailed guidance regarding environmental conditions that should characterize including research and development studies undertaken or proposed -indicates that environmental disturbances from previous activities and sensitive receptors should be identified -indicates that designated VECs (Natural Areas, Environmentally Sensitive Areas, Prime Protection and Critical Wildlife) that might be affected should be identified	-generic guidelines indicate that description of existing environment should be sufficient to understand existing conditions, provide a sound basis for prediction and impact management and provide a basis for post-EIA studies (i.e., not just descriptive) -indicates that baseline data should provide a statistically valid measure of the parameter's natural variability -points out that attention devoted to parameter should reflect importance -specific data requirements detailed in project specific guidelines; suggests some potential sources (e.g., GIS)	-project guidelines require description of existing biophysical, socio-economic and land use conditions -project guidelines detail environmental components to be described -includes references to describing existing environment in both qualitative and quantitative terms and to descriptions of original research	-EA proposal guidelines indicates EAP should include data collection methods and sources -selective detailing of baseline data requirements by review agency (e.g., for heritage resources, land use), by project type (e.g., waste management projects) and through class assessment requirements (e.g., municipal water, wastewater and road projects) -selective provision of criteria for determining environmental significance (e.g., for heritage resources)	-generic guidelines refer to the need to describe the environment likely to be affected by the project (biophysical, human communities, culture, heritage, archaeological, landscapes and resource use) -project guidelines contain detailed descriptions of baseline conditions requirements; includes selective references to method requirements (e.g., modelling, archaeological investigations) -project guidelines require consideration of different scenarios
Impact Identification	-generic guidelines provide examples of types of potential impacts -project report specifications detail specific potential impacts and related data requirements	-terms of reference provide detailed lists of potential impacts should consider	-project-specific guidelines identify potential impacts that should consider	-project guidelines requires identification of any direct potential environmental impacts of proposal -indicates in project guidelines (Repap) reference to sustainable forest ecosystems	-selective references to potential impacts by review agencies (e.g., transportation, municipal affairs, culture), by project type (e.g., waste management) and in class assessments (e.g., transmission lines)	-generic guideline indicate that positive, negative and residual environmental impacts should be listed and evaluated -project guidelines include a detailed list and explanation of potential impacts to address; include selective references to methods requirements

Table A-8- Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Impact Prediction	-generic guidelines point to need to assess anticipated changes in environmental conditions attributable to project -points to need to differentiate between direct and indirect effects -project report specifications provide details regarding impact prediction methods (e.g., modelling) to address specific issues also (Tulsequah) details terrain assessment, soil survey and land capability mapping requirements	-terms of reference indicate that predictions should be quantified, where possible -makes specific references to the location,, extent, magnitude and duration of effects by project stage -requires ecological land classification -includes selective references to methods (e.g., air quality models)	-indicates that should address likelihood, magnitude and duration of each environmental change -project-specific guidelines indicate that should provide complete and, where practical, quantitative analysis of potentially significant impacts -includes selective references to methods (e.g., air quality modelling)	-project guidelines indicate that all certain and probable impacts should be classified as direct or indirect, location and severity of impacts as well as time frames within which they may occur; also indicates that worst case scenarios should be considered	-generic guidelines refer to distinguishing between positive and negative and direct and indirect impacts -certain impact type guidelines (e.g., heritage resources) provide and define magnitude criteria (e.g, magnitude, severity, duration, frequency, range, diversity) -certain environmental quality guidelines (e.g., water quality, air quality, ground water) provide standards, objectives and methods guidance (e.g., modelling)	-generic guidelines refer to objective components (nature, magnitude, prevalence, duration) -project guidelines indicate that proponent should indicate accuracy and interpretation limits of any mathematical models used -project guidelines indicate prediction methods should be explained; includes best vs. worst case scenarios and description of accuracy and reliability of predicted impacts
Uncertainty and Risk	-generic guidelines refer to health concerns, effects / risks and assessments and to potential for accidents but not to risk assessment; notes issue of scientific uncertainty -points out need to consider data reliability -general point made that social impacts are often less predictable and need for rigorous and committed impact management responses	-terms of reference make specific references to the need to address the potential for environmental effects (risks), uncertainties and contingencies -points to need to identify implications of data gaps and validity issues for conclusions -indicates that main risks and uncertainties should be identified and addressed	-generic guidelines indicate that special risks or hazards should be identified -indicates that impacts during normal and worst cases scenarios should be assessed including overall environmental risks -notes implications for impact prediction reliability of data gaps should be assessed; indicates may require additional data collection -specific guidelines indicate that human health risk should be included; also refers to public and occupational health and safety	-project guidelines make specific reference to the consideration of human health impacts -in one project guideline (hazardous waste management) refers to need to assess risk, including consideration of probability of occurrence and risk reduction measures	-generic guidelines indicate where effects uncertain, should explain why and level of certainty	-generic guidelines indicate special attention to health, accident risk and safety and emergency measures -project guidelines stress quality, reliability and interpretation of data; requires indication of sample size and provision of dispersion or variability coefficient -project requirements detail health concerns to be addressed

Table A-8- Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Impact Interpretation	-generic guidelines point to need to identify key issues and to address effects significance within the project setting	-terms of reference indicate that impact significance should be explained in terms of magnitude, extent, duration, frequency and reversibility -indicates that significance of effects, before and after mitigation, should be described	-generic guidelines point out that all potentially significant impacts should be addressed; notes that significance of change should be interpreted, with rationale including public involvement -general guidelines point out that EIA should provide a complete, whenever practical, quantitative analysis of potentially significant effects by project stage	-one project guideline (Repap) refers to distinguishing between significant and insignificant impacts	-selective references to impact significance (e.g., waste management projects) but only in the context of criteria weights for use in comparative evaluation methods -occasional general references to impact significance (e.g., in class EAs) -project screening guidelines include environmental significance criteria (i.e., when a project might be environmentally significant) -issues to consider when considering "bump up" request listed in class EAs	-generic guidelines refer to subjective components (criteria of uniqueness, rareness, sensitivity, reversibility)
Interrelationships and Cumulative Effects	-generic guidelines point to need to address cumulative, region-scale and cross boundary effects; reference to cumulative effects includes trends in characteristics and conditions and additive effects of project in relation to other development activities -project guidelines points to need to consider ecosystem functions and natural processes -points to need to focus on suspected cause and effect linkages	-terms of reference point out need to address regional, temporal and cumulative effects -provides detailed guidance regarding impact sources and key interrelationships -requires description of current uses, resources and other activities with potential, in combination with proposed development activities, to affect the environment -paper prepared for Energy Resources Conservation Board; detailed analysis of CEA methods and procedural recommendations (Hegmann and Yarranton 1995)	-project-specific guidelines indicate that cumulative and residual impacts should be discussed under each section; reference is also made to overall environmental risks	-project guidelines (Repap) indicates that should assess trans-boundary effects and environmental stresses such as global warming, ozone depletion and air borne pollutants	-generic guidelines include general references to cumulative effects of alternatives -selective reference to cumulative effects within disciplines (e.g., heritage resources)	-generic guidelines refer to need to consider indirect, cumulative, latent and reversible impacts -project guidelines specify potential cumulative impacts must consider

Table A-8- Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Overall Rigour	-detailed project report specifications (Bamberton) provides mapping scale requirements -study design guidance detailed in project report specifications	-detailed study design guidance provided through draft and final terms of reference	-generic guidelines refer to need for accurate and comprehensive evaluation of positive and negative socio-economic and bio-physical changes -indicates that all methods used and assumptions should be documented -project specific guidelines refer to scientifically valid data collection, analysis and interpretation methods; includes scientifically valid statistical analyses and links to monitoring	-project guidelines indicate information shall be included on scientific reports and papers on topics relevant to the proposal and original studies performed by qualified scientists or engineers, commissioned by the proponent -project guidelines indicate that information should be provided on peer reviewed scientific reports and papers relevant to the proposed facility	-no specific guidance provided except with regard to environmental quality requirements (e.g., air quality modelling)	-generic guidelines indicate that statement must be scientifically designed and prepared; reference is also made to statement being scientific in nature -project guidelines refer to justification of sampling methods and statistical analysis; also requires critical analysis of method reliability, scope of results, reproducibility of analyses and quality control; in addressing interpretation limits requires proponent to refer to literature and comparable project experience -project guidelines require exhaustive literature review, complete with references; should ensure availability; also methods employed must be indicated for all sections including interpretive constraints; requires inclusion of references to scientific works and appropriate bibliographical references

Table A-8- Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Sustainability and Environmental Management	-generic guidelines do note need for utility projects to be consistent with integrated resource plan (IRP) -refers to need to incorporate energy efficiency and conservation measures -project report specifications point to relationship with land use planning processes -public raised sustainability in review of draft report specifications (Bamberton); response indicates where addressed	-terms of reference (Syncrude) indicate that proponent's participation in regional air monitoring, networks, health studies and biomonitoring initiatives should be specified -indicates that legislation, policies and approvals applicable to project should be specified; particular reference to land use and resource policies -specific references (Syncrude) to ensuring that federal and provincial greenhouse gas emissions commitments should be considered and addressed; also reference to ensuring resource sustainability (GAP)	-project-specific guidelines (Weyerhaeuser) indicate commitment of forest management plans to integrated resource management approach; also indicates intent to demonstrate understanding of sustainable forest ecosystem based management and biodiversity maintenance -project specific guidelines refer to proposed land use and resource uses	-a project guideline (Repap) refers to applying, to extent possible, ecosystem-based approach to forest management at landscape level, and to employ adaptive management strategies; also refers to 1997-2009 Forest Management Plan -reference is also made to applying principles of Sustainable Development Strategy for Manitoba and a range of other federal and provincial policies -requires a sustainability assessment (Repap) with integration of principles throughout EIS	-selective references to broader policy context (e.g., land use planning component, for waste management projects) -selective references to sustainability - type principles (e.g., ecosystem principles for waste management projects)	-generic guidelines identify sustainable development as an EA goal and a perspective for EA -project guidelines indicate need to place in broader policy context (e.g., energy policy guidelines, forest management agreements) -project guidelines identify sustainability objectives, with particular reference to the maintenance of biological diversity
Overall Process	-generic guidelines stress need for ongoing public involvement; provides public consultation principles, objectives, responsibilities and examples of techniques -provides specific principles and participation suggestions for First Nations consultation	-disclosure documents for screening generally address proposed public consultation procedures -terms of reference indicate that public consultation measures should be specified, concerns and suggestions recorded and resulting changes identified -indicates that public forums should be provided through the EIA planning process and for post approval period -indicates that legislation, policies and guidelines applicable to project should be identified	-generic guidelines point out that public should be involved in each stage of planning process; includes a public involvement program with more than 1 way communications -indicates that EIA should be understandable to non-specialist; including glossary of technical terms and an EIS summary -specific guidelines note that extent of public influence, especially in assessing significance of effects should be explained	-project-specific guidelines require inclusion of public and First Nations consultation program; also refers to working closely with First Nations communities and other members of public -project specific guidelines refer to inclusion of executive summary, with a minimum of technical terminology; also requires inclusion of a glossary of terms -project guidelines require a public involvement program	-EA Proposal guidelines suggest inclusion of public and agency consultation plan -EA guidelines include numerous references to early and ongoing consultation with affected parties and focus on issues resolution -separate guidelines provided for the role of review participants and of public; public guidelines includes principles, examples of methods and criteria for evaluating methods ; greater detail selectively provided (e.g. for waste management projects)	-generic guideline indicates that EIS be designed for public consultation and information purposes, including a non-technical summary -general guidelines list public consultation objectives and indicate ample provision should be made for information and consultation mechanisms -general guidelines for northern projects stress participation of native people -project guidelines specify consultation requirements -project guidelines stress concise, easy-to-read style

Table A-9 - Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 2)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Scoping	-provides for scoping through project guidelines -project guidelines require the identification of VECs through a scoping exercise	-provides for scoping through project guidelines for terms of reference -project guidelines suggest using VECs to provide focus	-provides for scoping through project terms of reference -project guidelines indicate that predictions should focus on significant issues; identifies significant issues identified during screening stage	provides for scoping through project terms of reference -stress on format that will enable reviewers to focus immediately on items of concern -in some cases public concerns raised to date identified	-provides for scoping through screening procedures and panel guidelines; initially scoping determined by responsible authority -reference guide for heritage resources includes suggested scoping procedures -project guidelines based on scoping sessions with stakeholders -project guidelines identify specific issues that merit special attention
Data Collection and Analysis	-project guidelines require clear definition of temporal and spatial boundaries; also identifies boundary definition considerations and refers to administrative, technical, biophysical, socioeconomic and project area boundaries	-project guidelines suggest showing clear temporal and spatial contexts for the study and analysis of changes to VECs -project guidelines require that study area(s) should be stated; provides a study boundary definition	-project terms of reference require temporal and spatial boundaries; breaks down temporal boundaries by project stage; breaks down spatial boundaries by impact type -project terms of reference identifies specific considerations to address in temporal and spatial boundary definition	-project terms of reference define and explain study area -project terms of reference identify data collection and analysis methods including supplementary research requirements -includes requirement to identify project stages to be considered -indicate that all references will be cited	-reference guide for heritage resources includes procedures for identifying spatial and temporal project boundaries -project guidelines includes principles - identification of spatial and temporal boundaries -for spatial boundaries includes maximum range if direct or indirect effects on valued ecosystem and social system components; reference made to use of traditional knowledge in boundary definition and to consideration of natural systems and community analysis -for temporal boundaries includes project stages including post-decommissioning period -project guidelines note that the use of offsite data should be appropriately qualified -project guidelines require clear spatial and temporal boundaries for VECs, including explanation and justification

Table A-9 - Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 2)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Baseline Conditions and Analysis / Research	-project guidelines require the identification of VECs; require methods for identifying and criteria for determining VECs to be clearly stated -project guidelines specify existing environmental conditions to be described	-project guidelines provide a detailed list of environmental components to be described; includes specific reference to the identification of VECs and areas of cultural or archaeological significance; includes a definition of VEC -requires delineation of how VECs determined -project guidelines require description of existing environment over 4 seasons	-project terms of reference note a requirement for a detailed description of the existing environment -suggests that VECs should be established at the outset of the process; defines VECs -identifies specific VECs to consider -identifies components of existing environment to be included	-generic guidelines point out that EIS has to describe the present environment that would be directly or indirectly affected; also notes that future environment if undertaking did not take place must be predicted -project terms of reference provide for VEC identification and indicates that project will be placed within context of existing systems; specific baseline conditions analysis requirements noted including sensitive areas data base requirements -in some cases VECs identified -environmental components to be addressed in component studies (original baseline information gathering for VECs) described; includes rationale/objectives, study area, methods, outputs, references) -indicates that qualitative and quantitative descriptions of present and potential conditions (over the expected lifespan of the activity) must be provided; emphasis placed on relevant conditions	-generic guidelines provides examples of existing environmental conditions that may be described and types of sources -general guidelines points out that environment description should include components, interrelationships and sensitivity to disturbance -reference guide on physical and cultural heritage resources includes examples of resources, jurisdictions and sources -project guidelines provide detailed baseline requirements including consultation, environment description and status, transport mechanisms, pathways and target areas; also specifies regional baseline requirements, including VECs and government information requests to address institutional framework and regional baseline -project guideline refers to past, present and future environmental conditions to extent necessary to predict changes -project guidelines include requirement to take into account past, present and future dynamism of ecosystem, including relevant cultures, societies and economies; includes interactions among ecosystem components; also refers to past, present and future human environmental conditions

Table A-9 - Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 2)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Impact Identification	-project guidelines specify potential impacts for which impact predictions are required	-project guidelines identify potential impacts must identify	-project guidelines specify potential impacts to focus on; identified as significant issues	-project terms of reference indicate that both biophysical and socio-economic impacts, that might reasonably be expected, must be described -identifies potential impacts that will be considered	-generic guidelines list general method types (overlays, matrix tables, expert groups) for identifying project - environment interactions -general guidelines provide examples of socioeconomic effects, physical and cultural heritage effects and considerations that must address -reference guide on heritage resources includes examples of heritage resource effects; also includes procedures for analysis of potential effects on cultural heritage resources -project guidelines include detailed list of potential impacts to address
Impact Prediction	-generic guidelines refer to proposed methods for evaluating the accuracy of impact predictions -project guidelines indicate that predictions must consider all aspects and phases of project; indicates general preference for objective, measurable predictions -project guidelines refer to distinguishing impact nature, magnitude, duration and distribution; also require that predictions be amenable to testing through ongoing monitoring	-project guidelines suggest stating impact predictions explicitly, including basis for predictions -project guidelines distinguish between project magnitude and importance -project guidelines detail potential impacts for which predictions are required	-project terms of reference include general reference to the desirability of quantification where possible, modelling and prediction; indicates that where professional judgments, speculation or experience used to predict impacts, limitations should be identified -project terms of reference require that nature, magnitude, duration and geographic concentration / distribution of impacts should be predicted -makes selective impact prediction methods suggestions (e.g., air quality model, matrix for wildlife impacts)	-generic and project guidelines refer to direct and indirect impacts -project terms of reference indicate that spatial and temporal extent of impacts will be determined -points out that impacts should be expressed in terms of frequency, spatial extent, magnitude, duration and level of certainty for each project stage -contains specific impact prediction requirements; further detail provided for component studies -explains anticipated contents of component studies (e.g., study areas, study outputs and methods [including literature reviews, field programs, modelling and projections]) -indicate that predictions will be explicit with discussion of rationale	-reference guide for heritage resources identifies principles for predicting impacts -project guidelines note that predictive methods and models and their parameters and databases should be consistent, should enable comparative use of data and should be sufficiently evaluated to provide useful analysis and prediction of impacts -project guidelines provide detailed impact prediction requirements including impact modelling requirements and statement of impacts in a form suitable for monitoring -project guidelines provide detailed requirements regarding analysis of net benefits, biophysical and socioeconomic impacts for which predictions are required; includes scenarios of future community development and impact scenarios, drawing upon historical analysis and comparative case studies -project guidelines include requirement that impact predictions be stated explicitly with basis for each -project guidelines include specification of nature, magnitude, duration, extent, level of confidence and range of certainty of predicted changes

Table A-9 - Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 2)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Uncertainty and Risk	-project guidelines indicate that limitations of predictions should be discussed, with references to supporting documentation; also require the specification of any degree of uncertainty inherent in projections -project guidelines require emergency contingency plans and make specific reference to the prediction of human health and safety effects	-project guidelines indicate that report shall state where factual data are unavailable or where existing data cannot accurately represent environmental conditions over 4 seasons; if data have been extrapolated or otherwise manipulated to depict environmental conditions modelling methods and equations required as well as calculated error margins -requires consideration of health implications for public and employees	-project terms of reference refer to description of proposed methods/ models for evaluating the accuracy of predicted impacts -identifies human health and safety as VECs	-project terms of reference indicates that unplanned events will be addressed -indicates that the identification of knowledge gaps is imperative -includes requirement to address level of certainty for each impact prediction (degree of confidence) -indicates that any limitations to conclusions caused by insufficient data will be identified and discussed	-generic guidelines point out that malfunctions and accidents must be considered and makes specific reference to human health effects; defines health effects and identifies health considerations should address -general guidelines provide criteria for determining likelihood (e.g., probability of occurrence, scientific uncertainty) -project guideline include principle of identification of information gaps and research needs; points out that significant gaps should be identified and efforts to acquire indicated -project guidelines provide detailed requirements to identify major project risks, preventative measures and emergency response; includes analysis of risk probability; includes more specific requirements regarding public and worker health and safety -project guidelines require identification of data gaps, description of efforts to obtain and methods to address (e.g., simulation, analogue modelling, extrapolation) and discussion of implications for reliability of predictions -project guidelines requires the consideration of potential effects on health of animals

Table A-9 - Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 2)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Impact Interpretation	project guidelines require proponent to clearly distinguish significant from insignificant effects; gives examples of considerations bearing on interpretations (e.g., scientific determinations, social values, public concerns, socioeconomic judgements); particular reference to potential impacts on VECs	-project guidelines suggest defining a context within which significance of change of VECs can be determined -project guidelines distinguish between project magnitude and importance	-generic guidelines differentiate between predicted impacts and the significance of those impacts -project terms of reference indicate, in identifying VECs, should consider government regulations, guidelines, objectives and codes as well as public issues; significant issues should be integrated early in process -requires specific rating system to address significance of impacts on each VEC -indicates that significance of predicted impacts on each environmental component should be determined using objective criteria established with review committee and other stakeholders	-generic guidelines indicate that EIS will be prepared if an Environmental Preview Report indicates significant environmental impacts may result from undertaking -project terms of reference indicate that significance interpretation ratings will be used with clear definitions of terms	-generic guidelines indicate that significance of environmental effects must be considered -general guidelines differentiates between adverse and significant effects; provides criteria and factors for determining adverse effects (e.g., loss or rare or endangered species, species diversity reduction, loss of critical habitat) and criteria for determining significance (magnitude, geographic extent, duration, frequency, irreversibility, ecological context); also stresses importance of public input into significance interpretations -general guidelines include reference guide for addressing significance; reference guide addresses concepts, legislative requirements, framework for addressing, factors for determining adverse environmental effects, bibliography and glossary -reference guide for heritage resources includes suggested procedures for significance determination -project guidelines provide detailed requirements regarding impact significance interpretations; includes ecological, social, economic, cumulative and regulatory significance -project guidelines include requirement to determine how significance of predicted change in VECs to be determined; includes terms used to define significance and groups and individuals to contact in deciding on significance

Table A-9 - Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 2)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Interrelationships and Cumulative Effects	-project guidelines refers to need to consider any indirect, cumulative or synergistic effects -project guidelines require that predictions clearly identify impacts with respect to tolerance levels of organisms in the environment	-project guidelines suggest an explicit strategy for investigation interactions between project and each VEC	-project terms of reference require the consideration of both residual and cumulative effects	-project terms of reference identifies facility characteristics to be detailed with a focus on impact sources -no direct reference to cumulative effects but interrelationships of concern identified in project terms of reference	-generic guidelines provides criteria for identifying triggered projects (interdependence, linkage and proximity) -generic guidelines indicate that cumulative effects must be considered; also identifies examples of cumulative effects and cumulative effects considerations -generic guidelines provide examples of transboundary effects and procedures for addressing -generic guidelines for cumulative effects includes reference guide; reference guide addresses such matters as the concept, relationship to legislation, considerations and framework for addressing; also includes bibliography and procedure for identifying future projects to consider in EA -project guidelines require consideration of direct, indirect and cumulative effects on regional environment; includes detailed requirements regarding cumulative effects to consider -project guidelines address cumulative effects of related activities; includes requirement to describe associated projects and a requirement to treat as part of project; also requires identification of future phases and how they will be reviewed
Overall Rigour	-reference in general guidelines to using scientific methods to evaluate potential impacts	-project guidelines suggest explicit study strategy and methods for investigation including how strategy coordinates individual studies; points out if don't use Beanlands and Duinker approach should document method to be used and compare to that used by Beanlands and Duinker (Beanlands and Duinker 1983)	-generic guidelines include references to scientific evaluation and to scientific and technical information -project terms of reference proposes EIA be conducted in accordance with technique recommended by Beanlands and Duinker or a similar technique; includes study strategy at outset, boundaries, quantification where possible, modelling and prediction	-generic guidelines refer to a requirement that all information sources used in EIS be listed -clear study design, especially for component studies, required from project terms of reference	-project guidelines include general principles - separation of fact and value, inclusion of adequate information, use of local knowledge and required level of detail -project guidelines include reference to EIS being focused and methodologically rigorous; specific reference to Beanlands and Duinker (Beanlands and Duinker 1983); includes a list of methodological readings -project guidelines include requirement to describe methods for investigating effects on each VEC; includes requirement to formulate hypotheses to be tested -project guidelines include requirement to include traditional knowledge in addition to knowledge based on western scientific tradition -project guidelines include requirement that all raw data be made available

383

Table A-9 - Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 2)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Sustainability and Environmental Management	-no specific references	-project guidelines include requirement to identify all relevant regulatory requirements -selective references to broader policies (e.g., Acid Rain Reduction Agreement, ambient air quality objectives, water quality guidelines)	-generic guidelines identify EIA as a policy directed toward sustainable development -selective references to broader policies (e.g., acid rain reduction agreement, air quality objectives, emission guidelines, sulphur dioxide reduction agreement)	-project terms of reference indicate that broader policies and principles will be adhered to (e.g., Fish Habitat policy of the Department of Fisheries and Oceans, including "no net loss" principle) - regulatory requirements and agency contacts sometimes identified in project terms of reference	-generic guidelines point out requirement to consider effects on the capacity of renewable resources that are likely to be significantly affected by the project to meet present and future needs; identifies examples of ecological considerations for addressing sustainable use of renewable resources -general guidelines identify links to other legislation -project guidelines include stipulation that conforms to all applicable government requirements and demonstration that authorities have been contacted

Table A-9 - Application of Guideline Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 2)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Overall Process	-generic guidelines encourage consultation with residents in area of potential impacts and to ensure that concerns properly identified and understood -project guidelines include more specific consultation requirements and principles	-generic guidelines and regulations refer to importance of public consultation; requirement to document public concerns and steps taken to address concerns in regulations -project guidelines require detailing of public information program and results of public consultation, including commitments -project guidelines require a non-technical executive summary and the use of non-technical language wherever possible	-project terms of reference identify stakeholders to be contacted and requirement to identify and address any concerns raised -project terms of reference note importance of public consultation; impacts must be clearly known, understood and public fully consulted	-generic guidelines refer to a requirement for a public information program; requires that program fully inform local residents of nature of the project and its effects on the environment -general guidelines refer to the inclusion of specific responses to public concerns and proposed measures to deal with these concerns -project terms of reference stresses executive summary will be understandable and concise -public consultation to be undertaken specified	-generic guidelines provides summary rationale for public involvement, ways in which public concerns can be expressed, examples of publics, potential roles of public involvement; also suggests early involvement and at each stage -generic guidelines indicate that public comments must be considered; provides examples of types of public concerns -generic guidelines stipulate any public consultation undertaken should be described and any future public consultation program -general guidelines provide a citizen's guide to process; notes types of public and where and how can participate; also includes a series of fact sheets -DOE policy statement includes commitment to facilitate opportunities for public participation -class screening and comprehensive procedures point to need to designate public access points, review results of public input and facilitate resolution of disagreements -mediation procedures provide mediation principles and CEAA procedures; procedures for participant funding also provided -project guidelines include such principles as inclusion of public concerns and use of local knowledge -project guidelines include general principle - readability of EIA; reference is made to executive summary, style, format, glossary, graphics, index and 2 way reference (concordance) to Guidelines -project guidelines provide examples of stakeholder contacts and recommends ethical research and consultation principles (e.g., ethical principles for research in the north, UN equity resolution)

Table A-10 - Criteria - Proposal Evaluation - Refining Analysis and Synthesis Activities

Criteria Groups	Criteria
Scoping	• applies clear scoping criteria; defines thresholds of acceptability (CEQ 1993) • scopes out, with rationale, unreasonable alternatives (Wood 1995) • scopes out, with rationale, irrelevant and negligible impacts • consistently applies scoping criteria • focuses on key proposal characteristics, major potential impacts and major interrelationships (Munn 1975) • focuses on major issues and key stakeholders • focuses on most efficient and effective impact management measures • provides for full stakeholder involvement in scoping process • facilitates document preparation and formatting (Kennedy and Ross 1992)
Data Collection and Analysis	• establishes and substantiates administrative boundaries (Beanlands and Duinker 1983) • establishes and substantiates temporal boundaries and time frames (Beanlands and Duinker 1983) • establishes and substantiates spatial boundaries (Beanlands and Duinker 1983) • identifies and substantiates ecological boundaries (Beanlands and Duinker 1983) • explains and substantiates data collection and analysis methods (Malik and Bartlett 1993) • identifies data sources (Jain, Urban and Stacey 1977; Malik and Bartlett 1993) • identifies and substantiates sampling procedures (Friesema, Culhane and Beecher 1987) • assesses data accuracy, quality, reliability and appropriateness (Beanlands and Duinker 1983; Costanza, Funtowicz and Ravetz 1992) • identifies data and knowledge gaps and implications (Carpenter 1995a) • uses up-to-date data (Malik 1995) • uses primary data sources wherever practical and appropriate
Baseline Conditions and Analysis / Research	• explains and substantiates baseline and research methodology (Malik and Bartlett 1993) • analyses historical conditions • describes environmental settings (Malik 1995) • identifies patterns of fluctuations (Westman 1985) • identifies sensitive and significant components of environment (valued environmental components) (Wood 1995) • provides for public involvement in local data provision • predicts future environmental conditions over potential duration of proposal effects • represents scientific research fully and fairly (Malik and Bartlett 1993) • considers comparable projects (Beanlands and Duinker 1983; Burdge 1994) • uses control studies where warranted (Burdge 1994)
Impact Identification	• considers broad range of impacts (physical, biological, social, cultural, economic) (Gibson 1993; Winder and Allen 1975; Malik 1995) • describes and substantiates impact identification methods • defines criteria with rationale for each (Jain, Urban and Stacey 1977; Malik 1995; Interorganizational Committee 1994) • minimizes double-counting of impacts (Munn 1975) • involves public in impact identification

Table A-10 - Criteria - Proposal Evaluation - Refining Analysis and Synthesis Activities

Criteria Groups	Criteria
Impact Prediction	• describes and substantiates impact prediction methods (Winder and Allen 1975) • identifies prediction limitations (Julien 1995) • predicts impact direction (positive, negative) • predicts magnitude of impacts with and without proposal (Carpenter 1981) • treats impact predictions as hypotheses testing (Beanlands and Duinker 1983) • considers spatial distribution of impacts (including space lags and crowding) • considers temporal distribution of impacts (including time lags and crowding) • considers distribution of impacts by population group (Munn 1975; Interorganizational Committee 1994) • assesses reversibility of impacts (Bass and Herson 1993) • considers statistical significance (Beanlands and Duinker 1983) • quantifies impact magnitude where practical • makes use of models (conceptual and quantified) (Wood 1995: Beanlands and Duinker 1983) as appropriate • uses a range of methods (Interorganizational Committee 1994)
Uncertainty and Risk	• explains how uncertainty and risk considered (Spaling, Smit and Kreutzwiser 1993; Holling 1978) • identifies novel technologies and conditions (Carpenter 1995a) • allows for natural variability (Winder and Allen 1975) • uses more than one indicator where practical and appropriate • bounds impact predictions and makes use of sensitivity analyses (Carpenter 1995a) • provides safety factors (Reckhow 1994) • identifies which aspects of analysis more uncertain (Reckhow 1994) • identifies which uncertainties most likely to affect decisions (Reckhow 1994) • assesses probability of impacts • establishes degree of confidence in data and projections (Malik 1995; Carpenter 1981, 1995a) • assesses human health and ecological risk; chronic and acute (especially low probability high consequence impacts) (where pertinent) (Lee and Colley 1991; Carpenter 1995a; Hope 1995) • makes use of probabilistic risk assessment where appropriate (Carpenter 1995) • identifies uncertainties and knowledge gaps (Malik and Bartlett 1993) • provides for public involvement in risk and impact perception, acceptability and management interpretations (Kamrin 1993)
Impact Interpretation	• explicitly and consistently addresses impact significance (Malik and Bartlett 1993) • identifies and consistently applies impact significance criteria (Malik and Bartlett 1993) • places interpretations of significance in broader (local, regional, national, international) context (Beanlands and Duinker 1983; Malik 1995) • considers sensitivity and significance of receptors in interpretations (Erickson 1994; Interorganizational Committee 1994) • considers public policies and standards in interpretations (Erickson 1994) • considers public preferences and concerns in interpretations (Wood 1995) • considers impact magnitude in interpretations • considers uncertainty in interpretations • considers whether impacts permanent or irreversible (e.g., resource loss, biodiversity) interpretations • considers cumulative effects potential in interpretations

Table A-10 - Criteria - Proposal Evaluation - Refining Analysis and Synthesis Activities

Criteria Groups	Criteria
Interrelationships and Cumulative	• considers interactions among proposal activities • considers interactions within disciplines • considers potential indirect impacts (Bass and Herson 1993) • considers potential interactions across disciplines (e.g., ecological, social, economic) • considers cumulative additive impacts (e.g., time and space crowding) • considers cumulative non-additive (e.g., synergistic) impacts
Overall Rigour	• undertakes EIA as an experiment; treats predictions as hypotheses to be verified through monitoring (Beanlands and Duinker 1983; Spaling, Smit and Krautzwiser 1993) • employs clear study design (Beanlands and Duinker 1983) • identifies institutional constraints (e.g., time or cost) (Malik and Bartlett 1993) • makes explicit and substantiates assumptions (Munn 1975) • ensures no bias • defines scientific and technical terms (Munn 1975) • makes use of peer review (Malik and Bartlett 1993)
Environmental Management and Sustainability	• places impacts within the broader (holistic) context of environmental issues and problems (Miller 1993) • assesses sustainability impacts; uses specific sustainability criteria (Gibson 1993; Doyle and Sadler 1996)
Overall Process	• ensures succinct and understandable analysis (Munn 1975) • ensures public involvement early and throughout process (Doyle and Sadler 1996)

Table A-11- Scaling Levels - Refining Analysis and Synthesis Activities - Proposal Evaluation

Scaling Levels	A	B	C	D	E
Scoping	-explicit and systematic procedures used to screen alternatives and impacts and to focus analysis -explicit scoping criteria defined and applied -full stakeholder involvement in scoping	-explicit and systematic scoping procedures used; reasons provided but scoping criteria not defined or applied -full stakeholder involvement in scoping	-explicit identification of key issues and concerns; generally structures analysis -reasons generally provided -public involvement generally limited to issue identification; no direct involvement in scoping	-general effort to focus analysis but in an ad hoc manner -limited and inconsistent provision of reasons -link from the public issues to analysis largely unclear	-no apparent scoping
Data Collection and Analysis	-clear rationale provided for temporal, spatial, ecological and administrative boundaries -data sources and methods identified and substantiated -up-to-date, largely primary data used; supplementary analyses used to fill gaps	-data sources and methods identified and substantiated -clear rationale provided for temporal, spatial, ecological and administrative boundaries and no to minimal supplementary analyses used to fill data gaps or the reverse	-partial or limited rationale for boundaries and data sources and methods identified and substantiated or clear rationale for temporal, spatial, ecological and administrative boundaries but partial or limited identification of data sources and rationale for methods -heavy reliance on secondary sources	-partial or limited rationale for boundaries and for methods and sources -heavy to complete reliance on secondary sources	-minimal to no rationale for boundaries, sources and methods -heavy to complete reliance on secondary sources
Baseline Conditions and Analysis / Research	-baseline and research methods fully presented and supported -historical, present and likely future conditions assessed including allowance for natural variation -analysis incorporates local knowledge and focuses on VEC and VSC identification -considers comparable projects and uses control studies	-3 of Level A criteria	-2 of Level A criteria	-1 of Level A criteria	None of Level A criteria
Impact Identification	-considers a broad range of impacts -describes and substantiates impact identification methods -explicit criteria defined with clear rationale for each -clear public and agency role in impact identification	-3 of Level A criteria	-2 of Level A criteria	-1 of Level A criteria	-None of Level A criteria

Table A-11- Scaling Levels - Refining Analysis and Synthesis Activities - Proposal Evaluation

Scaling Levels	A	B	C	D	E
Impact Prediction	-impact prediction methods described and explain -impacts treated as hypotheses to be tested -distribution of impacts predicted (e.g., over space, over time, by group) -impacts modelled and quantified, where practical	-3 of Level A criteria	-2 of Level A criteria	-1 of Level A criteria	-None of Level A criteria
Risk and Uncertainty	-impact prediction confidence limits identified and bounded -systematic procedures used to identify and address sources of uncertainty -systematic consideration of human health and ecological risk, where pertinent -risk and uncertainty aversive approach employed	-3 of Level A criteria	-2 of Level A criteria	-1 of Level A criteria	-None of Level A criteria
Impact Interpretation	-impact significance interpretations placed in broader context -explicit criteria applied to define impact significance; consistently applied	-explicit criteria applied to define impact significance and consistently applied but not placed within broader context	-impact significance addressed with criteria but: -not always consistently applied; or -narrow range of criteria or -not distinguishable from impact magnitude (e.g., combined ratings)	-ad hoc treatment of impact significance; no criteria	-no apparent consideration of impact significance
Interrelation-ships and Cumulative Effects	-systematic treatment of additive and non-additive cumulative effects -systematic treatment of interactions across disciplines -systematic treatment of interactions within disciplines	-cumulative effects addressed but in an overview, qualitative manner; not always clear if addressed systematically -systematic treatment of interactions across and within disciplines	-no explicit consideration of cumulative effects -systematic treatment of interactions across and within disciplines	-no explicit consideration of cumulative effects -interactions across disciplines limited to major obvious connections -systematic consideration of interactions within disciplines	-no explicit consideration of cumulative effects -neither interactions within or across disciplines are addressed in a systematic manner
Overall Rigour	-EIA treated as an experiment with predictions treated as hypotheses to be tested -clear study design -technical and scientific terms defined -assumptions and constraints explicit and explained - highly specialized analyses subject to peer review	-addresses 3 or 4 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	-addresses none of Level A criteria

Table A-11- Scaling Levels - Refining Analysis and Synthesis Activities - Proposal Evaluation

Scaling Levels	A	B	C	D	E
Sustainability and Environmental Management	-sustainability impacts assessed with explicit sustainability criteria -impact analysis and interpretations placed within the broader context of environmental issues and problems	-reference to sustainability concerns but not addressed in a systematic manner with explicit criteria -impact analysis and interpretations placed with the broader context of environmental issues and problems	-no references to sustainability -impact analysis and interpretations placed with the broader context of environmental issues and problems	-no references to sustainability -scattered and brief references to selective broader environmental issues and problems	-no references to sustainability -no references to broader environmental context
Overall Process	-analysis succinct and understandable throughout -ample and ongoing public involvement	-analysis succinct and understandable throughout -public involvement prior to major decision points	-analysis succinct and understandable throughout -selective public involvement (e.g., late in process or many interpretations where no to limited public involvement)	-parts of analysis difficult to understand and are longer and more descriptive than they need to be and selective to limited public involvement	-analysis difficult to follow and no to limited public involvement in analysis and synthesis

Table A-12- Application of Scaling Levels - Refining Analysis and Synthesis Activities -Proposal Evaluation

Criteria	Steepbank	McArthur	OSB	Condie	East Prince	Churchill	Laidlaw	Strait	Military	Salmon
Scoping	C	B	D	C	C	C	A	B	C	C
Data Collection and Analysis	A	A	C	B	B	C	B	B	B	B
Baseline Conditions and Analysis / Research	B	B	D	C	C	D	B	C	B	B
Impact Identification	A	B	D	C	B	C	A	B	C	C
Impact Prediction	A	B	B	C	B	C	B	D	B	B
Risk and Uncertainty	A	C	C	C	C	D	A	C	B	C
Impact Interpretation	C	C	C	C	C	D	B	B	C	D
Interrelation-ships and Cumulative Effects	B	A	D	D	D	D	A	B	C	D
Overall Rigour	B	C	C	C	C	D	B	C	C	C
Sustainability and Environmental Management	B	B	D	C	C	D	D	D	C	D
Overall Process	A	A	B	B	B	B	A	C	B	C

Scaling Levels A to E

Table A-13 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie - Queen Elizabeth	East Prince
Scoping	-analysis focuses on key issues -scopes out, with rationale, unreasonable alternatives -focuses on key proposal characteristics, impacts and interrelationships	-scopes out, with rationale, unreasonable alternatives -focuses on issues raised by stakeholders and on VECs -focuses on key proposal characteristics, impacts and interrelationships	-scopes out, with rationale, unreasonable alternatives -focuses on key proposal characteristics and issues	-analysis scoped to address corridor related issues -public and agency issues highlighted -unreasonable alternatives scoped out with rationale -focuses on key proposal characteristics, issues and impacts	-some issues scoped through waste management strategy -EIA scoped through draft and final guidelines and draft and final terms of reference -issues raised during public meetings identified and addressed through documentation -impact analysis scoped by assessing likelihood of impact
Data Collection and Analysis	-describes regional setting and addresses on-site and regional off-site effects -study areas (regional, local) and temporal boundaries defined using explicit criteria and with stakeholder involvement; study area boundaries varied by discipline -establishes and substantiates ecological boundaries -identifies data sources -identifies and generally substantiates data collection and analysis methods, including sampling procedures -addresses data limitations (level of confidence) and implications -uses up-to-date data; extensive generation and use of primary data	-analysis broken down on the basis of project stages and study areas -regional baseline analysis undertaken; including VEC identification -rationale provided for study areas used by each discipline -local communities and regions delineated for purposes of public consultation and socio-economic impact analysis -uses up-to-date data -extensive field sampling and laboratory analyses undertaken (e.g., ground water, surface water, air, soil, vegetation, fish, sediment)	-temporal impact differences addressed by project stages -spatial study areas - site, local, regional; defined but no rationale provided -places in ecoregion context -data sources and collection analysis methods described -uses primary data (e.g., ground water analysis) as needed -up-to-date data; sources referenced	-addresses impact by project stage including decommissioning -data sources identified throughout and in bibliography -broad study area reflected in mapping; temporal boundaries limited to distinctions among project stages for impact analysis -data collection and analysis methods described; sampling procedures described for field analysis -up-to-date data; primary sources used where needed	-temporal boundaries based on project stages - construction, operations, post-closure -spatial boundaries qualitatively described; spatial boundaries more of a description of setting -data sources identified in a bibliography; references also noted in text -up-to-date data used; primary data used as needed (e.g., ground water, surface water, biology, benthic invertebrates) -data collection and analysis measures described and explained -sampling procedures (ground water, surface water, benthic organisms) explained -in some cases data gaps are identified with suggestions for addressing

Table A-13 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie - Queen Elizabeth	East Prince
Baseline Conditions and Analysis / Research	-employs ecological land classification for terrestrial resources assessment -focuses on VECs; definition and rationale for each VEC; variations in precision in the definition of criteria for selecting VECs among disciplines -baseline conditions sometimes historical overview and future conditions; with most disciplines existing conditions -baseline analysis methods generally described and substantiated -public involved in local data provision -scientific research appears to be fully represented	-analysis focuses on VECs; VECs identified and rationale provided; included stakeholder involvement -regional context (ecological regions) established -ecologic land classification used to provide a framework for identifying and rating habitats for environmental sensitivity -regional baseline established to address cumulative regional impacts of mining projects -baseline analysis and methods described and substantiated -public involved in local data provision -scientific research appears to be fully represented -socio-economic analysis includes review of historic economic impacts and links with the natural and economic environments; also considered over 30 relevant comparative case studies	-broad range of physical, biological, social, cultural and economic conditions considered -socioeconomic analysis addresses employment, population and housing trends and characteristics -historical analysis of climate, water quality conditions and school enrolment -impacts from previous forest industry projects considered -research (e.g., ground water, air quality) fully and fairly presented -methods described and explained	-broad range of biophysical and socioeconomic considerations addressed) -places within regional context (physiographic regions, regional climate, ecodistrict, ecoregion, vegetation, wildlife, land use) -identifies regional whooping crane sightings and habitat subregions for migratory birds (mapping based on scaled levels (e.g., specific wildlife nesting areas and habitats, migratory bird study) -literature review of bird mortality and of electric and magnetic field issue -wide range of field investigations undertaken -focuses on rare and endangered flora, wildlife and fisheries -mapping of biophysical constraints, land use and heritage potential -comparable situations addressed in migratory bird study and selectively for other impacts -environmental settings described	-environmental setting (climatological, geological - hydrogeological, surface water, biological, socio-economic, transportation) described; generally establishes broader context (e.g., PEI) before focusing on site and site vicinity -range of environmental components considered, as noted above -some historical conditions presented (climate, sedimentation, water quality, population growth) -scattered references to other documents on landfilling -baseline conditions analysis methods described and key information sources highlighted -details of field investigations presented (e.g., groundwater, surface water; includes sampling procedures) -significance ratings for fish resources and salmonoid habitat; selective references to VECs as identified by others -support materials (e..g, boring logs, test pits records, forest stand descriptions traffic data, cost analysis) provided in appendices
Impact Identification	-identifies and explains conservation goals, criteria and techniques -broad range of impacts identified in the form of impact hypotheses -impact identification methods described and explained; issues and rationale for VECs -definition and rationale for each hypothesis -public involved in issue identification and in the identification of VECs and hypotheses	-broad range of potential impacts identified and defined -basis for impacts (e.g., issues, historical impacts, VECs) generally explained -public involved in the identification of impacts and VECs -potential impacts presented in a form comparable to hypotheses	-broad range of impacts; specific impact criteria -criteria not defined and no rationale provided; general sense of how impacts identified provided	-a series of environmental constraint maps were used to identify and compare corridors -broad range of potential impacts considered -criteria groups were identified -public involved in impact identification	-sites identified with constraint mapping (exclusionary constraints); narrowed to 3 site shortlist with ranking / weighting scoring system; public input into both guidelines and terms of reference -impacts identified with matrices comparing environmental components and project components; initial distinction - no effect, minimal effects likely, potential impacts and impacts

Table A-13 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie - Queen Elizabeth	East Prince
Impact Prediction	-impact prediction methods generally described and supported -includes discipline-specific modelling - geology, air quality, economic input - output analysis -environmental performance analysis includes climate model, contaminant distribution and fate model and ecosystem sustainability model (terrestrial, aquatic, river) with predictions and performance evaluation -predicts direction, uses hypotheses and generally identifies prediction limits -impact magnitude classified (direction, severity, duration, geographic extent); scaling rating for each	-impact prediction methods generally described and supported -succinct summary of proposed facilities - impact sources -explicit consideration of severity, geographic and temporal extent -several models employed (e.g., dispersion modelling, ecological risk modelling, radiation modelling, dewatering, water quality) -monitoring and modelling associated with existing operations used to partially ground impact predictions -impact magnitude classified (severity, geographic extent, duration) and scaled	-impact magnitude distinctions - project phase, magnitude and duration; magnitude and significance addressed by composite ratings (e.g., major, moderate, minor, negligible, no - negative and positive); scaling levels defined for physical environment and biological community but not for socio-economic impacts, although ratings provided -modelling used to address air quality impacts -impacts generally quantified -impact prediction methods generally explained or self evident	-corridors identified with overlay mapping; methods described -impact magnitude reflected in scaling levels used in corridor evaluation mapping -impact magnitude summarized in matrix (project stage, magnitude, duration, environmental risk); scaling levels defined for magnitude, duration and environmental risk	-impact magnitude addressed with scaling system (0 to 10); definition provided for each scaling level for each criterion; site selection only -impact level ratings for major environmental components by activity within each project stage; 4 rating levels - no, minimal, possible and definite -where impact or likely impact identified summarized as issue and assessed in greater detail coupled with consideration of mitigation; largely qualitative analysis -groundwater velocities calculated and contaminant plume plotted under "worst case" conditions (i.e., no mitigation); assumptions and methods identified and explained
Uncertainty and Risk	-undertook a health impact analysis; includes quantitative human health risk assessment; addresses accident release scenarios; participant in regional health study -considers most probable and worst case conditions -explicit identification of assumptions, weak points and consequences of deviation -explicit identification of degree of confidence associated with impact rating for most disciplines; implications generally addressed -uses conservative assumptions; some use of sensitivity analyses	-undertook ecological risk assessment; includes consideration of cumulative effects -includes an analysis of health effects - workers and public; including estimated risks; a hazards operability study (HAZOP) was also undertaken -uncertainties often acknowledged but not always addressed systematically -assumptions generally identified; assumptions appear to be conservative; some use made of sensitivity analyses	-risk addressed through description of emergency response planning and health and safety analysis; includes emergency response manual -documents health care facilities and services -probability of occurrence of impacts often identified; limited explicit consideration of risk or uncertainty -experience with existing plant used to enhance design and minimize health and safety impacts with new plant	-ecological risk addressed in terms of bird mortality analysis -data interpretation limits and implications addressed in bird migratory bird study -environmental risk ratings (low, moderate, high, unknown) -human health risk addressed in literature review of electric and magnetic fields	-areas of uncertainty identified, generally with additional investigation requirements -conservative ("worst case") waste quantity assumptions -degree of uncertainty identified where possible and mitigative measures and monitoring programs suggested where sensitive receptors -uses a population projection range (low, medium, high); basis for sensitivity analysis -impacts sensitive to accidental dumping highlighted -traffic accident estimates provided and emergency response measures highlighted

Table A-13 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie - Queen Elizabeth	East Prince
Impact Interpretation	-impact significance interpretations a composite rating (degree of concern) based on severity, duration and geographic extent; unclear from rating role of VECs, public and agency concerns and uncertainty	-composite rating used - negative (negligible, minor, moderate, major) and positive); ratings defined based on scale of severity (focusing on VECs), scale and duration	-impact significance addressed (indirectly) through composite rating taking into account magnitude and duration	-impact significance reflected in weights used for corridor evaluation evaluations; no explicit weighting across disciplines -subjective ratings of mitigation success (low, moderate, high); scaling levels not defined	-impact significance addressed with weights for objectives and criteria; magnitude and significance combined with numerical scoring system; used for site selection only -public input (public acceptability) into site selection system -impact significance implied with comparisons against guidelines and requirements -impact significance interpretations not addressed systematically; scattered through text

Table A-13 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie - Queen Elizabeth	East Prince
Interrelationships and Cumulative Effects	-clear and succinct presentation of facility characteristics; identifies impact sources and interconnections among sources; also identifies other sources -addresses regional impacts and cumulative impacts of other sources (e.g., oils sands developers and forest harvesting; associated Suncor projects) -considers additional or incremental effects of project on biophysical resources of regional study area -places in context of current operations and reserves -in addressing contaminants impacts undertook chemical screening, exposure pathway screening and receptor screening -in environmental performance assessment addresses chemical sources, potential pathways, potential receptor impacts, including severity and likelihood -linkages from sources and among effects (across disciplines) traced through with network diagrams and models (by project stage) and through analysis of linkages connecting sources to hypotheses and among hypotheses	-places in context of existing facilities -studies and models food chain effects exposure pathway analysis undertaken (as part of ecological and human health risk assessment); also used in tailings analysis -undertook ecological risk modelling and cumulative effects modelling; explicit consideration of cumulative effects (e.g., water quality, air quality, ecological risks) - background, existing and proposed facilities and all proposed mines in northern Saskatchewan -assesses local and regional ecosystem effects; includes analyses of typical energy and mass flows and ecosystem sensitivity and vulnerability -direct and indirect impacts considered -regional cumulative effects of 3 existing and 3 proposed mines on air quality, water quality and receptor dose modelled and assessed -socioeconomic analysis addresses environmental and economic links and links to other communities	-major potential impact sources identified -cumulative impacts on labour force and municipal infrastructure considered -cumulative effects minimized by building on a decommissioned industrial site; designated for industrial use -impacts relative to background considered -no direct, explicit consideration of cumulative effects	-succinct description of facility characteristics and impact sources -some sporadic consideration of interrelationships -no apparent consideration of cumulative effects	-succinct description of facility characteristics and impact sources -systematic consideration of project environment interactions (with matrix) -direct and indirect interactions qualitatively noted in places but not addressed systematically -no reference to cumulative effects

Table A-13 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie - Queen Elizabeth	East Prince
Overall Rigour	-clear study design; well defined observational methods --range of parameters calculated (most probable and worst case) and tied to monitoring -assumptions made explicit and supported -potential impacts identified as impact hypotheses to be tested and linked to monitoring -traditional knowledge survey undertaken -glossary of terms provided	-generally clear study design -references provided throughout -full reference list and glossary provided -full cross references to guidelines -explicit links from most potentially significant impacts to monitoring	-acronyms and units defined -literature cited listed -overall study design outlined; more detail provided for physical impacts	-terms and abbreviations defined -reasonably clear study design	-general approach described -methodology and assumptions for physical (ground water, surface water) and, to a lesser extent, biological impacts addressed with a degree of rigour (e.g., clear methods, explicit assumptions, sampling procedures); less so for other impacts
Environmental Management and Sustainability	-considered Alberta land use guidelines (draft Integrated Resource Plan) -specific references to all pertinent federal and provincial regulatory requirements and where addressed -explicitly addresses ecosystem sustainability (dry land sustainability, wetlands sustainability); includes sustainability predictions -cumulative effects analysis linked to biodiversity -links EIA to corporate environmental management program	-identifies regulatory framework -explicit consideration of resource sustainability; analysis linked to Bruntland report, Saskatchewan Round Table and Government of Saskatchewan objectives and frameworks; explicitly assesses resource impacts against sustainability criteria	-comparisons made against relevant standards, objectives and guidelines -impacts generally placed within regional context	-follows relevant SaskPower guidelines and is placed within the context of Saskatchewan Energy Strategy -relationship to other environmental management policies and initiatives partially addressed through agency review and mapping analysis	-EIA developed within the context of an integrated waste management strategy; relationships to program identified; references to waste reduction and recycling reflective of sustainability concerns -places surface water analysis within broader context with discussion of soil entry into surface water as a major resource management problem in PEI; also establishes water quality analysis with discussion of point and non-point source pollution on PEI -applicable legislation identified

Table A-13 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part 1)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie - Queen Elizabeth	East Prince
Overall Process	-clear and succinct documentation; summary of project, public consultation, impacts and approvals -a range of consultation mechanisms (e.g., newsletters, forums, surveys, meetings, workshops) with prime interested groups and communities (local and provincial) were undertaken through planning process; included several consultation agreements with prime interested communities -cross references guidelines and issues to EIA documents	-regional consultation undertaken across northern Saskatchewan -a range of consultation mechanisms (meetings, working groups, impact management agreements, surveys) -clear and succinct documentation; support material provided to those who require -cross references guidelines and issues to EIA documents	-a series of meetings with the public were held; the project received strong support from the municipality, other organizations and individuals; responses provided to all questions -documentation succinct and understandable	-provides succinct and understandable summary and technical reports - range of consultation mechanisms (e.g., meetings, information distribution, open houses) through planning process; public and agency issues and concerns raised recorded and responses provided -printed complete transcripts of public meetings and letters to moderator -public input to each decision point	-includes succinct and understandable executive summary -public input received through a series of meetings undertaken through the course of the planning process; all comments recorded and point-by-point responses provided

Table A-14 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Scoping	-scopes out, with rationale, unreasonable alternatives -public and agency issues highlighted -focuses on key proposal characteristics, issues and impacts	-scoping facilitated with draft and final EA Proposal -unreasonable alternatives screened out with clear thresholds of acceptability; consistently applied -separate effects scoping analysis; network diagrams used to identify potential effects; summary rationale for effects not applicable or clearly negligible -public and agency concerns identified and responses provided -analysis focuses on major potential effects, impacts and interrelationships stakeholder involvement in scoping	-SEE (specific environmental evaluation) scoped from generic assessment and other studies and reports that address need and alternatives and that identify design assumptions; previous studies and reports also address many impact issues and public concerns -issues scoped from generic evaluation, FEARO panel, EMP Review and professional judgment - listed by source and subject; extensive public input; basis for VEC and valued socio-economic components (VSC); other issues cross referenced to elsewhere in documentation	-EIS scoped through project - specific guidelines issued by EARP panel; issues from Guidelines contributed to shaping of EIS -unreasonable alternatives scoped out -concerns and issues identified near beginning of EIS; based on Guidelines, transcripts of Panel review meetings and professional judgment -issues refined based on baseline studies, project characteristics, VEC sensitivity, public concerns and similar project experience	-EIA focused through project guidelines and terms of reference and public and scientific review of the project registration -analysis focused on water quality and marine environment as a VEC -unreasonable alternatives scoped out
Data Collection and Analysis	-data sources identified; references provided throughout -clear description and rationale for study area boundaries -field investigations recorded - plant communities (aquatic and terrestrial), breeding birds, mammals; sampling locations identified -overview of methods -up-to-date data; primary sources used where needed -no temporal distinctions drawn in impact analysis	-study areas and time horizons presented with rationale for each ; both overall and by discipline -data sources identified and sampling procedures explained -data collection and analysis procedures identified and explained for each discipline -up-to-date data; extensive use of primary data -data accuracy assessed and allowance made for uncertainties (e.g., supplementary investigations, conservative assumptions, sensitivity analyses)	-ecological, socioeconomic, project, administrative and technical boundaries established -ecological boundaries defined subdivided by VEC; temporal and spatial boundaries within ecological boundaries specified; distinction also drawn by project stage; similar distinctions drawn for VSC -administrative boundaries linked to jurisdictional mandates -technical boundaries address technical limits to predict and monitor impacts -compiled from available information -references provided throughout and consolidated at end of report	-broad study area delineated; rationale provided although cursory; areal extent of land claims also identified -references provided for each section -ecological boundaries (population, spatial, temporal) defined for each VEC -project duration identified; impact frequency and duration distinctions drawn for biophysical analysis -data collection and analysis methods described; data sources identified -data gaps identified and supplementary analysis undertaken as needed -scattered references made to data uncertainties -heavy reliance on secondary source data	-study area defined with summary rationale; impact area also identified with rationale -construction and operations periods considered -data collection and analysis methods described and substantiated -references provided through text and in list of references -uses up-to-date data; primary sources added as needed -sampling procedures identified and substantiated

Table A-14 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Baseline Conditions Analysis / Research	-brief reference to electric and magnetic field research -literature references - bird collisions -broad range of biophysical and socioeconomic considerations addressed -places within regional context - climate, soil, terrain, vegetation, wildlife, aquatic resources, land use and access, heritage resources and infrastructure -plant communities, wildlife observations and land uses (e.g., trails) along each route identified and mapped -biophysical land classification for study area - terrestrial -organic and mineral, aquatic and cultural (no scaling)	-baselines conditions analysis methods presented and explained, both overall and by discipline; summarized in EA Proposal and detailed in Site Assessment Reports -analysis of historical and existing operations used to ground impact predictions and as a basis for cumulative effects assessment; role of other development influences also identified -broad definition of environment -analysis for each discipline placed in regional and local context -historical (where applicable), existing and likely future conditions without proposal assessed and summarized by discipline -significant and sensitive environmental components identified -public baseline input; through local resident surveys and interviews -literature review of comparable projects for socio-economic impacts; control community for property value analysis -full and fair representation of research -natural variability addressed in ground, surface water, air quality, noise, transportation and property value analyses	-VECs identified at outset; VECs (terrestrial, marine) and VSCs (staging areas, bridge, land-based facilities) identified through scoping analysis -broad range of biophysical (terrestrial and marine) and socioeconomic components addressed -places in regional and historical context -distinction drawn between New Brunswick and PEI terrestrial conditions; sensitive areas highlighted -detailed description of marine environment (physical oceanography, chemical oceanography, marine biological resources) -regional (Canada, Atlantic Canada, PEI, New Brunswick) and local (overall and by sector) analysis of economy; also provides regional and local perspective of labour force, transportation network (land, marine) and of social conditions, facilities and services -likely future conditions only addressed sporadically and in very general terms -it appears that scientific research is fully and fairly represented; albeit in a summary fashion	-baseline analysis focused on VECs; defined with explicit criteria (abundance/status, public concern, professional concern, economic importance); basis presented in matrix; VSCs not identified; focuses on key issues -broad range of biophysical, socioeconomic and health and safety environmental components; public involved in data provision -similar projects reviewed; not addressed systematically -research appears to be fairly represented -sensitivity of VECs to project elements (e.g., noise) assessed -survey of individuals in study area undertaken to identify perceptions, concerns and issues -project setting described; includes history of military activities in area, future developments, other projects and recognized rights; historical impacts, mitigative measures and complaints described -regional and subregional context established; national and provincial setting described for human environment - historical environmental quality conditions presented; spatial and temporal VEC and human environmental characteristics illustrated by maps and charts respectively; includes natural - human interactions (e.g., caribou harvesting) -social profile prepared and projected forward -baseline methods described	-baseline analysis focused on VEC - water quality and marine environment; oceanographic component study (attached as appendix) completed to provide information on surface currents, salinity and temperature profiles and freshwater currents in Salmon River Cove -field investigation program undertaken and computer model used to analyse data -natural variability allowed for by allowing for variations in tides and in on and offshore winds -existing environmental conditions described - freshwater environment, terrain, soils, vegetation, marine environment, tides, currents, bathometry and water quality -currents were studied and bacteriological samples taken to determine the current state of the receiving water -freshwater inflows were identified and salinity was measured -long term wind data obtained from nearest weather station -exiting water and sewer system described -population projected, including a safety factor -selective presentation of historical data (e.g., angling records, waste water chemistry) -mapping of scuba transects (marine benthic life), water sampling locations, bacterial sampling locations) -chart of marine bacteriological analysis commercial fishing mapped -technical support material (e.g., scuba surveys, water analyses, bacteriological analyses, lab analysis, cost analysis) in appendices

Table A-14 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Impact Identification	-clear description of route identification and selection approach -route selection criteria listed but not defined -succinct identification of impacts (terrain, vegetation, wildlife, management areas, transportation and infrastructure, traditional land use, aesthetics, firewood and heritage resources)	-broad range of impacts addressed (physical, natural, social, economic) -definition and rationale provided for each criterion -public involved in impact identification	-impact identification extends from VEC and VSC and issue scoping and from baseline conditions analysis -impacts subdivided by biophysical / socioeconomic and by stage, location and by VEC or VSC -matrices used to link project activities to VECs and VSCs for each of staging areas, bridge and land-based facilities	-broad range of biophysical and socioeconomic impacts addressed -impacts identified through issues scoping, literature and secondary source reviews, surveys, field work and interviews	-land, freshwater and marine impacts during construction and operations identified and assessed -a broad range of potential impacts were considered
Impact Prediction	-use made of biophysical constraint mapping (unscaled) for study area and along routes -impact magnitude distinctions entirely qualitative	-impact prediction methods, both overall and by discipline presented, initially in EA Proposal and detailed in Site Assessment Report -extensive uses of matrices, network diagrams and models; models included ground water, surface water, air, risk and noise -computer imaging used for visual impact analysis -positive and negative impacts predicted, with and without proposal; distinction drawn between change from current operations and change from baseline -impact magnitude distinctions - project phase, typical and high end conditions, geographic distribution, high and low fill rates, duration, frequency; scaling levels for each and composite rating; definitions for each level and composite rating -impact predictions tied into on and offsite monitoring; includes biomonitoring program and benthic survey	-largely qualitative evaluation of each project activity / VEC - VSC interaction; analysis addresses required mitigative measures and potential for cumulative effects -distribution of effects (over space, time, by population group) if addressed, undertaken qualitatively; no use of matrices, network diagrams or models in presentation of impact prediction analysis	-human environmental conditions with and without project projected; limited projections of natural environmental conditions without project although historical conditions described -impact prediction methods described -modelling used for physical impact prediction (e.g., noise, air quality) -input-output modelling used in economic analysis; also use of multipliers, analogy and professional judgments -bio-physical impact magnitude factors (geographic extent, duration, frequency, level of confidence); defined and individual and composite ratings provided; also positive - negative and direct - indirect distinctions and ratings before and after mitigation; same procedure not used for socio-economic or public and safety impacts; where addressed qualitative analysis	-information from oceanographic component study used to model pathogen circulation and to project dilutions of sewage through the water column; combined with tide, wind and dilution projections to predict water quality impacts and as a basis for the analysis of related impacts -impact magnitude rated at four levels - major, moderate, minor and negligible; generic definition provided but not for individual environmental components -qualitative analysis of impacts using ratings and drawing upon impact prediction methods noted above; impact magnitude before and after mitigation assessed; analysis subdivided by construction (land, freshwater, marine environment), routine operation (marine environment) and unplanned events

Table A-14 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Uncertainty and Risk	-brief reference to electric and magnetic field research -hazardous materials handling and spill response measures highlighted -uncertainty and risk addressed sporadically and qualitatively -ecological risks limited to overview of bird collision issue	-uncertainty ratings (scaled) for each predicted impact; uncertainty ratings a factor in impact importance ratings -allowance made for natural variability -impact predictions bounded; conservative assumptions; use made of sensitivity analyses -deterministic and probabilistic human health and ecological risk assessments undertaken -health and ecological risk also addressed through comparisons against standards, criteria and guidelines -areas of uncertainty identified and implications explored	-design allows for global warming and various environmental forces (e.g., ice, wind, earthquakes) -impact uncertainties initially addressed through limits imposed by administrative and technical boundaries -baseline analysis provides an overview of public health and safety (although provides little information) and emergency services (by community) -data limitations and uncertainties identified through documentation; implications not always addressed -impacts of accidental events for each VEC addressed, qualitatively -potential for accident or fire addressed through fire and safety policy -potential for accidental release of hazardous materials addressed qualitatively through design and contingency measures	-baseline health and safety study undertaken -specific linking of areas of uncertainty to monitoring program -separate technical study of air safety undertaken -includes aircraft accident probability assessment and emergency responses procedures -scattered references to areas of uncertainty through text; not consolidated and implications not always addressed -field work and research undertaken to address areas of uncertainty -impact predictions based on "worst case scenarios"; current and maximum conditions addressed -level of confidence ratings for impact predictions -public health and safety benefits and risks by stage and by impacted group identified in tables and text; predictions assessed against standards and criteria, taking into account literature	-allowance made for uncertainty in tides, winds and dilution -allowance made for uncertainty in population projection; other conservative assumptions used in design criteria; allowance made for potential future expansion -consideration given to unplanned events; possible events identified and contingency measures described

Table A-14 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Impact Interpretation	-impact significance addressed sporadically and qualitatively	-impact importance (significance) ratings for each predicted impact; factors in impact importance ratings include magnitude, public concerns, agency concerns, regulatory compliance, receptor sensitivity and significance, connections to other activities, uncertainty; scaling levels for each and composite rating; definition and rationale provided for each -importance ratings interpreted, with and without mitigation	-definitions of significance (based on extent, duration, magnitude of impact and receptor sensitivity and ability to recover) provided for various VECs and VSCs -significance interpretation (significant or insignificant) provided for each project activity / VEC - VSC interaction; each interpretation substantiated -impact ratings with and without mitigation summarized in tabular form; no adverse significant impacts identified	-impact significance addressed qualitatively and often not explicitly or systematically; implied through references to concerns, impact magnitude and sensitivity of receptors -resource use importance ratings (major, moderate, minor importance); conflicts (current, new) defined and identified in charts and delineated on maps	-impact significance addressed qualitatively if at all; inference seems to be that significant potential impacts identified through scoping and, therefore, that impact magnitude is equivalent to impact significance
Interrelationships and Cumulative Effects	-succinct description of facility characteristics and impact sources -limited consideration of interrelationships and minimal explicit consideration of cumulative effects; a few references to related EISs (roads, other transmission lines, Spaceport)	-impact interrelationships identified both within and among disciplines; extensive use of network diagrams -cumulative effects addressed both within and among disciplines -cumulative effects considered include combination of background, existing operations (that will continue into future), proposed operations and other projects affecting the same environment -overall review of cumulative effects includes consideration of indirect effects, compounding impacts, non-additive impacts and projects that might affect the same environment	-succinct project description including major impact sources -cumulative effects defined; selection of impacts and impact ratings take into account cumulative effects (i.e., each project VEC evaluated in context of all other project interactions with other VECs) -cumulative effects interpretations provided for each project activity - VEC - VSC interaction -qualitative overview of cumulative effects presented at the end of the biophysical and socioeconomic sections -many potential indirect impacts addressed although links not illustrated, through, for example, network diagrams	-succinct project description with a focus on identification of potential impact sources; includes assumed characteristics in 1996 and 2001 -baseline description largely separate components; includes overview of terrestrial, freshwater and marine ecosystem -links between human and biophysical environments addressed throughout -VEC analysis structured to address interrelationships - source / VEC connections, potentially affected populations, concerns, exposure, sensitivity to impacts, impacts) -direct - indirect distinction drawn in impact predictions; network diagrams used to trace linkages -with biophysical analysis - summary CEA; issues identified and qualitatively discussed; no parallel socio-economic CEA on grounds that CEE an underlying theme	-succinct project description with a focus on impact sources -interrelationships addressed to some degree with modelling; by focusing on major impact sources and potential direct impacts likely that indirect and cumulative impact potential minimized -no direct consideration of cumulative effects

Table A-14 - Application of Proposal Evaluation Criteria - Refining Analysis and Synthesis Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Overall Rigour	-clear study design; linked to Environmental Protection Plan for the construction and operation of line	-glossary of terms provided for each section -criteria not treated as hypotheses but in similar form; environmental quality data suitable for verification through monitoring -clear study design -assumptions generally explicit and substantiated -peer review used for ground water and risk analyses	-overall study strategy presented; modelled on conceptual framework recommended by Beanlands and Duinker 1983 (Beanlands and Duinker 1983) -predicted effects linked to monitoring -institutional constraints highlighted	-study approach laid out at beginning of EIS: including identification of project assumptions -a glossary of terms and acronyms is provided; concordance index to guidelines also provided -range of peer reviews undertaken -assumptions generally made explicit	-clear study approach -rigorous approach to component study (e.g., clear objectives, assumptions defined, methods substantiated, sampling procedures supported, clear presentation of findings)
Environmental Management and Sustainability	-placed within context of SpacePort Canada infrastructure, planning and approvals and within context of regional supply system -scattered references to environmental management policies and other EISs; also reflected in mapping	-analysis placed in context of applicable regulatory requirements and policies (e.g., ground water surface water, air, agriculture, environmentally sensitive areas, risk) -selective references to broader environmental issues and problems -no explicit references to sustainability	-SEE extends from a generic evaluation of bridge and tunnel alternatives, a government response to the Panel report, the Ice Committee report and draft and final Environmental Management Plan -regulatory requirements identified and addressed -only scattered references to broader environmental management perspective presented and no mention of sustainability	-placed in broader conservation context (e.g., various conservation strategies, natural areas of Canadian significance, International Biological Program) -some potential issues and cumulative effects relate to sustainability concerns (e.g., long range transport of air pollution, sustainability of resource base) but sustainability is not addressed systematically	-if project operates as should will contribute to a more sustainable environment; enhances water quality -no specific references to environmental management or sustainability
Overall Process	-provision for public input at major decision points -range of consultation measures (presentations, meetings, open house) -issues raised recorded and responses provided -complete record of government and public consultation -succinct and understandable analysis	-succinct and understandable analysis -all public and agency comments recorded and responses provided -draft and final reports; changes from draft reports noted; role of public and agency comments highlighted -wide range of public consultation measures (e.g., open houses, surveys, workshops, community advisory committee, meetings); outputs from each identified and addressed	-builds on extensive public consultation undertaken through previous reports -succinct and understandable analysis	-extensive public information and consultation undertaken; includes interviews, surveys and numerous meetings; adhered to "Ethical Principles for the Conduct of Research in the North" -succinct and understandable analysis	-succinct summary presented in executive summary -public consultation meeting held; presentations followed by questions and answers -questions raised in public meeting listed in text and letters from concerned citizens provided in appendix; point by point responses not included in report

Table A-15 - Procedural Comparison - Positive and Negative Tendencies - Siting Approaches

Criteria	Environmental suitability	Community control	Social equity
Rigour - traceability, substantiation	The ESA can systematically identify, screen and compare sites. It can make effective use of scientific and technical knowledge and balance economic, environmental and social concerns (Massam 1993). The ESA is less effective in integrating subjective and personal knowledge or in addressing social equity and community control concerns.	The CCA makes effective use of local and personal knowledge and preferences. It may be less effective in incorporating scientific and technical knowledge or in addressing social equity issues.	The SEA systematically addresses equity concerns and makes effective use of local and personal knowledge. The bargaining process, with a SEA, may not always be traceable and the role of scientific and technical knowledge can be undermined. Community control issues may receive limited attention.
Fairness (equity)	The ESA is fair in the sense of minimizing aggregate environmental impact. It may also be unfair to the natural environment. The perspectives of public groups and individuals can be marginalized because experts tend to control the process.	The CCA is fair in the sense that the "host" community has much more control over its own fate. The same degree of control, and in turn, fairness does not always extend to the most directly affected individuals, vulnerable individuals, access route communities and communities adjoining the host community (Gerrard 1994)	The SEA directly and explicitly seeks to avoid and offset procedural inequities for unrepresented and underrepresented interests. A SEA can be less effective if parties are unable to demand their fair role in the process (Seley, 1983).
Public involvement	The ESA can provide for public and agency inputs at key decision points. The emphasis, that tends to be placed on expert opinion can inhibit public involvement (Anderson and Greenberg 1982) .	The public assumes a central role with the CCA. Particular emphasis is placed on the effective use of public knowledge and resources. Questions can be raised regarding the ability to participate of small, volunteer, "boom and bust" communities (Lang 1990).	A SEA can facilitate public involvement and local knowledge use (Lang 1990). Public involvement can be inhibited if public spokepersons are unrepresentative of the community or if legal and technical advisors assume too prominent a role.
Consensus building and conflict resolution	A systematic ESA is less acrimonious than a closed or biased process. Rigorous, often quantitative, evaluation is not usually conducive to consensus building or conflict resolution. Stressing negative impacts and "worst case" assumptions may also exacerbate conflicts.	A high degree of community influence over the siting process can reduce suspicion and facilitate consensus building and conflict resolution. Yet there is the danger that facility proponents may narrowly outvote facility opponents. In such cases community divisions may be widened.	The SEA actively seeks to build consensus and resolve conflict through a bargaining process (O'Hare 1977). The SEA is less effective in instances where there are fundamental value differences. There is the danger that funding assistance can be interpreted as a "bribe".
Public acceptance	The ESA is consistent with the public preference for avoiding impacts (Zeiss 1991, 1992). Favourable public reaction can be further reinforced by focusing on siting opportunities (Morrell 1984). Often the ESA proceeds from the false assumption that public education, an expert team and rational analysis enhance public acceptance (Kasperson 1985; Heiman, 1990).	A higher degree of public control can contribute to community support or acceptance (Myles 1992;Bord 1992; Richards 1996). A CCA may be less successful in obtaining public acceptance if the primary bases for opposition are perceived inequities and risks and/or fundamental value conflicts. It may also be that much more difficult to obtain public acceptance for a siting process that follows an unsuccessful CCA.	A SEA can enhance the potential for public acceptance by resolving procedural inequities. Public opposition is less likely to be diminished in instances where that opposition is based upon perceived risk or fundamental value conflicts. Compensation has been shown to be of limited benefit in obtaining public acceptance (Zeiss and Lefrund 1995, 1996: Lant and Sherrill 1995; Gerrard 1994).
Adaptability and flexibility	The numerous variations and subset combinations within ESA offer a considerable degree of flexibility. Further flexibility can be provided through the use of sensitivity analyses. Flexibility in the application of the ESA is sometimes hampered by the rigid application of formalized planning rules.	A CCA can flexibly incorporate public concerns and preferences although the transition from a broadly based public (e.g., a siting task force) to a local public (i.e., the site neighbours and community) can be difficult. Addressing complex technical choices and concerns may be more difficult with a CCA.	The bargaining process that takes places with a SEA can flexibly accommodate new concerns and conflicts. The siting process may become cumbersome if participant funding results in duplicate technical studies and extensive provisions for peer reviews.

Table A-15 - Procedural Comparison - Positive and Negative Tendencies - Siting Approaches

Criteria	Environmental suitability	Community control	Social equity
Cost	The ESA tends to emphasize efficient and effective resource use. An opportunistic approach can be especially cost-effective. A comprehensive search for the "best" site can be very time-consuming and costly, especially if it culminates in lengthy adversarial proceedings (e.g., hearings).	There are cost savings with a CCA when the scope of the search process is rapidly narrowed to a small number of volunteer communities and sites (O'Hare 1977). Nevertheless the CCA does involve a heavy commitment of time and resources to work directly with groups and individuals through every aspect of the siting process. The cost of an unsuccessful CCA (e.g., no volunteer communities or all volunteer communities back out) can be especially high.	The SEA can be cost effective if it provides a mechanism for resolving conflicts and securing approval in the face of opposition. Costs related to participant funding and the bargaining process can be *quite high*. The procedural costs associated with a multiple facility SEA can be especially high.
Local political support	If minimal overall environmental impact can be demonstrated, it may be possible to obtain tacit political acceptance with an ESA. By assuming a unitary, rather than a pluralistic, planning process, it may be difficult to build and sustain political support.	The CCA correctly recognizes that planning and decision-making are collective, collaborative and political. As such the CCA merges critical voters interests with the public interest. A CCA may be less effective when political leadership is reluctant to share responsibility with citizen representatives or where the perspectives of politicians and citizen representatives do not coincide.	A SEA can foster local political process because it recognizes that planning and decision-making is inherently a bargaining process among often conflicting interests. A SEA can enhance the potential to build coalitions of support but only to the extent that participant funding is not viewed as a form of co-option.
Regulatory approval	The focus, placed on systematic analysis and documentation with the ESA, is usually conducive to comprehensive regulatory review. The assumption that the planning and approval process is apolitical is naive and can undermine approval potential.	A CCA can enhance the potential for regulatory approval because it seeks to integrate regulatory approval and political/public support. The product of a CCA may be more vulnerable to criticism in adversarial forums where the expectation may be a highly technical siting process and documentation.	SEA recognizes that regulatory approval potential is enhanced when there is public and political support. The potential for approval may be undermined though when technical approval requirements are neglected in the search for consensus. Obtaining approval for multiple facilities may be especially difficult.

Table A-16 - Substantive Comparison - Positive and Negative Tendencies - Siting Approaches

Criteria	Environmental suitability	Community control	Social equity
Safety and health effects	The ESA generally addresses calculable risks quite effectively but is less effective in the consideration of perceived risk.	The CCA tends to give more prominence to perceived risks. Calculable risks may receive insufficient attention if economic benefits are the primary community concern (Bullard 1990). If there are only a small number of remote, voluntary communities, risks (especially transported-related) may be unduly high and too much reliance may be placed on engineering solutions.	A SEA tends to give more attention to perceived risks through the course of the bargaining process. Overall transportation risks will be minimized with multiple facilities (Lang 1990). Other risks may be greater because of the reduced choices available when unfair locations are avoided or when multiple facilities are to be sited. Multiple facilities may be more difficult to manage or regulate. A SEA can mean the acceptance of higher risk levels because of financial compensation.
Physical and biological effects	The ESA tends to effectively address direct physical effects although there is not always an appreciation that the counting and measurement of components of the natural environment is not equivalent to the prediction of effects. The ESA tends to give limited consideration to natural systems effects (e.g., impact on ecological integrity and sustainability).	The CCA tends to pay more attention to local knowledge of the natural environment (Armour 1992). If there are limited choices produced through the CCA, physical and biological effects may be greater than necessary, especially along access routes (Gerrard 1994). The CCA tends to devote limited attention to natural system effects.	Multiple facilities may reduce the magnitude of impact at each location and may minimize transportation impacts (Lang 1990). Multiple facilities may mean less potential to avoid physical and biological effects, greater natural system impacts and greater impacts stemming from facility management and regulation difficulties. There is the danger of natural environmental compromises because of the prospect of financial compensation.
Social and economic effects	The ESA is usually effective in considering direct physical land use and nuisance effects. It tends to be less effective in addressing social and economic system and community effects. The ESA also has the tendency to represent social impacts with physical data (e.g., house counts). Such representations are not always appropriate. In addition, social and economic effects, as derived through subjective, qualitative and personal data and knowledge, are often not adequately represented with the ESA.	The CCA tends to place particular emphasis on community concerns and perspectives (Armour 1992) ,on local knowledge and on social impacts, especially perceived risks. There is a danger of greater social impacts than desirable if the range of siting choices is very limited or if economic benefits supersede social concerns. Social impacts along access routes, on opponents to the facility and on communities adjoining the volunteer community may receive insufficient attention.	The SEA focuses on the fair distribution of costs and benefits. Particular emphasis is placed on the interests of the least advantaged and the most burdened elements in society (Kasperson 1985). Compensation may mean amenity for poor communities (O'Hare 1977). Effects at each location and along access routes are minimized with multiple facilities. The avoidance of unfair locations, or a multiple facilities approach can result in siting compromises. Financial compensation may be a poor substitute for social effects. In addition, the SEA is premised upon the questionable assumption that impacts can be accurately predicted and that appropriate levels and forms of compensation can be determined.
Community control	The ESA tends to reduce community control. Expert judgements tend to supplant local decision-making authority.	The CCA generally enhances local decision-making authority. Gains in local autonomy may be less evident in small boom and bust communities (Lang 1990) and may prove illusionary if the voluntary siting approach fails.	Local decision-making authority can be reinforced if the primary community concerns are related to equity and fairness. The SEA is of much less value in furthering community control if social equity is not preeminent.

Table A-16 - Substantive Comparison - Positive and Negative Tendencies - Siting Approaches

Criteria	Environmental suitability	Community control	Social equity
Social equity	The ESA is equitable in the sense of seeking to minimize overall environmental effects but the distribution of those effects tends to receive limited attention (O'Hare 1977; Bullard 1990).	A CCA is equitable in its treatment of potential voluntary host communities. In such cases the outcome of the process is a joint responsibility of the proponent and the host community. Social equity with the CCA is undermined if the least advantaged and potentially most affected groups and individuals are outvoted and the facility proceeds despite their opposition (Lake 1993). Low income communities may be more prone to volunteer (Gerrard 1994).	The SEA focuses on minimizing substantive inequities (Pushchak and Burton 1983). "Win-win" outcomes are sought and principles such as "user pay" tend to be reinforced (Lang 1990). Social equity will diminish if the process results in siting compromises. Social equity can be further undermined if views of compensation among stakeholders are inconsistent (Masam 1993). The extent to which social equity is achieved will also depend on the accuracy of impact predictions and on the extent to which it is appropriate to substitute financial compensation for effects.
Service	The ESA seeks to minimize overall environmental effects without compromising service provision. An over emphasis on subtle environmental differences can result in significant service compromises. Service can be jeopardized if the siting and approval process is protracted.	A CCA may result in service compromises if the voluntary communities are all in remote locations.	Multiple facilities can result in the maximization of service provision. Service advantages tend to diminish with rapidly changing markets and technologies. In such cases facilities tend to specialize and the geographic service advantages of multiple facilities are reduced.
Cost	If service objectives are not compromised operating costs can be kept low. An ESA, involving a costly and protracted siting and approval process, can mean that the recovery of such costs might necessitate much higher operating costs.	An efficient and focused CCA can lead to reduced procedural costs and, in turn, to lower operating costs. Capital and costs can be greater than desirable with remote voluntary communities (e.g., transportation costs, transfer facilities).	The biding process associated with a SEA is arguably a more accurate reflection of true costs (Inhaber 1992). Although multiple facilities may keep transportation costs down such costs may be more than offset by the absence of economies of scale and the additional land acquisition and duplicate facility costs. The costs associated with compensating communities and individuals may mean that new facilities will be unable to compete with existing facilities (Kasperson 1985).

Table A-17 - Criteria - Guidelines Evaluation - Refining Evaluation Activities

Activity	Criteria
Problem Definition	• encourages systematic approach to problem definition
Goals, Objectives and Criteria Identification	• encourages placement of goals, objectives and criteria within broader context and framework • encourages clear definition of purpose, goals and objectives • points out need to define and provide a rationale for criteria • indicates need for criteria to reflect stakeholder values • stresses need to address interactions among criteria
Generation of Alternatives	• indicates need for systematic procedure for generation of alternatives • indicates alternative types that should be considered • indicates need for rationale for alternatives considered
Screening of Alternatives	• points out need for specific screening criteria with clear threshold of acceptability • indicates need to consider mitigation potential for alternatives rejected • indicates need for range of screening criteria • points out need to substantiate screening decisions • points out need to exclude alternatives that are inconsistent with the goal of sustainability
Scaling of Impacts	• indicates need to address impact magnitude differences in a systematic and explicit manner • indicates need to substantiate impact scalings
Criteria Ranking and Weighting	• points out need to systematically and explicitly address differences in impact importance • indicates need to provide clear and consistent reasons for criteria rankings and, if applied, criteria weightings • indicates need to consider interrelationships among impacts
Comparison of Alternatives	• points out that evaluation procedures must be clearly explained and substantiated • points out the need to explain and substantiate the choice of methods • points out need to address different impact types • points out need to use all relevant data in evaluation • indicates need to address uncertainty and alternative interpretations in evaluation • points out need to apply criteria consistently across alternatives • indicates need to consider mitigation potential in evaluation • points out that distributional (temporal, spatial, by group) differences should be considered • indicates need to consider sustainability differences • points out need to focus on key tradeoffs • indicates need to substantiate conclusions
Proposal Acceptability	• notes importance of satisfying government standards and requirements • indicates that need to consolidate all advantages and disadvantages as basis for acceptability decision • indicates that proposal not acceptable if contrary to sustainability requirements
Political and Public Involvement	• points out need for public and political involvement in all evaluation activities • encourages simple and understandable evaluation • encourages, where warranted, additional measures to ensure involvement of interested and affected populations • points out need to make explicit role of politicians and public • encourages consensus building and conflict resolution
Overall Evaluation Process	• indicates that all assumptions, interpretations and judgments should be explicit and substantiated • stresses need for focused, efficient and effective evaluation • stresses need to design process to suit problem and context • encourages integration of sustainability concerns

Table A-18: Scaling Levels - RefiningEvaluation Activities - Guideline Evaluation

Scaling Levels	A	B	C	D	E
-problem definition	-generic guidelines identify principles and approaches for problem definition -project guidelines provide more detailed direction regarding matters to consider in defining problem	-project or generic guidelines provide detailed directions regarding matters to consider in problem definition	-generic and / or project guidelines provide general guidance regarding scope of problem definition	-generic or project guidelines note need to define problem	- no guidance provided
-goals, objectives and criteria identification	--generic guidelines explain need to place goals, objectives and criteria within broader context -generic guidelines explain need to clearly identify purpose, goals and objectives -generic guidelines indicate need to define and provide a rationale for criteria -project guidelines provide more detailed direction regarding concerns that should be addressed by criteria	-project or generic guidelines explain need to place goals, objectives and criteria within broader context -project or generic guidelines explain need to clearly identify purpose, goals and objectives -project or generic guidelines indicate need to define and provide rationale for criteria	-project or generic guidelines explain need to clearly identify purpose, goals and / or objectives -project or generic guidelines indicate need to define and provide a rationale for criteria	-project or generic guidelines indicate need to define and provide a rationale for criteria or identify general environmental components should address	- no guidance provided
-generation of alternatives	-generic guidelines indicate need to systematically generate alternatives -generic guidelines provide examples of types of alternatives that should consider -project guidelines identify specific alternatives that must be considered	-project guidelines indicate need to systematically generate alternatives -project guidelines identify types of alternatives that should be considered or identify specific alternatives that must be considered	-generic or project guidelines identify types of alternatives that should be considered and / or identify specific alternatives that must be considered	-generic or project guidelines indicate need to consider alternatives	- no guidance provided
-screening of alternatives	-generic guidelines indicate that alternatives should only be screened using specific criteria with clear thresholds of acceptability, after the consideration of mitigation potential -generic guidelines identify government acceptability requirements, including a sustainability requirement -project guidelines provide more specific direction regarding the screening of alternatives	-generic or project guidelines indicate that alternatives should only be screened using specific criteria with clear thresholds of acceptability, after the consideration of mitigation potential -generic or project guidelines identify government acceptability requirements	-generic or project guidelines indicate that alternatives should only be screened using specific criteria with clear thresholds of acceptability, after the consideration of mitigation potential or generic or project guidelines identify government acceptability requirements	-generic or project guidelines indicate that a clear rationale should be provided for any rejected alternative	- no guidance provided

Table A-18: Scaling Levels - RefiningEvaluation Activities - Guideline Evaluation

Scaling Levels	A	B	C	D	E
-scaling of impacts	-generic guidelines indicate that differences in impact magnitude should be scaled using specific criteria and criteria should then be applied consistently to alternatives and impacts -generic guidelines provide examples of impact magnitude scaling criteria -generic guidelines indicate that the impact magnitude ratings should be substantiated -more specific guidance is provide in project guidelines (e.g., area - specific concerns that should be reflected in impact magnitude analysis)	-project guidelines indicate that differences in impact magnitude should be scaled using specific criteria and criteria should then be applied consistently to alternatives and impacts -project guidelines indicate that impact magnitude ratings should be substantiated -project guidelines provide examples of specific concerns that should be addressed in impact magnitude analysis	-generic or project guidelines indicate that impact magnitude differences should be addressed explicitly, systematically and consistently	-generic or project guidelines indicate that impact magnitude differences should be addressed	- no guidance provided
-criteria ranking and weighting	-generic guidelines point out that criteria used to compare alternatives should be ranked -generic guidelines indicate that a clear rationale should be applied in the ranking of criteria -generic guidelines provide examples of factors that should be considered in criteria rankings (e.g., public and agency priorities, public policies, potential for inducing other effects, uncertainty) -project guidelines provide more specific guidance regarding matters that should be addressed in criteria ranking	-project guidelines point out that criteria used to compare alternatives should be ranked -project guidelines indicate that a clear rationale should be applied in the ranking of criteria -project guidelines provide examples of factors that should be considered in criteria rankings (e.g., public and agency priorities, public policies, potential for inducing other effects, uncertainty)	-generic or project guidelines point out that criteria used to compare alternatives should be ranked -generic or project guidelines indicate that a clear rationale should be applied in the ranking of criteria	-generic or project guidelines point out need to consider differences in criteria importance	- no guidance provided

Table A-18: Scaling Levels - RefiningEvaluation Activities - Guideline Evaluation

Scaling Levels	A	B	C	D	E
-comparison of alternatives	-generic or project guidelines point out need to clearly explain and support the choice and application of evaluation methods -generic or project guidelines point out need to consistently consider impact magnitude and impact importance differences -generic guidelines point out need to consider net effects (e.g., after mitigation potential) -generic or project guidelines point out need to explicitly consider agency and public concerns and preferences -generic or project guidelines point out need to consider uncertainty in evaluation (e.g., sensitivity analyses, multiple methods) -generic or project guidelines point out need to consider sustainability differences -generic or project guidelines point out desirability of addressing distributional (e.g., by group) differences -generic or project guidelines point out need to substantiate choices	-5, 6 or 7 of Level A criteria	3 or 4 of Level A criteria	1 or 2 of Level A criteria	- no guidance provided
-proposal acceptability	-generic guidelines identify government policies and standards that any proposal must satisfy -generic guidelines point out that net effects of proposal must be consolidated as a basis for determining proposal acceptability -project guidelines identify specific acceptability that are directly applicable to proposal	-project guidelines identify government policies and standards that any proposal must satisfy -project guidelines point out that net effects of proposal must be consolidated as a basis for determining proposal acceptability	-project or generic guidelines identify applicable government policies and standards or project or generic guidelines point out that net effects of proposal must be consolidated as a basis for determining proposal acceptability	-project or generic guidelines point out that project acceptability will be assessed	- no guidance provided
-political and public involvement	-generic or project guidelines point out necessity of public and agency involvement in evaluation -generic or project guidelines point out importance of traceable and understandable evaluation -generic or project guidelines indicate the need for clear documentation of role of agencies and public in evaluation process -generic or project guidelines encourage use of measures to broaden the base of public understanding involvement and to facilitate consensus building and conflict resolution	-addresses 3 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	- no guidance provided

Table A-18: Scaling Levels - RefiningEvaluation Activities - Guideline Evaluation

Scaling Levels	A	B	C	D	E
-overall evaluation process	-generic or project guidelines stress need to make explicit and substantiate all assumptions, interpretations and judgments -generic or project guidelines stress need for focused, efficient and effective evaluation -generic or project guidelines stress need to adapt evaluation to context -generic or project guidelines indicate that sustainability concerns should be integrated into process	-addresses 3 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	- no guidance provided

Table A-19- Application of Scaling Levels - Refining Evaluation Activities - Guideline Evaluation

Criteria	BC	ALB	SASK	MAN	ONT	QUE	NB	NS	PEI	NFLD	CAN
Problem Definition	C	C	A	C	B	C	D	C	C	B	B
Goals, Objectives and Criteria Identification	D	D	C	C	D	B	E	D	D	D	D
Generation of Alternatives	C	B	B	C	A	C	B	C	C	C	C
Screening of Alternatives	D	D	D	D	D	D	D	D	E	D	D
Scaling of Impacts	E	E	E	E	C	C	D	E	D	E	E
Criteria Ranking and Weighting	E	E	C	E	C	C	B	E	E	E	C
Comparison of Alternatives	D	C	D	D	C	C	D	D	D	D	D
Proposal Acceptability	D	D	C	C	C	D	C	C	E	C	B
Political and Public Involvement	B	C	C	D	B	C	D	D	D	D	C
Overall Evaluation Process	C	D	B	B	C	B	C	C	C	D	B

Scaling Levels A to E

Table A-20 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Problem Definition	-general guidelines require that purpose of project be specified -general guidelines indicate that rationale for project may be included (market or public demand and reasons for initiating project)	-project guidelines require that need be discussed -project guidelines indicate that reasons to pursue project should be described; includes references to public demand and local benefits	-general guidelines indicate proponent should explain why the proponent is proposing the development at this time; suggests should set 2 questions - a) can same objective be met through another environmentally acceptable but still economically feasible alternatives? 2) do project benefits to province justify environmental costs? -project guidelines refer to project need -project guidelines specific matters to address regarding project rationale -project guidelines highlight need within a broader policy framework; references to sustainability in one case	-general guidelines refer to justification; rationale and objectives of the proposed development -project guidelines refer to describing the need and justification for the proposal	-general guidelines refer to problem or that is being addressed - the purpose; notes purpose should be broad enough to allow consideration of a reasonable range of alternatives; also indicates that purpose should be defined again at end of process in greater detail -defines rationale as summary explanation of process; as distinct from need; notes that proponent should clarify, quantify and justify need -general guidelines indicate that final determination of need will be made through approval process -waste management guidelines provide more details · regarding addressing problem or opportunity	-general guidelines refer to describing the existing situation and its context, and then outlining the problems or needs that the project will address -general guidelines refer to the description of the project context (*raison d'etre)* -project guidelines, in addressing project justification, suggest referring to policy guidelines; specific suggestions made regarding matters should consider

416

Table A-20 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Goals, Objectives and Criteria Identification	-general guidelines refer to need to consider technical-engineering, environmental features and impacts, socio-economic/cultural heritage features in study area identification and in site and route selection analyses	-project guidelines refer to use of technical, geotechnic, economic and environmental criteria to select project components -project guidelines refer to need to discuss route selection criteria -project guidelines refer to discussing the criteria used to evaluate the options -project guidelines refer to describing why factors were chosen	-general guidelines refer to identifying the objectives of the proposed project -general guidelines indicate that criteria that influenced eventual choice should be presented -project guidelines refer to a clear identification of criteria -project guidelines refer to explicit criteria	-general and project guidelines refer to rationale and justification of proposed development; reference is also made to the objectives of the proposal	-general guidelines refer to environmental criteria reflecting the broad definition of environment in legislation -EA proposal guidelines suggest inclusion of definitions of screening criteria for defining alternatives; reference is also made to preliminary criteria for choosing among alternatives -waste management guidelines (public projects) suggest specific screening and comparative site selection and assessment criteria -factors to consider in evaluating alternative solutions cited in class assessments -study for government (not policy) stresses need for rationale for criteria	-general guidelines refer to listing the main objectives of the project at the local, regional and provincial levels; also refers to clearly explaining the criteria on which the choice of objectives was based and demonstrating how they are in keeping with the situation described under problems or needs -general guidelines refer to well-defined, explicit and precise criteria -general guidelines refer to description of goals and relationship with the environment -general guidelines refer to listing the principal objectives and then reasons for carrying out project -project guidelines refer to considerations should address for each of the alternatives highlighted in the project guidelines -project guidelines refer to defining each criterion -project guidelines refer to stating and explaining criteria

Table A-20 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Generation of Alternatives	-general guidelines refer to the identification of site or route options -general guidelines refer to the identification of potential feasible alternatives methods for undertaking the construction, operation, modification, dismantling or abandonment of the project; refers to both overall project and project components	-project guidelines indicate that alternatives considered should be listed (including locations and methods) -proponent required to discuss reasons for selecting various project components -project guidelines refer to need to discuss alternative technologies for various specified facility components -project guidelines refer to discussing major features from an environmental alternatives perspective (location, process, timing)	-general guidelines indicate that proponent, in project guidelines, should identify any alternatives -general guidelines indicate that proponent, in discussing alternatives, should provide a brief account of the extent to which biophysical and socio-economic considerations influenced the identification of alternatives -general guidelines refer to identifying feasible alternatives for meeting project objectives -general guidelines refer to need to consider non-structural alternatives, structural or process alternatives and site selection alternatives; provides examples of each -general guidelines provide details regarding how alternatives are to be described -project guidelines refer to procedures for developing alternatives; examples of factors to consider provided	-general guidelines ask the question - are there alternative ways to meet the objective of the proposal? -project guidelines refer to explaining process by which site chosen; asks the questions - are there acceptable alternative sites? Are there alternative ways to meet the objectives of the proposal?	-general guidelines refer to a reasonable range of alternatives; reference is made to alternatives to undertaking and alternative methods of carrying out the undertaking; requires consideration of do nothing alternative -general guidelines point out importance of explaining how initial set of alternatives were determined including criteria and assumptions -general guidelines provide examples of types of alternatives could consider -waste management guidelines (public projects) identify alternatives to consider -class environmental assessments identifies alternative solutions will consider	-general guidelines refer to listing all alternative methods of achieving the project -general guidelines refer to considering the options of cancelling or postponing the project and alternatives to the project -project guidelines identify specific alternatives and sub-alternatives to consider

Table A-20 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Screening of Alternatives	-general guidelines, for site selection, refer to the definition of the study region; notes major disciplines and refers to need for rationale	-project guidelines indicate that the environmental implications of alternatives should be summarized; reasons for selected alternatives should be discussed -reference is also made to need for discussion regarding how criteria used to select locations and identify constraints	-general guidelines refer to identifying a small number of alternatives to be subject to more detailed examination on the basis of initial feasibility	-general and project guidelines ask the question - are there acceptable sites?	-general guidelines indicate that some alternatives may be eliminated on the basis of a less detailed evaluation; reference is also made to initial screening to identify reasonable alternatives -general guidelines point out need to clearly explain any outstanding negative features that are used to eliminate alternatives; refers to considering problem or opportunity, mandate or market and undertaking during screening -waste management guidelines refer to screening criteria	-general guidelines refer to analysing theoretical feasibility, taking into account environmental as well as technical and financial constraints -general guidelines make the point that the more options that are eliminated the better the justification should be and the clearer the criteria and their relative importance
Scaling of Impacts	-no guidance provided	-project guidelines indicate that environmental information for project alternatives should be at equivalent level of detail	-general guidelines include general reference to providing documentation of all methodologies used and assumptions employed in various analyses -project guidelines refer to a clear identification of methodology, includes reference to strengths and weaknesses of methodology	-general and project guidelines ask the question - by what process was the site for the development chosen?	-general guidelines refer to clear documentation of methods -waste management guidelines describe and suggest the use of net effects scaling -study for government (not policy) advocates criteria scaling	-general guidelines refer to rating the significance of impacts associated with alternatives -project guidelines refer to clearly indicating the differences between the constituent classes (acceptable vs. desirable); also states shall justify the attribution of a given class to a criterion on the basis of knowledge acquired about the environment -general guidelines refer to clearly explaining methods and techniques

Table A-20 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part I)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Criteria Ranking and Weighting	-no guidance provided	-project guidelines refer to showing how the environmental factors were used in the selection process	-general guidelines include general reference to providing documentation of all methodologies used and assumptions employed in various analyses -project guidelines refer to describing methodology including assignment of weights and strengths and weaknesses of evaluation methodology -project guidelines refer to the provision of a complete rationale for how weightings assigned	-general and project guidelines ask the question - by what process was the site for the development chosen?	-general guidelines refer to clear documentation of methods -waste management guidelines describe and explain the determination of the relative importance of criteria -study for government (not policy) advocates criteria ranking and weighting	-general guidelines refer to explicit and clearly defined relative weights -general guidelines refer to clearly explaining methods and techniques -project guidelines refer to stating the relative importance of criteria in relation to each other for comparing alternatives -project guidelines refer to stating and explaining how criteria were weighted

Table A-20 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Comparison of Alternatives	-general guidelines refer to the assessment of the relative merits of site selection options including reasons for preferred location(s) -general guidelines refer to assessment of potential feasible methods for undertaking the project -general guidelines refer to the comparative evaluation of the major direct and indirect effects of alternatives -general guidelines refer to assessing site options first at a reconnaissance level and then the more detailed assessment of alternative site(s) or route(s) within area(s) or corridor(s) -project specific guidelines provide details regarding transportation options and alternative impact management options to consider and potential effects to address; focus on data and issues rather than on methodology	-project guidelines indicate that the environmental implications of alternatives should be summarized; reasons for selected alternatives should be discussed -project guidelines refer to need to discuss selection process -project guidelines refer to consideration of efforts to reduce potential impacts in alternatives analysis	-general guidelines indicate that the proponent should, in the project proposal, indicate why each alternative considered was rejected in favour of the proposed course of action -general guidelines refer to predicting and evaluating the likely environmental implications of the development of the feasible alternatives; refers to selecting a preferred alternative on the basis of both environmental and economic criteria -general guidelines refer to the need to provide a rationale for the selection of the preferred alternative -project guidelines refer to evaluation of pros and cons of alternatives and reasons for selection of preferred alternative -project guidelines refer to providing details regarding evaluation technique	-general guidelines asks the question - by what process was the site for the development chosen? -general guidelines refer to describing and comparing certain and probable, positive and negative impacts, including all alternatives still under consideration	-general guidelines refer to systematically evaluating net environmental effects; reference is made to evaluating the advantages and disadvantages of the undertaking and its alternatives -general guidelines refer to a staged evaluation of alternatives at progressively greater levels of detail -general guidelines refer to clear documentation of methods -general guidelines refer to evaluating effects, with and with mitigation, of each alternatives on all environmental components; reference is also made to a consistent basis for tradeoffs; summary charts are encouraged -waste management guidelines provide detailed suggestions regarding evaluation and site selection methods -a study done for government (not policy) advocates quantitative evaluation procedures	-general guidelines refer to choosing alternative that best meets objectives and causes least disturbance to existing environment and to quality of life of people concerned -general guidelines refer to indication of results of any sensitivity analyses or the degree of actual differentiation among the alternatives; clearness with which one alternative distinguishes itself from the others -general guidelines refer to assessing proposal within the context of alternative futures; to address uncertainty -general guidelines refer to clearly explaining methods and techniques -general guidelines refer to justifying the option chosen -project guidelines refer to the alternatives analysis addressing inevitable and irreversible impacts -project guidelines refer to selecting best alternative, including sensitivity analyses

Table A-20 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Proposal Acceptability	-general guidelines indicate that, with projects with significant public costs or liabilities, a more extensive economic analysis may be required	-project guidelines refer to analysing alternatives including a "no development" scenario	-general guidelines refer to identifying major environmental tradeoffs of project; also refers to involving potentially affected public in assessment of overall environmental acceptability of the development -general guidelines refer to providing key environmental information necessary to determine the environmental acceptability of the project -general guidelines refer to question - do the project benefits justify the environmental costs? -project guidelines refer to comparative analysis of key resource benefits; reference is also made to complete statement of net environmental costs and benefits	-no specific guidance provided except in the one case where reference is made to adherence to sustainability principles and policies -reference is made to assessment based on net effects	-general guidelines refer to the inclusion of the do nothing alternative as a benchmark for evaluating consequences and to assist the review of whether undertaking should be approved -reference is made to the need to establish that the advantages outweigh the disadvantages for the proponent and the people of Ontario	-project guidelines refer to selecting alternative that best meets objectives and is in closest harmony with biophysical and socio-cultural environment

Table A-20 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Political and Public Involvement	-general guidelines require application and project report to specify public consultation undertaken and planned; separate reference to issues discussed with agencies and with First Nations -general guidelines provide more details regarding public consultation (e.g. responsibilities, techniques, communications and participant assistance); separate more detailed guidance regarding First Nations participation	-project guidelines provide detailed public participation requirements; measures and opportunities	-general guidelines stress desirability of early public contact; more than one way communications -project guidelines require public involvement program; reference is also made to early involvement, two-way communications and public concerns being an integral part of the assessment	-general and project guidelines ask the question -to what degree was there local public involvement in the selection of a site? -project guidelines refer to working closely with local interest groups, including First Nations; also requires detailing of plans to involve public and details regarding public consultation mechanisms	-general guidelines refer to consulting with affecting parties -EA proposal guidelines suggests inclusion of a proposed public and agency consultation plan; reference is also made to a listing of issues and concerns -more detailed guidelines for pre-submission consultation identify benefits of consultation, consultation principles, roles for various parties and examples of methods -waste management guidelines provide detailed suggestions regarding public consultation procedures through the evaluation process; same for class assessments	-general guidelines refer to considering the community's values in evaluating alternatives -general guidelines identify public participation objectives and principles (e.g. right of public to be informed, responsibilities of public to participate, agreement that inequalities between people of different social conditions should not be heightened by environmental degradation) -general guidelines refer to ample provision for information and consultation mechanisms -general guidelines provide more detailed consultation guidance
Overall Evaluation Process	-general and specific guidelines stress need for focused evaluation -project guidelines identify many instances where assumptions, interpretations and judgments will need to be explained and substantiated	-general and project guidelines stress need for focused evaluation	-general and project guidelines stress need for focused evaluation and for substantiation of interpretations, methods and conclusions - scattered references in one project guideline to biodiversity and resource sustainability concerns	-general and project guidelines stress need for focused evaluation and for substantiation -project guidelines, in one case, refer to an ecosystem-based approach -project guidelines refer to considering and directly reflecting the Principles of Sustainable Development as contained in the Sustainable Development Strategy for Manitoba; several related policies also cited; requires that EIS shows how policies and principles addressed	-general guidelines refer to the provision of clear, complete documentation -general guidelines stress need for traceable process and justification for conclusions	-general guidelines identify promotion of sustainable development as an EA goal -project guidelines refer to project optimization; the integration of the project design with the ecological and social objectives inherent in sustainable development -project guidelines refer to supporting to assumptions, interpretations and conclusions -project guidelines stress succinct analysis and substantiation of conclusions

Table 21 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Problem Definition	-project guidelines require that the report provide a clear justification for the project	-project guidelines refer to identifying VECs and defining a context within which the significance of changes to VECs can be determined -project guidelines indicate that, because the project has a potentially negative impact upon the environment, the public need for the undertaking must be discussed; in one case refers to discussing the environmental and socio-economic justification for the project	-project guidelines make provision for description of project rationale -project guidelines indicate that EIA should describe the purpose of the project and explain the environmental implications of non proceeding with the project; includes reference to policy context	-general guidelines refer to providing reasons for the undertaking -project guidelines refer to project rationale and justification; includes specific references to local and provincial benefits, historical, current and projected demand and conclusions of feasibility research -project guidelines identify specific matters to address in rationale / need analysis; also notes that relationship to legislation, permitting, regulatory agencies and policies should be addressed -project guidelines indicate that need should be clearly stated and linked to government policy and broader context	-general guidelines refer to need to address the purpose of the project -general guidelines refer to determining the scope of the project, the scope of the assessment and the scope of the factors to be considered; includes determination of appropriate level of effort -project guidelines refer to need to define and explain problem including present magnitude and expected growth of the problem; detailed list of matters should address provided -project guidelines indicate that rationale for project should be provided; includes reference to regulatory criteria and assumptions -project guidelines point to need to consider whether project might infringe on any individual or collective rights; also point out that any associated projects should be described
Goals, Objectives and Criteria Identification	-no specific guidance	-project guidelines, in some cases, identify environmental components and examples of factors should consider in the evaluation of alternatives -project guidelines refer to providing environmental, social and economic reasons for the selection of the preferred site	-project guidelines include specific examples of issues (criteria) that should be used in the evaluation of alternative sites and alternative technologies	-project guidelines refer to defining and describing in detail environmental, engineering, economic and social site selection factors; reference is also made to costs, benefits, environmental risks and feasibility -project guidelines refer to clear presentation of selection criteria -project guidelines identify major considerations (criteria) to be addressed in description of alternatives	-general guidelines identify broad factors to consider (e.g., physical, biological, social, human health, heritage) -project guidelines identify broad factors (e.g., health risk, social impacts, costs) should be considered in alternatives analysis -project guidelines list specific issues that should be addressed in alternatives analysis -project guidelines indicates that siting criteria should be discussed; reference is made to use of site selection methods, processes and experiences -project guidelines indicate that environmental, engineering, operational and economic criteria should be used in alternatives analysis

Table 21 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Generation of Alternatives	-project guidelines indicate alternatives to proposal should be evaluated; refers to need to consider null or do nothing alternative, alternative locations and alternative designs and operating procedures -project guidelines provide types and examples of alternatives should consider and considerations that might lead to the identification of additional alternatives -project guidelines indicate that basis for identifying alternative designs and operating procedures should be the analysis of specific components of the project to identify more environmentally sound practices	-project guidelines indicate that other methods for carrying out the undertaking and alternatives to the undertaking should be described and discussed including the null or do nothing alternative; in some cases examples provided	-project guidelines refer to identifying alternatives to and alternative methods for carrying out the undertaking; includes more specific references to alternative sites and technologies with specific examples of alternatives or matters that should be addressed by alternatives	-general guidelines refer to alternative methods of carrying out the undertaking and alternatives to the undertaking -project guidelines refer to alternative sites and design alternatives -project guidelines, in some cases, identify specific alternatives that should / will be considered project guidelines identify facility components for which alternatives should be addressed; includes requirement for a detailed summary of alternatives considered	-general guidelines refers to alternatives to the project and alternatives means of carrying out project; provides examples of each; notes that refers to alternatives that are technically and economically feasible -project guidelines refer to concerns that should be addressed by alternatives; includes reference to actions by other parties -project guidelines identify specific areas where impact management options should be identified and evaluated -project guidelines list major types of alternatives that should consider; also highlights issues that should address in each analysis

Table 21 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Screening of Alternatives	-general guidelines refer to an evaluation of alternatives -project guidelines refer to describing the methodology used to select the site; includes reference to rationale for rejecting other sites and applicable government guidelines	-project guidelines refer to providing reasons for the selection of the preferred method and a discussion of all alternatives to the undertaking including the do nothing alternative -project guidelines indicate that reasons for the selection of the proposed method should be provided	-general guidelines refer to reviewing alternatives	-project guidelines refer to justifying location -project guidelines include references to use of a matrix diagram; only sites that meet the selection criteria will be considered project alternatives to be described further -project guidelines refer to the provision of a rationale for the selection of the preferred approach -project guidelines note that if only one alternative is viable or possible should be indicated with supporting argument -project guidelines note that enough information for an informed decision on each alternative should be provided; desirability of clear format stressed -project guidelinis refer to excluding alternatives that are not feasible	-general guidelines refer to methods for identifying project-environment interactions (overlay maps, matrix tables, expert groups) -project guidelines refer to rationale, constraints and criteria that might affect the selection of a particular alternative and the rejection of other alternatives
Scaling of Impacts	-project guidelines refer to the definition of significant effects	-no specific guidance provided	-project guidelines refer to the use of objective criteria in defining significance when predicting environmental effects	-no specific guidance provided	-no specific guidance provided
Criteria Ranking and Weighting	-project guidelines refer to clearly defining significance; gives examples of factors especially regarding VECs	-no specific guidance provided	-no specific guidance provided	-no specific guidance provided	-general guidelines refer to need for criteria for determining whether environmental effect adverse, significant and likely; detailed description of procedures for addressing provided in guidelines, although generally with reference to predicted impacts rather than alternatives analysis

Table 21 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Comparison of Alternatives	-general guidelines refer to an evaluation of alternatives -project guidelines refer to describing the methodology used to select the site; includes reference to rationale for rejecting other sites and applicable government guidelines	-project guidelines refer to providing reasons for the selection of the preferred method and a discussion of alternatives to the undertaking including *the do nothing* alternative -project guidelines refer to providing environmental, social and economic reasons for the selection of the preferred site	-general guidelines refer to reviewing alternatives -project guidelines refer to identifying commonalities and differences between proposal and alternatives -project guidelines refer to evaluating the environmental impacts associated with each alternative	-project guidelines refer to justifying location; includes references to describing the process of comparing alternative sites; notes evaluation process will be described and the selection of the preferred site justified -project guidelines refer to a detailed discussion of all design alternatives; discussion in sufficient detail to compare costs, benefits and environmental risks - indicates that discussions should focus on selecting the design that minimizes any adverse environmental impact -project guidelines refer to the provision of a rationale for the selection of the preferred approach; indicates summary of discussion will be presented in matrix form -project guidelines note that enough information for an informed decision on each alternative should be provided; desirability of clear format stressed	-general guidelines refer to methods for identifying project-environment interactions (overlay maps, matrix tables, expert groups) -project guidelines refer to comparison of significant differences among alternatives -project guidelines refer to alternatives capable of addressing problem being presented at a level of detail sufficient to permit a meaningful comparative evaluation -project guidelines refer to rationale, constraints and criteria that might affect the selection of a particular alternative and the rejection of other alternatives; refers to identification of experience information that reinforces selection

Table 21 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Proposal Acceptability	-project guidelines refer to use of alternatives analysis in facilitating decision-making and in determining acceptability; also refers to the evaluation of the do nothing alternative; notes need to examine the implications of not proceeding with the project with reference to economic, environmental and social factors -project guidelines refer to providing clear justification for project in order to allow for an evaluation of the relative costs and benefits of the proposed project; in one case also stipulates that a cost benefit analysis must be undertaken including a clear description of non-quantifiable residual effects	-project guidelines refer to the evaluation of the advantages and disadvantages to the environment of the undertaking; specific reference to need to discuss the null or "do nothing" alternative -project guidelines refer to evaluating the environmental costs and benefits to the impact area; notes that the residual impacts are very important in the evaluation because they represent the environmental cost of the project; reference is also made to discussing the environmental, social, and economic costs and benefits of the project including the context of the project in relation to regional and local development plans	-no specific guidance provided	-general guidelines refer to advantages and disadvantages to the environment of the undertaking; reference is made in one case to distinguishing project-related environmental effects from natural variation -project guidelines refer to specific government policies that proposal will adhere to	-project guidelines refer to determination of net benefits and to whether project is acceptable or unacceptable; detailed requirements specified regarding benefits and costs to address -project guidelines refer to need to address significance of residual effects
Political and Public Involvement	-general and project guidelines refer to consulting with area residents; indicates affected public should be well informed and that values and concerns are incorporated and adequately addressed in study	-project guidelines refer to the need to describe any public information / consultation programs, including reporting of results and proponent commitments	-project guidelines provide specific guidance regarding consultation with municipalities and public information sessions -project guidelines refer to the importance of fully consulting the project through the assessment process	-project guidelines provide specific guidance regarding public consultation measures (e.g., public meetings, issues raised to be addressed) to be instituted -project guidelines identify public issues raised to date	-general guidelines refer to an open and balanced EIA process; stresses desirability of a public consultation program; detailed guidance provided in reference guides; includes provision for mediation -project guidelines provide detailed direction regarding areas where public involvement is especially important -project guidelines detail public consultation requirements (e.g., principles, parties to involve)

Table 21 - Application of Guideline Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Overall Evaluation Process	-project guidelines include general references to succinct, focused analysis and to the substantiation of conclusions	-project guidelines include general references to succinct, focused analysis and to the substantiation of conclusions	-project guidelines include general references to succinct, focused analysis and to the substantiation of conclusions -project guidelines do refer to the use of objective criteria in defining significance when predicting environmental effects	-project guidelines indicate desirability of focusing on items of concern	-sustainable development established as objective of legislation -project guidelines refer to a clear and comprehensive analysis -project guidelines refer to rationale, constraints and criteria that might affect the selection of a particular alternative and the rejection of other alternatives

Table A-22 - Criteria - Proposal Evaluation - Refining Evaluation Activities

Activity	Criteria
Problem Definition	• clearly states and frames problem (or opportunity) (VanGundy 1988) • analyses and redefines problem structure (Bardwell 1991) • links ends to problem structure (VanGundy 1988)
Goals, Objectives and Criteria Identification	• establishes environmental management context within which goals and objectives are defined • provides clear purpose, goals and objectives (Doyle and Sadler 1996; Holling 1978) • links criteria to goals and objectives • defines and provides a rationale for each criterion • ensures criteria reflect values and interests of stakeholders (Leung 1985; McAllister 1980)
Generation of Alternatives	• uses systematic procedure for alternatives generation (VanGundy 1988) • identifies all reasonable alternatives • provides rationale for alternatives considered • considers alternatives to proposal including no-action, and non-structural alternatives (Bass and Herson 1993) • considers, where appropriate, locational alternatives (Westman 1985) • considers implementation alternatives (e.g., design, construction, operations, mitigation, after-use) (Westman 1985; Bass and Herson 1993)
Screening of Alternatives	• clearly specifies criteria for screening alternatives (Wood 1995) • considers mitigation potential prior to screening decisions • identifies and applies screening decision rules clearly and consistently • uses a range of screening criteria (technical, ecological, economic, social) (Bass and Herson 1993) • screens out unsustainable alternatives (Gibson 1993) • substantiates all screening decisions
Scaling of Impacts	• addresses differences in impact magnitude in a systematic and explicit manner • substantiates impact scalings
Criteria Ranking and Weighting	• uses systematic procedures for addressing differences in importance among criteria (Canter, Atkinson and Leistritz 1985) • provides a clear and consistent rationale for criteria rankings • provides a clear and consistent rationale for criteria weightings (if applied) • considers implications of interrelationships among impacts for criteria ranking
Comparison of Alternatives	• clearly describes and provides rationale for comparative evaluation methods used (Jain, Urban and Stacey 1977; Malik 1995) • applies a broad range of environmental criteria, reflective of different components of the environment • makes effective use of available data • addresses different impact types (e.g., indirect) • allows for uncertainty and alternative interpretations in evaluation procedures (e.g., through use of sensitivity analyses or more than one method) • applies criteria consistently across alternatives • considers mitigation potential in comparisons • considers distribution of impacts over time (e.g., future generations), over space and by population group (e.g., social equity concerns) in evaluation • considers sustainability differences in comparisons (Gibson 1993) • identifies and considers key tradeoffs (Malik and Bartlett 1993) • substantiates conclusions
Proposal Acceptability	• evaluates selected alternative against legal and administrative standards and requirements (McAllister 1980) • evaluates selected alternative(s) against environmental carrying capacity and sustainability principles

Table A-22 - Criteria - Proposal Evaluation - Refining Evaluation Activities

Activity	Criteria
Political and Public Involvement	• provides for full stakeholder involvement • involves politicians and public in problem definition and framing • involves politicians and public in alternative identification • involves politicians and public in criteria identification • involves politicians and public in criteria ranking • involves politicians and public in screening decisions (Wood 1995) • involves politicians and public in selection of preferred alternative (s) (Wood 1995) • uses simple and understandable evaluation procedures • provides assistance (e.g., funding), where warranted, to involve potentially affected groups (Spaling, Smit and Kreutzwiser 1993) • makes the contribution of politicians and public clearly evident • facilitates consensus building and conflict resolution
Overall Evaluation Process	• makes explicit and substantiates all assumptions • substantiates all areas of interpretation and judgement (Malik and Bartlett 1993) • minimizes potential for bias, distortion and manipulation • focuses analysis on impacts and differences pertinent to decisions (Malik 1995; Winder and Allen 1975) • ensures procedures efficient and cost effective (Voogd 1983) • designs procedures to suit proposal and area characteristics • integrates sustainability concerns

Table A-23: Scaling Levels - Refining Evaluation Activities - Proposal Evaluation

Scaling Levels	A	B	C	D	E
Problem Definition	-clearly states and frames problem or opportunity -analyses problem structure -links ends (goals and objectives) to problem structure	-clearly states and frames problem or opportunity -analyses problem structure	-clearly states and frames problem or opportunity	-briefly highlights problem or opportunity to be addressed	-no reference to problem
Goals, Objectives and Criteria Identification	-places goals and objectives within a broader environmental management context -clearly defines purpose, goals and objectives -defines and provides a rationale for each criterion -links criteria to values and interests of stakeholders	-addresses 3 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	-no goals, objectives or criteria identified
Generation of Alternatives	-uses systematic, traceable procedures for identifying alternatives -considers a range of types of alternatives (e.g. no-action, locational, engineering) -provides a rationale for alternatives considered	-considers a range of types of alternatives (e.g. no-action, locational, engineering) -provides a rationale for alternatives considered	-considers a range of types of alternatives (e.g. no-action, locational, engineering) or -provides a rationale for alternatives considered	-considers alternatives	-no alternatives generated
Screening of Alternatives	-defines clear thresholds of acceptability and applies screening criteria clearly and consistently -considers mitigation potential before rejecting alternatives -uses a range of screening criteria (e.g. technical, ecological, economic, social) -screens out unsustainable alternatives -substantiates all screening decisions	-addresses 3 or 4 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	-unclear how alternatives screened
Scaling of Impacts	-uses specific criteria to explicitly and consistently indicate impact magnitude differences -defines and provides a rationale for scaling levels -provides a rationale for each application of scaling levels	-uses specific criteria to explicitly and consistently indicate impact magnitude differences -defines and provides a rationale for scaling levels	-uses specific criteria to explicitly and consistently indicate impact magnitude differences	-addresses impact magnitude differences but not always explicitly or consistently	-ad hoc treatment of impact magnitude differences
Criteria Ranking and Weighting	-ranks criteria in a clear and consistent manner -provides a rationale for criteria rankings -includes a range of factors in criteria rankings (e.g., public and agency concerns, uncertainty)	-ranks criteria in a clear and consistent manner -provides a rationale for criteria rankings	-ranks criteria in a clear and consistent manner	-ranks criteria but not always clearly or consistently	-no criteria ranking or ranking entirely implicit

Table A-23: Scaling Levels - Refining Evaluation Activities - Proposal Evaluation

Scaling Levels	A	B	C	D	E
Alternatives Comparison	-provides a clear description of and rationale for the evaluation methods used -clearly and consistently considers impact magnitude and importance differences -addresses net effects in evaluation (i.e., after mitigation) -explicitly considers public and agency concerns in comparison -explicitly addresses uncertainty (e.g., sensitivity analyses, multiple methods) -addresses sustainability differences -addresses distributional differences (e.g., by group) -substantiates choices	-5, 6 or 7 of Level A criteria	-3 or 4 of Level A criteria	-1 or 2 of Level A criteria	-largely ad hoc evaluation
Proposal Acceptability	-explicitly assesses proposal against government policies and requirements -assesses proposal against sustainability principles (e.g., environmental carrying capacity) -consolidates net effects in a form suitable for evaluation of acceptability by approval bodies	-explicitly assesses proposal against government policies and requirements -consolidates net effects in a form suitable for evaluation of acceptability by approval bodies	-consolidates net effects in a form suitable for evaluation of acceptability by approval bodies	-proposal sufficiently understandable that conducive to assessment of acceptability by approval bodies	-so poorly organized and written that difficult to assess acceptability of proposal
Political and Public Involvement	-involves public and agencies in each component of evaluation -clearly documents role of agencies and the public in the evaluation process -actively seeks to involve broad range of publics (e.g., participant funding, conflict resolution measures) -evaluation in a form that is conducive to public and agency review	-addesses 3 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	-addresses none of Level A criteria
Overall Evaluation Process	-all assumptions, interpretations and judgments explicit and substantiated -evaluation focused on key tradeoffs -evaluation adapted to context -sustainability integrated into evaluation	-addresses 3 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	-evaluation largely implicit, unfocused and poorly substantiated

Table A-24 - Application of Scaling Levels - Refining Evaluation Activities - Proposal Evaluation

Criteria	Steephank	McArthur	OSB	Condie	East Prince	Churchill	Laidlaw	Strait	Military	Salmon
Problem Definition	B	B	B	B	D	D	B	D	C	C
Goals, Objectives and Criteria Identification	D	D	E	D	D	D	C	D	E	E
Generation of Alternatives	B	B	D	B	C	C	A	D	B	B
Screening of Alternatives	D	D	D	D	D	D	B	D	D	D
Scaling of Impacts	E	D	E	C	B	E	A	C	E	E
Criteria Ranking and Weighting	E	E	E	D	E	E	A	D	E	E
Alternatives Comparison	D	D	D	C	C	D	B	C	E	D
Proposal Acceptability	B	B	B	B	B	C	B	C	B	B
Political and Public Involvement	D	E	E	C	B	B	A	C	D	D
Overall Evaluation Process	D	D	D	D	B	C	B	D	E	C

Table A-25 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part I)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Problem Definition	-addresses problem or opportunity from a corporate perspective -addresses need in terms of market demand, economic and environmental viability and role within Canada's energy production -places need interpretations within the context of an Alberta Chamber of Resources Task Force report -EIA is placed within the context of Suncor's environmental management program, community issues and regional land use planning	-provides proponent perspective on opportunity -provides a separate uranium market analysis; addresses historical and production cycles, major price factors, market uncertainties, analytical framework and assumptions, market scenarios and summary and conclusions -separate analysis of need for tailings disposal presented; systematically addresses future tailings and waste storage requirements	-opportunity viewed from corporate perspective but also placed within the context of a 20 year forest management plan, subject to a separate EIA -project need analysis addresses market demand quantitatively based on historical demand relative to supply -explicit reference to sustainable resource availability -reference is also made to other facilities -provides 20 year wood volume and wood flow estimates	-needs analysis places proposal within the context of systems planning and environmental planning principles -addresses energy demand and links to related facilities -notes that proposal is consistent with Provincial energy strategy; includes selective references -identifies specific purposes to be served by line, and consequences of not constructing; links to system load growth, systems benefits and supply implications	-need and alternatives to landfill addressed in waste management strategy -placed within context of relevant legislative requirements and guidelines
Goals, Objectives and Criteria Identification	-no specific goals or objectives for alternatives evaluation; does identify specific conservation and reclamation goals and criteria -explicit criteria are only identified for one of the sets of alternatives; in all other cases reasons for screening and advantages and disadvantages described in text form only -criteria not defined, no rationale for criteria provided and not linked to stakeholder concerns	-no goals or objectives identified -no explicit criteria for milling alternatives analysis -explicit criteria for tailings disposal location; brief summary description of each criterion -explicit criteria for tailings deposition methods analysis; criteria listed but not defined; qualitative rationale provided within text -criteria (in the form of headings) identified for comparing two tailings pit locations; criteria not defined and no rationale provided -no criteria for haul route analysis	-no goals, objectives or criteria identified	-no goals or objectives identified -only criteria identified for the process leading to the identification of the three transmission alternatives is costs and system performance; neither is defined -only criteria identified for selection of preferred transmission alternative also costs and performance, not defined although linked to length of line -criteria for moving from 15 to 3 corridors partially provided; specific cost criteria and selective references in text to specific environmental constraints that influenced choice -specific criteria listed for comparison of corridors; definition and rationale not provided	-no goals provided -objectives identified; used to group criteria -criterion (16 km as a surrogate for transportation cost) identified for study area identification -explicit exclusionary criteria identified -explicit and precise criteria identified to compare 40 sites -criteria used as basis for ranking of final 3 sites listed

Table A-25 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part I)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Generation of Alternatives	-clearly identifies a range of alternatives in five areas; explains overall basis for alternatives selection and for alternatives within each area -considers no action alternative; non-structural alternatives not considered -both locational and some general implementation alternatives considered -it would appear that many other detailed implementation issues would have involved the consideration of alternatives; no evidence in documentation	-four milling options were identified during feasibility studies; clearly listed; no rationale for alternatives presented -five tailings storage options identified; clearly listed; qualitative rationale provided for the identification of the options -five tailings deposition methods identified; clearly listed and described; qualitative rationale provided for the identification of alternatives; summary table highlights operational aspects of each alternative -two tailing pit locations identified; qualitative rationale for identification -some options noted in construction haul route analysis; only partially described	-two location alternatives are identified; systematic process for identifying not presented, just notes considered two sites -addresses plant size; does not explicitly identify alternatives - simply explains rationale for selected size -addresses construction timing; does not explicitly identify alternatives; simply explains rationale for selected timing -identifies two gluing system technologies and two drying systems technologies; rationale for consideration of technologies not presented -unclear if there were other design and operational options that might have been considered	-addresses no action and non-structural alternatives in needs analysis -identifies three transmission alternatives; other alternatives considered not identified just reasons for rejection (e.g., high cost) or mentioned in passing (e.g., lower voltage or upgrading existing lines) -identifies 15 potential corridors (map of routes provided); generally qualitative basis for route identification together with constraint mapping; specific rationale for how mapping used to identify specific corridors only partially provided -identifies three corridors based on screening analysis -identifies preferred corridor based on comparative analysis -no implementation alternatives identified and no alignment alternatives within preferred corridor	-alternatives other than landfill addressed through waste management strategy; also provides site size assumptions -no sites beyond 16 km radius considered; screened -no design or operational options considered -rationale for siting alternatives provided

Table A-25 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part I)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Screening of Alternatives	-the alternatives analysis is a mixture of screening and comparative analysis; alternatives evaluated qualitatively with summary reasons for conclusions; supported by pre-feasibility and feasibility analyses -criteria not clearly specified nor are there well defined thresholds of acceptability -range of criteria informally applied; reasons provided for decisions -no reference to sustainability in screening analysis	-the milling alternatives analysis is largely a form of screening; addresses basis for conclusions qualitatively; no explicit criteria although a broad range of considerations; decisions substantiated but no consistently applied decision rules and no consideration of mitigation potential -the processes of identifying the five tailings disposal options and the five tailings deposition methods are both a form of screening; explicit criteria not identified although a range of considerations; decisions substantiated but no consistently applied decision rules and no consideration of mitigation potential -the comparison of tailings disposal options has a form of screening; 2 major disadvantages - not acceptable and not acceptable; ratings not defined; therefore, unclear how applied or if applied consistently -the haul route analysis contains some options; in some cases screened; physical construction constraints only consideration; no explicit criteria	-one location alternative is screened using qualitative point form reasons (e.g. small size, environmental impact, commuting distance, expense); no specific criteria although a range of considerations; minimal substantiation provided -plant size alternatives other than selected size screened; qualitative reasons provided for size rather than explicit screening process for identified alternatives -timing alternatives other than preferred timing screened; qualitative reasons provided for timing rather than explicit screening process for identified alternatives	-several, unspecified alternatives were screened before 3 transmission alternatives were identified; qualitative examples of reasons for examples of alternatives are provided; clear screening criteria not applied -qualitative basis for selection of preferred transmission alternative; summary reasons only -screening of areas not addressed by 15 corridors; constraint maps provided and separate map of corridors; substantiation of links from constraints to corridor identification not directly provided -screening of 12 corridors addressed with systematic cost comparison (capital, incremental maintenance cost, incremental line loss cost) and partial environmental analysis (identifies significant environmental features bisected by rejected alternatives); not clear what is considered to be the threshold of acceptability with costs; if viewed as a comparative evaluation criteria not defined and not applied consistently	-areas beyond 16 km screened to minimize transportation costs; no clear threshold of acceptability -within 16 km area exclusionary constraint mapping undertaken; clear basis for identification of 40 sites -qualitative screening reasons (insufficient land available and other constraints - setbacks that could adversely affect long term operation) given in executive summary for the rejection of one of the 3 shortlisted sites; criteria not defined and not clear that consistently applied to all 3 sites

Table A-25 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part I)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Scaling of Impacts	-no scaling of impacts	-a form of scaling (very good, good, satisfactory, major disadvantage and not acceptable) used for screening and comparison of tailings storage options -two crude forms of scaling are used in the analysis of various tailings disposal methods; with the environmental criteria, collectively, the alternatives are ranked from best to worst (basis for scaling not systematic or explicit); the economic criterion (capital costs) contains qualitative ratings (e.g., low, medium, high, very high) for best and worst case capital and operating costs (basis for rating not presented and unclear why actual costs not used) -no scaling for tailing pit location or access route analyses	-no scaling of impacts in alternatives analysis	-scaling of impacts based on area within corridors (i.e., the greater the environmental area, the greater the environmental impact) -explanation provided on scaling procedure	-scaling system (1 to 10) used for each criterion in comparison of 40 sites; a definition is provided for each scaling level -a separate scaling system (1 to 4) (no, minimal, possible, definite) for final 3 sites; linked to various construction and operations activities; mixes probability and magnitude; levels not well defined

Table A-25 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part I)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Criteria Ranking and Weighting	-no ranking or weighting of criteria	-no ranking of criteria used in tailings storage options analysis, tailings deposition methods analysis, tailing pit location analysis or access route location analysis	-no ranking or weighting of criteria	-criteria ranking and weights (4, 2, 1) provided within each environmental area type (e.,g. agricultural capability) with higher weight for greater significance or sensitivity of feature; limited rationale provided -environmental area types weighted equally; no rationale provided -acknowledged that scale of 4,2,1, 0 is arbitrary -no explicit ranking of environmental criteria relative to land use / corridor length, cost and public responses -rankings and weightings consistently applied but rationale rather limited -no consideration given to interrelationships	-categories and criteria ranked based on judgement of committee for use in comparison of 40 and then three sites

Table A-25 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part I)

Criteria Group	Steephank Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Comparison of Alternatives	-the alternatives analysis is a mixture of screening and comparative analysis; alternatives evaluated qualitatively with summary reasons for conclusions; supported by pre-feasibility and feasibility analyses -not clear from text if criteria consistently applied to alternatives or if mitigation potential considered -much of the analysis addresses cost and market issues -environmental concerns addressed in a broad, qualitative and selective manner -a summary matrix of some considerations is used for one comparison; very brief, qualitative analysis without no explicit criteria; resource differences summarized in a matrix for two other sets of alternatives -no or minimal reference to different impact types (e.g., indirect), to uncertainty or to distribution of impacts -conclusions qualitatively substantiated	-tailings disposal evaluation includes a summary table where ratings (1 to 5) are applied to each criterion for each alternative; rationale for ratings not provided; a separate table qualitatively summarizes engineering, environmental and safety considerations but does not conform to criteria; unclear how two tables combined to produce a conclusion; methodology not adequately explained, data not effectively used; no allowance for uncertainty; mitigation potential not considered; sustainability not addressed; distribution of impacts not addressed and minimal substantiation for conclusions -tailings methods analysis uses two summary tables that at least mean that criteria are applied to each alternative; however, the tables are not well substantiated; basis for conclusions largely qualitative arguments; unclear if data used effectively or mitigation addressed; no apparent consideration of indirect effects, effects distribution or sustainability; a limited sensitivity analysis for costs analysis -fully qualitative comparative evaluation of tailing pit locations; untraceable process -the haul route analysis contains some options; in some cases compared; physical constraints only; no explicit criteria	-a qualitative evaluation of two gluing systems is presented; just a brief list of reasons why one system was favoured -a qualitative evaluation of two drying systems is presented; just a brief list of reasons why one system is favoured -minimal reference to data, uncertainty or mitigation potential; no consideration of distribution of impacts -conclusions not well substantiated	-comparative evaluation methodology for environmental criteria explained with example; simple additive weighting -separate comparison of length through cultivated, raw and irrigation potential; not clear how tradeoffs within 4 categories addressed -separate cost comparison -separate list of public responses by corridor -summary rationale provided for selecting corridor; although environmental constraints addressed consistently unclear how aggregation across all other factors undertaken -rationale includes selective references to mitigation potential; not addressed in a systematic or consistent manner -no consideration of indirect impacts -no provision for uncertainty or distribution of impacts (except over time for costs) -no reference to sustainability -conclusions partially substantiated	-comparative evaluation of 40 sites based on simple additive weightings; all available data used, supplemented by field checks; ensured consistent application of ratings -original scoring system does not indicate a clear preference from among the 3 remaining sites (one of which was screened for other reasons) -detailed description of impacts associated with each of the three sites, including consideration of mitigative measures; however, it is unclear how these descriptions, together with the additional scaling table and the original scoring tables were combined to come up with a preferred site

Table A-25 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part I)

Criteria Group	Steephank Mine Project	McArthur River Project	OSB Plant	Cendie-Queen Elizabeth	East Prince
Proposal Acceptability	-succinct presentation of major impacts with impact management but benefits addressed separately; no overall balancing of costs and benefits -specifically addresses regulatory requirements including project-specific guidelines -selective references to sustainability or to environmental carrying capacity -provides an overall net effects summary table subdivided by impact hypothesis; highlights construction, operations and long term impacts; also summarizes in text -separate analysis presented of economic (e.g. employment, taxes) for Alberta, other Canada and Federal	-succinct presentation of major impacts with impact management but benefits addressed separately; no overall balancing of costs and benefits -specifically addresses regulatory requirements including project-specific guidelines -provides a summary table of net effects (scaled); major impact types by project, phase and region -provides a separate financial and net economic benefits analysis study - overall, Saskatchewan and Canadian governments, Saskatchewan and northern Saskatchewan	-addresses legal and administrative standards -provides a summary description of positive and negative impacts in summary table and in text -no reference to carrying capacity -explicit reference to sustainable resource availability but not to project sustainability impacts	-addresses legal and administrative requirements -summary table presented detailing potential impacts (magnitude, duration, environmental risk, mitigation) -summary text also provided -no specific references to carrying capacity and sustainability	-major impacts summarized and linked to regulatory requirements -assumed that either of the final two sites is environmentally acceptable no reference to carrying capacity or sustainability
Political and Public Involvement	-broad ranging public consultation (multiple opportunities, forms of consultation and stakeholders) but no specific references to involvement in alternatives analysis; focus impact assessment -succinct and readily understandable evaluation process	-broad ranging public consultation (multiple opportunities, forms of consultation and stakeholders) but no references to involvement in alternatives analysis; focus impact assessment -succinct evaluation process; limited traceability	-public involvement program undertaken and documented; included forest management advisory committee meetings and several information meetings -no specific references to alternatives	-broad ranging public involvement program; complete record provided -public discussed several screening issues and directly involved in preferred corridor selection	-extensive public involvement in each phase of site selection process -each public issue raised is addressed -evaluation process generally simple and understandable

Table A-25 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part I)

Criteria Group	Steepbank Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Overall Evaluation Process	-alternatives analysis does not explicitly address sustainability; ecosystem sustainability (e.g., soil, vegetation, wetlands, wildlife) is qualitatively addressed in reclamation analysis -assumptions underlying alternatives analysis largely explained -areas of judgment addressed qualitatively -bias not immediately evident; however, qualitative nature of analysis lends itself to a selective presentation of advantages and disadvantages	-provides a qualitative overview of eco-system impacts, cumulative effects and resource sustainability -evaluation process assumptions do not always appear to be supported and areas of judgment often not well supported; primarily relies on qualitative argumentation - provides a qualitative overview of eco-system impacts, cumulative effects and resource sustainability	-assumptions and judgments in evaluation analysis not well supported -with qualitative analysis greater potential for bias -focused analysis -limited reference to sustainability; explicit reference to sustainable resource availability but not to project sustainability impacts	-assumptions and judgments not always explicit or well supported especially prior to selection of final 3 corridors -analysis generally focused and well designed to suit area characteristics -no reference to sustainability issues	-foundation for process reasonable; basis for everything from study area to final 3 sites clear and well substantiated -basis for study area and preferred site (as compared with other 2 shortlisted sites) not as well supported -analysis generally focused and well suited to area -no reference to sustainability concerns

Table A-26 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Group	Churchill -Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Problem Definition	-places proposal within the context of facilities to served, other approvals, regional supply system -provide a qualitative rationale; addressed do nothing alternative and power requirements -placed within the context of regulatory requirements	-purpose of EA planning process and documentation presented -placed with context of project background -quantitative analysis of opportunity (draft and final) presented based on historical waste volumes and management by other sources -placed within context of regulatory requirements	-environmental evaluation placed within project history context and linked to regulatory requirements -many aspects of problem and need addressed through previous documentation	-places in regional and historical context -places in regulatory and issues context -provides general rationale for participating in NATO training and specific rationale for low level flight training, tactical fighter centre and use of Goose Bay -includes overview of economic benefits and links to future developments, other projects and recognized rights	-placed in the context of previous studies (feasibility) and regulatory requirements provides a summary description of the need, including the major consequences of not proceeding -addresses future need (based on population projections) and links to related facilities
Goals, Objectives and Criteria Identification	-screening criterion listed for evaluation of existing line -explicit criteria not identified for screening of two smaller size lines; evident from qualitative rationale -explicit criteria not identified for study area identification; analysis based on specific environmental features -site selection and environmental assessment objectives identified -specific criteria identified for identifying routes; not defined -specific criteria not identified for possibility of different end points for line -specific criteria not identified for route comparison; routes characteristics are described with text and illustrated with maps	-goals and objectives not identified -criteria groups, criteria and, in several cases, indicators identified for each alternative type (alternatives to the undertaking - screening criteria, alternative locations - screening and comparative evaluation, alternative waste management methods - screening criteria and engineering alternatives - comparative criteria) -definition and rationale provided for each criterion	-report objective identified -environmental protection plan objectives identified -explicit criteria formulated for conceptual generic evaluation of bridge and tunnel alternatives -explicit environmental criteria and other project requirements formulated for evaluation of private sector proposal -no criteria and no alternatives explicitly evaluated in environmental evaluation	-no goals or objectives identified -explicit screening criteria not identified for alternatives subject to screening analysis (listed below); reasons are for choices are provided -subsequent studies to locate more precisely several areas and facilities; will apparently include technical and environmental criteria and will be subject to separate approval requirements	-identifies the purpose of the EIS -no explicit criteria are identified for the various alternative analyses as described below

Table A-26 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Group	Churchill -Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Generation of Alternatives	-identifies alternative of existing line and 3 sizes of transmission lines -route selection alternatives identified and assessed -alternative routes identified and assessed -no design and operations alternatives identified	-systematic procedures used to identify each set of alternatives -alternatives to the undertaking identified with network diagram, alternative locations identified with qualitative reasoning process, waste management alternatives identified by a progressive process of moving from technology groups to individual technologies and engineering alternatives identified by a review of content and facility components to identify areas of choice with potential impact differences -no action alternative considered in alternatives to analysis	-bridge and tunnel alternatives described and evaluated in a generic evaluated -alternative private bids evaluated in a separate evaluation -no approach road alternatives because rights-of-way acquired in the 1960s -design refinements and detailed route-specific analysis did not lead to the identification of any locational, design or mitigation options -assumption appears to have been made that once determination made that a bridge and design assumptions established all that remains is to predict and manage effects	-logically identifies choices - why participate in NATO, why low level training, why a NATO tactical fighter centre and why Goose Bay as a training centre -identifies (basis less clearly apparent) - low level flight training alternatives (technology - flight simulators and geographical alternatives - Europe, North American region other bases) -identifies NATO tactical centre alternatives (organizational alternatives - among NATO countries, technological alternatives - none identified although examples of alternatives under development cited, geographical alternatives - other bases) -all of the above identified in very broad terms -no explicit identification of alternative area boundaries, alternative corridors, alternative fuel dumping areas and a range of other areas where impact mitigation might involve choices; in all cases focus on impact prediction and management; in several cases impacts are ameliorated -subsequent studies to locate more precisely several areas and facilities; will apparently include technical and environmental criteria and will be subject to separate approval requirements	-addresses do nothing alternative in project need analysis -identifies and describes two alternatives to the project -identifies and describes three types of treatment -identifies and describes four lagoon types -identifies and describes 3 types of activated sludge systems identifies and describes option of secondary treatment or diffused marine outfall -identifies and describes three alternative outfall routings -no impact management alternatives are identified

Table A-26 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Group	Churchill -Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Screening of Alternatives	-existing line rejected because would not meet energy needs; qualitative reason given; quantification would have been preferable -2 sizes of smaller sizes rejected with qualitative reasons; explicit criteria, with clear thresholds of acceptability not consistently applied to alternatives -study area identification a form of screening; although not explicit criteria provides specific environmental reasons for each boundary -biophysical constraint mapping used to identify alternatives routes; routes shown on separate map from biophysical constraints; inhibits traceable route identification; however, routes shown on large scale maps with sufficient physical features that fairly obvious; some consideration of mitigation (alteration of routes when significant impacts identified) -possibility of having different end points at one end of line rejected with a reason (overlapping constraints); consistent decision rule not applied or substantiated	-screening process used for alternatives to the undertaking; screening criteria consistently applied to each alternative - tables and text; full substantiation; screening criteria defined such that no mitigation potential -screening process used to reduce the number of alternative locations; screening criteria consistently applied to each alternative -text and tables; full substantiation; screening criteria defined such that no mitigation potential -screening process used for analysis of alternative waste management methods; screening criteria consistently applied to each alternative - tables and text; screening criteria defined such that no mitigation potential -decision rules in each case clearly defined and consistently applied	-only addresses do nothing alternative with summary rationale for project -identifies cut-off level for high risk but doesn't identify risk acceptability threshold -results of generic evaluation that net insignificant environmental impacts with bridge or tunnel; preference for bridge made on basis of economic considerations -1 tunnel proposal and 5 bridge proposals submitted; 3 bridge proposals shortlisted; tunnel not considered further from this point -generic evaluation used as a basis for design requirements by government (i.e., bridge design assumptions) -numerous informal screening procedures (e.g., explanations regarding approaches, location of administrative facilities, staging area locations, utility requirements construction procedures, mitigation, compensation and monitoring procedures); in some cases summary reasons provided but in most cases explanations just provided of what is to be done, how, when and where -no apparent consideration of alternative approaches to addressing issues raised	-summary, qualitative rationale addresses (in a very abbreviated manner) the alternatives of do nothing, why low level training, why a tactical fighter centre and why Goose Bay as a training centre -summary qualitative rationale provided for exclusion of low level flight training alternatives (technology, geographic) other than selected alternative -above analyses do not include explicit criteria or consistently applied decision rules; some qualitative comments provided regarding mitigation potential; no references to sustainability; a very brief summary rationale is provided in all cases -subsequent studies to locate more precisely several areas and facilities; will apparently include technical and environmental criteria and will be subject to separate approval requirements	-assessment of alternatives is a qualitative mixture or screening and comparative evaluation; no explicit criteria; text used to describe differences among various sets of alternatives and to provide a reasoned argument for preferred alternative selection -no explicit screening criteria or decision rules -scattered references to mitigation potential -decisions qualitatively substantiated -no references to sustainability

Table A-26 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Group	Churchill -Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Scaling of Impacts	-no scaling of impacts	-impacts scaled for comparative evaluation of alternative locations and for comparative evaluation of engineering alternatives (no, minor, moderate, major constraint levels); applied in a consistent and systematic manner -tables included with definitions of scaling levels for each criterion -in each case rationale for constraint level applied to each alternative provided	-identifies scaling levels (negligible, small, some, moderate, high) for impact magnitude; also provides five possibility scaling levels; defined in very general terms; not clear if applied consistently	-impacts scaled but only for impact prediction purposes	-no scaling of impacts
Criteria Ranking and Weighting	-no criteria ranking or weighting	-criteria group, criteria and indicators ranked and weighted for comparative evaluation of alternative locations and engineering alternatives -in each case draft and final tables included with rationale for each ranking -interconnections a ranking consideration	-generic evaluation identifies four importance evaluation levels based on presence of VECs	-no criteria ranking or weighting	-no criteria ranking or weighting

Table A-26 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Group	Churchill -Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Comparison of Alternatives	-characteristics of three routes described with text and illustrated with maps; summary text rationale then presented for selection of preferred route -unclear if comparative evaluation complete or balanced; no explicit consideration of mitigation potential, distribution of effects, uncertainty or sustainability -limited substantiation of conclusions	-clear rationale provided for comparative evaluation methods used; both qualitative and quantitative procedures -broad range of criteria used in both locational and engineering comparison -effective use of data; both direct and indirect effects addressed -sensitivity analyses applied with both evaluations -criteria consistently applied to alternatives (text, tables and quantitative evaluation) -comparisons based on net effects (use of net effects tables) -distribution over space addressed; social equity a criterion -sustainability not addressed -key tradeoffs identified and considered -conclusions fully substantiated	-methodology explained but application less clear -broad range of criteria -uses scaling of magnitude, importance and possibility to support a qualitative evaluation -individual frequency plots and summary tables of ratings provided on tables; no overall scores -does address mitigation potential (qualitatively) -addresses distribution of impacts by project phase and by activity type; also distinguishes between normal and accidental risks and provides uncertainty interpretation -qualitatively substantiates conclusions	-no comparison of alternatives -subsequent studies to locate more precisely several areas and facilities; will apparently include technical and environmental criteria and will be subject to separate approval requirements	-assessment of alternatives is a qualitative mixture or screening and comparative evaluation; no explicit criteria; text used to describe differences among various sets of alternatives and to provide a reasoned argument for preferred alternative selection -comparative evaluation methods not described -criteria not used; not possible to determine if same considerations addressed for each alternative -unclear if available data used -limited consideration of mitigation potential, or distribution of effects -analysis does appear to focus on key tradeoffs and conclusions generally substantiated

Table A-26 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Group	Churchill -Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Proposal Acceptability	-regulatory requirements appear to have been addressed -impacts of preferred route, including mitigation measures, public concerns (minimal) and monitoring detailed -impacts not summarized or counterbalanced against benefits; assumption alternative with lowest impact is acceptable	-regulatory requirements addressed -overall individual and cumulative net effects summarized but not compared against benefits -no reference to carrying capacity or sustainability	-initial determination of project acceptability reached based on generic level of detail analysis and environmental management plan -further determination made by Panel; considered tradeoffs between benefits and costs / impacts; government response, Ice Committee and environmental management plan addressed areas of concern identified by panel - a series of net effects summary tables are included that address each interaction by project stage; rates impacts (significant, insignificant) with and without mitigation -environmental effects detailed including economic effects; summary conclusion reached that overall effects, after mitigation and compensation, acceptable; succinct analysis of tradeoffs between benefits and costs not provided -no reference to sustainability	-regulatory requirements addressed -overall impacts summarized in tabular and text form; economic benefits (local, regional and national) detailed -no overall analysis of tradeoffs between benefits and costs / impacts -no reference to environmental carrying capacity or to sustainability -subsequent studies to locate more precisely several areas and facilities; will apparently include technical and environmental criteria and will be subject to separate approval requirements	-regulatory requirements addressed -summary analysis of residual impacts presented; compares impacts against benefits, taking into account need -environmental carrying capacity and sustainability partially addressed in the sense that the current system is clearly a greater burden on the environmental carrying capacity and a greater threat to sustainability
Political and Public Involvement	-public consultation program undertaken and well documented; people at open house filled out questionnaire for comparing 3 routes	-broad range of public consultation opportunities through evaluation process -opportunities, through public advisory committee and open houses, to review in draft and final form - opportunity, criteria, criteria ranking and scaling and each screening and comparative evaluation step -specific responses provided to all comments received; role of agency and public comments highlighted in text	-extensive public involvement through the course of the generic evaluation, panel review and environmental management plan - addressed issues related to major choices; extensive references to issues raised through these previous contacts in environmental evaluation -no specific references to the public consultation regarding the contents of environmental evaluation	-extensive public consultation undertaken; well documented -not apparent that alternatives systematically considered during public consultation	-thorough documentation of public concerns raised; documentation that alternatives were discussed; although concerns identified responses not provided and no indication provided regarding if or how addressed

Table A-26 - Application of Proposal Evaluation Criteria - Refining Evaluation Activities (Part II)

Criteria Group	Churchill -Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Overall Evaluation Process	-assumptions generally made explicit -substantiation of judgments uneven; especially weak with screening steps -process well adapted to proposal and area characteristics -no reference to sustainability concerns	-assumptions appear to be explicit and substantiated -all areas of interpretation and judgment appear to be substantiated -minimal potential for bias or distortion; traceable process -well adapted to proposal and area characteristics -sustainability concerns not addressed	-assumptions generally made explicit but not always substantiated -areas of interpretation and judgment not all supported especially with regard to potential alternatives -by not considering potential for alternatives in environmental evaluation potential for bias and distortion; also unclear if procedures appropriate to proposal and area characteristics -no reference to sustainability	-assumptions generally made explicit but not always substantiated -areas of interpretation and judgment not all supported especially with regard to potential alternatives -by not considering potential for alternatives, except in a very cursory manner, potential for bias and distortion; also unclear if procedures appropriate to proposal and area characteristics -no reference to sustainability	-assumptions and judgments generally explicit and substantiated -qualitative nature of evaluation makes it difficult to determine if there is bias or distortion -analysis appears to be well suited to proposal and area characteristics although determination difficult to reach with qualitative evaluation -sustainability concerns not systematically or explicitly integrated

Table A-27 - Criteria - Guidelines Evaluation - Refining Impact Management Activities

	Criteria
Mitigation	• stresses avoidance, protection and restoration over reduction or minimization • suggests the formulation of a mitigation plan encompassing a range of measures • points to need to explain, detail and justify mitigation measures for each significant adverse effect • points out need to address impacts of proposed mitigation measures • indicates need to specify mitigation commitments, responsibilities, costs and implementation schedule • encourages mitigation banking where appropriate
Compensation	• points out that compensation is not a substitute for impact avoidance or mitigation • suggests range of potential impact and equity-related compensation measures • points to desirability of in-kind compensation • indicates need for criteria for compensation • encourages use of host community agreements
Monitoring and Post Auditing	• encourages establishment of monitoring objectives and overall program • stresses rigorous monitoring approach • points to need to monitor source, ambient conditions, predicted impacts, effectiveness of mitigative measures, public concerns and social impacts • indicates need to allow for natural variation • points out need for monitoring suitable for detecting undesirable changes and for assessing damage claims • indicates need to address interrelationships and system-level impacts • points out need to focus on areas where greatest potential impact, environment most vulnerable and where greatest uncertainty • indicates need for appropriate institutional arrangements • encourages peer review of monitoring program and independent monitoring when appropriate • stresses need for specific measures and for clear monitoring responsibilities and commitments • encourages early commencement of baseline and impact monitoring • stresses need to distribute monitoring results • encourages environmental audits to enhance effectiveness, including a range of perspectives
Emergency and Contingency Measures	• stresses need for clear rationale and criteria for contingency measures • points out need for financial security for environmental liability • stresses need for emergency response plan and emergency response coordination, local liaison and public notification • points out need to provide technical assistance and training as needed • stresses need to make contingency and emergency planning responsibilities explicit
Consensus Building and Conflict Resolution	• stresses need for full stakeholder involvement and consensus building • stresses need to focus on key issues and choices • encourages use of dispute resolution mechanisms including, as appropriate, use of third parties • encourages inclusion of appeal mechanisms
Public Involvement	• stresses broad distribution of impact management information in readily understandable form • encourages a range of measures for incorporating community concerns • points out need for specific methods for involving public in all aspects of impact management (e.g., mitigation, compensation, conflict resolution, contingency and emergency planning) • points out need for mechanisms for on-going community involvement
Implementation	• stresses importance of regulatory compliance and detailed and enforceable terms and conditions • provides penalties for non-compliance • points out that impact management responsibilities must match resources and capabilities
Overall Impact Management	• stresses desirability of integrated impact management principles, policies and overall strategy • encourages placement within context of area-wide monitoring and management, general plans and policies, larger programs and strategies, sustainability objectives and priorities, state-of-environment reporting and past and current resource and environmental planning and management • encourages use of peer review and co-management where appropriate

Table A-28 - Scaling Levels - Refining Impact Management Activities - Guidelines Evaluation

Scaling Levels	A	B	C	D	E
Mitigation	-generic or project guidelines encourage the formulation of a mitigation plan -generic or project guidelines indicate that mitigation should be incorporated into alternatives analysis -generic or project guidelines indicate that mitigation should be addressed for each significant impact -generic or project guidelines indicate that characteristics of mitigation measures need to be detailed (e.g., type, location, responsibilities) -generic or project guidelines note that there should be a clear rationale for each mitigation measure -generic guidelines indicate that should consider alternative mitigation measures and impacts from mitigation -project guidelines highlight impacts where mitigation should be considered	-addresses 5 or 6 Level A criteria	-addresses 3 or 4 Level A criteria	-addresses 1 or 2 or Level A criteria	- no guidance provided
Compensation	-generic or project guidelines identify general compensation principles -generic or project guidelines encourage consideration of both impact and equity-related compensation measures -generic or project guidelines encourage the application of clear compensation criteria -generic or project guidelines encourage the use of host community agreements -generic or project guidelines provide specific direction regarding when and where compensation should be considered	-addresses 3 or 4 of Level A criteria	-generic or project guidelines address 2 of Level A criteria	-generic or project guidelines address 1 of Level A criteria	- no guidance provided
Monitoring and Post Auditing	-generic guidelines encourage the establishment of monitoring objectives and a focused overall monitoring program -generic guidelines point out need to undertake baseline monitoring prior to proposal approval -generic guidelines point out need to undertake compliance monitoring -generic guidelines point out need to undertake effects monitoring -generic guidelines point out need to monitor mitigation effectiveness -generic guidelines encourage distribution of monitoring results to agencies and public -generic guidelines encourage auditing of EIA effectiveness -project guidelines provide more specific guidance regarding what should be monitored and how	-generic or project guidelines address 5, 6 or 7 of Level A criteria	-generic or project guidelines address 3 or 4 of Level A criteria	-generic or project guidelines address 1 or 2 of Level A criteria	- no guidance provided

Table A-28 - Scaling Levels - Refining Impact Management Activities - Guidelines Evaluation

Scaling Levels	A	B	C	D	E
Emergency and Contingency Measures	-generic or project guidelines point out need for clear criteria for application of contingency measures -generic or project guidelines point out, where applicable, the need for emergency response planning -generic or project guidelines point out desirability for, where applicable, for financial security for environmental liability - generic or project guidelines provide specific direction regarding where and how emergency planning and contingency measures should be considered	-generic or project guidelines address 3 or 4 of Level A criteria	-generic or project guidelines address 2 of Level A criteria	-generic or project guidelines address 1 of Level A criteria	- no guidance provided
Consensus Building and Conflict Resolution	-generic guidelines stress need to focus on identifying and addressing areas of conflict -generic guidelines suggest use of dispute resolution measures, where applicable -generic guidelines provide principles and examples for use in consensus building and conflict resolution -project guidelines provide more specific guidance regarding areas of potential conflict and how might be addressed	-generic or project guidelines address 3 of Level A criteria	-generic or project guidelines address 2 of Level A criteria	-generic or project guidelines address 1 of Level A criteria	- no guidance provided
Public Involvement	-generic or project guidelines stress the need for public involvement in each impact management component -generic or project guidelines point out that impact management materials should be distributed to and understandable by agencies and the public -generic or project guidelines point out the importance of documenting the role of agencies and the public in impact management -generic or project guidelines encourage post approval public involvement	-generic or project guidelines address 3 of Level A criteria	-generic or project guidelines address 2 of Level A criteria	-generic or project guidelines address 1 of Level A criteria	- no guidance provided
Implementation	-generic or project guidelines point out regulatory and enforcement requirements -generic or project guidelines encourage the use of enforceable terms and conditions to ensure that all impact management conditions are implemented -generic or project guidelines identify penalties for non-compliance -generic or project guidelines point out need to specify implementation responsibilities	-generic or project guidelines address 3 of Level A criteria	-generic or project guidelines address 2 of Level A criteria	-generic or project guidelines address 1 of Level A criteria	- no guidance provided
Overall Impact Management	-generic or project guidelines stress the need for an overall impact management plan -generic or project guidelines stress the need to incorporate monitoring results into area-wide monitoring and management -generic or project guidelines stress the need to place within the context of broader environmental planning and management -generic or project guidelines encourage the use of peer review of impact management	-generic or project guidelines address 3 or 4 of Level A criteria	-generic or project guidelines address 2 of Level A criteria	-generic or project guidelines address 1 of Level A criteria	- no guidance provided

Table 29: Application of Scaling Levels - Refining Impact Management Activities - Guidelines Evaluation

Criteria	BC	ALB	SASK	MAN	ONT	QUE	NB	NS	PEI	NFLD	CAN
Mitigation	B	B	C	C	C	D	D	C	B	C	B
Compensation	B	D	D	D	D	D	D	C	E	D	D
Monitoring and Post Auditing	B	C	B	B	C	B	B	C	C	B	B
Emergency and Contingency Planning	C	B	B	B	D	D	B	B	D	B	B
Consensus Building and Conflict Resolution	C	C	D	C	B	C	E	D	E	E	B
Public Involvement	D	C	C	C	C	C	D	C	D	D	B
Implementation	C	D	C	B	C	C	C	D	B	B	B
Overall Impact Management	D	B	C	D	C	D	E	D	D	D	C

Scaling Levels A to E

Table 30 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Mitigation	-generic guidelines make specific reference to preventing or mitigating adverse effects through the life cycle of reviewable projects -general guidelines refer to a preliminary assessment of proposed mitigation measures in overview assessment -generic guidelines require that mitigation measures to prevent, reduce or offset adverse effects be included in application -generic guidelines refer to the preparation of a mitigation plan; also refer to means of incorporating energy efficiency and energy conservation measures in design -mitigation and compensation guidelines define mitigation and compensation, identify economic principles and include application suggestions (e.g., focus on significant impacts); economic orientation -project guidelines include detailed references to situations where mitigation potential must be addressed; in some cases reference is made to a mitigation plan	-project guidelines refer to measures to mitigate adverse impacts; indicates that measures to prevent or minimize adverse impacts and to enhance desirable effects should be discussed -project guidelines include specific mitigation requirements; refers to the development of mitigation strategies -project guidelines include specific references to the scheduling of mitigation measures and to the evaluation of the effectiveness of mitigation strategies and plans -project guidelines refer to environmental protection plans	-generic and project guidelines refer to government review of effectiveness of mitigative measures -generic guidelines refer to incorporating commitments by the proponent to implement effective mitigative and enhancement measures to avoid or minimize adverse impacts and to enhance positive impacts -generic guidelines refer to identifying and evaluating mitigative and enhancement measures -generic guidelines refer to determining residual impacts after implementation of mitigative and enhancement measures -generic guidelines include requirement for information on financial and environmental costs and anticipated level of success of each preventative or mitigative measure -project guidelines provide specific mitigation requirements	-generic guidelines refer to the inclusion of remedial measures to offset major adverse impacts, including the expected effectiveness of those measures; residual adverse impacts need to be discussed -project guidelines indicate that steps taken to mitigate impacts should be described; provides examples and notes that an explanation is required where impacts are identified and no mitigation is contemplated -project guidelines refer to describing measures to mitigate and /or compensate for adverse impacts; indicates types of impacts -project guidelines include a detailed list of environmental components where mitigation should be considered	-generic guidelines stress need to evaluate net effects (effects remaining after mitigation or enhancement) -generic guidelines refer to mitigation / enhancement (prevent, change, mitigate or remedy) -generic guidelines describe how mitigation can be incorporated into different stages of the EIA planning process; also refers to comparing the costs and effectiveness of measures -generic guidelines refer to proponent clearly specifying mitigation commitments -generic guidelines require description of mitigation and enhancement measures -generic guidelines (heritage) specify types of mitigation measures to consider -generic guidelines (class) indicate that specific remedial measures will be identified and described -generic guidelines (class and waste) identify typical mitigating or mitigation measures	-generic guidelines refer to considering reducing or mitigating adverse effects associated with options -generic guidelines refer to inclusion of measures to attenuate the harmful impacts of the project and reduce the residual impact -project guidelines identify specific areas where mitigation should be considered; requires consideration of mitigation strategies

454

Table 30 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Compensation	-mitigation and compensation guidelines define mitigation and compensation, identify economic principles and includes application suggestions (e.g., focus on significant impacts); economic orientation -project guidelines contain scattered references to compensation measures and to compensation plan -project guidelines refer to local hiring and purchasing	-project guidelines refer to economic costs and benefits; includes specific reference t o policies and programs regarding use of regional and provincial goods and services	-generic guidelines refer to proponent outlining what will do to maximize opportunities for enhancement -project guidelines refer to the identification of a compensation mechanism	-project guidelines refer to describing measures to mitigate and /or compensate for adverse impacts; indicates types of impacts	-generic guidelines refer to mitigation / enhancement (prevent, change, mitigate or remedy) -generic guidelines (waste) refer to the possibility of considering compensation after managing, controlling or reducing to the greatest extent possible; recommends that consider policies of other proponents	-generic guidelines refer to the proponent outlining actions intends to take to compensate for the adverse residual effects of selected alternative and indication of which groups, organizations or users will be affected by the measures -generic guidelines refer to inclusion of measures to attenuate the harmful impacts of the project and reduce the residual impact

Table 30 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Monitoring and Auditing	-generic guidelines make specific reference to commencing baseline monitoring before finalizing the application -generic guidelines refer to including a monitoring plan as part of a project report -general guidelines refer to the inclusion of an evaluation plan to evaluate the effectiveness of mitigation and monitoring plan; refers to on-site inspections to ensure compliance -generic guidelines refer to monitoring plans specifying parameters to be monitored and to sampling protocol and analytical procedures -generic guidelines refer to the project approval certificate detailing requirements for comparing actual versus anticipated effects and evaluating mitigation measure adequacy through a monitoring program -project guidelines provide detailed agency and public (including First Nations) responses and requirements for baseline and effects monitoring	-project guidelines indicate that environmental monitoring measures should be discussed -project guidelines include specific monitoring requirements within a monitoring program; reference is made to both routine compliance and environmental effects monitoring -project guidelines refer to evaluating the effectiveness of mitigation measures; includes reference to discussing achievements and knowledge gained from past mitigation measures	-generic and project guidelines refer to baseline data providing a sound basis for designing and evaluating the results of post-EIA studies; reference is made to providing a statistically valid measure of natural variability -generic guidelines refer to baseline and impact monitoring data being consistent and compatible -generic guidelines refer to specific commitments to monitoring and follow-up studies; refers to more than compliance monitoring (i.e., need to evaluate impact assessment itself); follow-up studies (audits) should address accuracy of predictions, adequacy of environmental protection measures and when and if to be implemented -generic and project guidelines require data regarding what is to be monitored, sampling frequency and methodology; also refers to provision of financial and environmental cost data and anticipated levels of success -project guidelines provide specific monitoring and research requirements; includes monitoring and inspection	-generic guidelines refer to government officials undertaking routine inspections to determine compliance; noted that in many cases regularly generated monitoring data will be required -generic guidelines refer to describing intended environmental monitoring measures during construction and operations -project guidelines indicate that such details as monitoring equipment, parameters to be measured and frequency of measurement should be provided; identifies general parameters to be monitored -project guidelines require that proposed mechanisms for monitoring environmental impacts of the proposed activities and subsequent research be specified -project guidelines include specific requirements regarding impacts monitoring, mitigation monitoring, ecosystem monitoring and research	-generic guidelines refer to a monitoring program -general guidelines refer to proponent clearly specifying monitoring commitments -generic guidelines (heritage) provide specific requirements for compliance reporting and monitoring -generic guidelines (class) require provision for and description of post-construction monitoring to ensure compliance and impacts as predicted; also notes that monitoring may be necessary to ensure effectiveness of selected solution	-generic guidelines refer to proponent describing surveillance program (compliance) and monitoring program (adequacy and effectiveness of mitigating measures); also requires that proponent to indicate form in which findings to be send to regulators -generic guidelines refer to monitoring focusing on, risks and uncertainties; also notes should verify, over a sufficient length of time, the adequacy and effectiveness of mitigating measures -generic guidelines refer to terms and conditions for monitoring program being developed by government and proponent -project guidelines include detailed surveillance and monitoring requirements; include references to operating monitoring policy, regular submission of monitoring reports, comparisons of actual versus predicted changes, planning and evaluation of mitigation measures, environmental follow up program (ecosystems) parameter selection, sampling and lab analysis constraints, and quality control; stresses sufficient flexibility for adjustments

Table 30 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Emergency and Contingency Measures	-generic guidelines refer to monitoring plans specifying impact management procedures to respond to issues and unforeseen impacts; notes contingency plans may be necessary to respond to unanticipated, adverse impacts and that many will have to be considered as part of project review prior to certification -project guidelines refer to provision of management plans and to specific contingency requirements -project guidelines include requirement to address environmental effects of accidents and malfunctions; includes requirement for a contingency plan	-project guidelines include a requirement that an emergency response plan be formulated to address public safety concerns; also refers to emergency contingency plans -project guidelines refer to spill management and emergency response measures -project guidelines refer to need to consider effects of environmental hazards including implications for contingency plans -project guidelines require the listing of all main risks and uncertainties and how contingency plans will respond to any negative impacts; includes specific reference to health effects and issues -project guidelines require preparation of environmental management plan, best management practices plan, spill management plan, toxicity reduction evaluation plan, emergency response plan and a remedial action plan	-generic and project guidelines refer to assessing any special risks or hazards and to contingency plans to be implemented in the event of their occurrence -generic and project guidelines refer to identifying undesirable situations such as spills and by indicating preventive or mitigative measures and contingency plans -project guidelines include specific contingency planning requirements -project guidelines include specific requirements to address public / occupational health and safety concerns -project guidelines refer to emergency response planning, training and responsibilities	-generic guidelines refer to non-compliance resulting in follow-up action -generic guidelines refer to describing intended measures to protect the environment following abandonment -project guidelines refer to the specification of operational and emergency controls; provides specific examples -project guidelines refer to assessing on or off-site accident risk -project guidelines identify specific types of risk reduction measures should consider; includes reference to emergency equipment, facility emergency plan, community emergency plan and liability insurance	-generic guidelines refer to proponent specifying contingency planning commitments -generic guidelines (heritage) provide specific list of matters to be addressed by contingency plans	-generic guidelines refer to analysis of accident risk and description of safety measures and emergency measures in case of an accident -project guidelines include requirement to include emergency intervention measures

Table 30 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Consensus Building and Conflict Resolution	-generic guidelines refer to making appropriate arrangements between proponents, contractors, government, First Nations and public, as necessary as part of monitoring -generic guidelines stress full stakeholder involvement and issue-oriented approach -generic guidelines refer to responsibility of proponent to participate in resolving issues; specific reference to possible use of an appointed mediator	-project guidelines refer to resolving issues and concerns with the public -project guidelines refer to environmental protection or mitigation measures that might require joint resolution by government, industry and the community -project guidelines refer to on-going, open and co-operative dialogue with public	-generic and project guidelines refer to fostering joint community-proponent planning of mitigation and enhancement measures	-generic guidelines refer to legislation accommodating the emerging role of mediation in decisions to resolve conflicts (by Commission) -generic guidelines refer to identifying and resolving issues	-generic guidelines refer to identifying and resolving issues and concerns; seeks mutually acceptable and environmentally sound proposals -generic guidelines describe role of pre-submission consultation in conflict resolution; indicates that EA advisor can act as facilitator -generic guidelines (waste) indicate proponents may wish to consider mediation / facilitation techniques if supported by all parties; gives examples of activities where may be useful	-generic guidelines refer to ample provision of consultation mechanisms, including environmental mediation (mediation by Board instead of hearing)

Table 30 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Public Involvement	-generic guidelines stress public importance of public consultation opportunities; provides separate guidelines for public consultation and for addressing aboriginal issues -generic guidelines refer to the inclusion of a consultation plan as part of the project report -project guidelines refer to public and First Nations involvement in monitoring	-project guidelines include specific public involvement requirements; includes references to public involvement in impact mitigation and monitoring and following completion of the EIA review process -project guidelines refer to strategies for maintaining the public consultation process following completion of the EIA review process to ensure public has an appropriate forum for expressing views regarding on-going development and operations; requirement to show how public to be involved in design, operation, mitigation and monitoring	-generic guidelines refer to involving the potentially affected public in the formulation and evaluation of mitigative and enhancement measures -project guidelines refer to public involvement, consultation and review in approval, implementation and amendment process	-project guidelines refer to public involvement during the obtaining of approvals, construction, operations, emergency conditions and decommissioning -project guidelines require description of mechanisms to involve affected public, First Nation and the resource users in the development of mitigation plans -project guidelines refer to public involvement in monitoring; includes reference to a community monitoring committee	-generic guidelines refer to proponent clearly specifying future consultation with ministries, agencies and the public -generic guidelines describe consultation principles and responsibilities; includes suggestions for incorporating consultation into planning and possible consultation methods and techniques -generic guidelines (class) indicate that results of monitoring program shall be communicated to review agencies and the public, if requested	-generic guidelines describe benefits of public consultation -project guidelines refer to the provision of forums and feedback mechanisms with public and native communities to discuss monitoring results -project guidelines include detailed consultation requirements

Table 30 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Implementation	-generic guidelines refer to Board attaching conditions to project approval certificate regarding mitigation and monitoring measures as well as measures to evaluate the effectiveness of mitigation measures -generic guidelines refer to project approval certificate specifying monitoring requirements -generic guidelines refer to enforcement by regulatory agency, authority of minister and potential for court appeal -project guidelines identify impact management requirements (mitigation, contingency measures, monitoring) necessary for compliance; includes identification of management responsibilities	-project guidelines refer to regulatory approval requirements -project guidelines refer to provincial approval of plans prior to implementation	-generic guidelines refer to project proceeding subject to required licences, permits and environmental protection measures -generic guidelines refer to incorporating commitments by the proponent to implement effective mitigative and enhancement measures to avoid or minimize adverse impacts and enhance positive impacts	-generic guidelines refer to a licensing process that considers all potential environmental impacts; notes that environmental assessment of project will result in promulgation of site specific conditions or regulations -generic guidelines refer to enforcement and penalties for offences -generic guidelines refer to the establishment of limits, terms and conditions to ensure effective environmental protection; general compliance principles identified; division of enforcement responsibilities also summarized	-generic guidelines describe decision process, considerations in determining EA acceptance and approval requirements; includes provision for the attachment of conditions -generic guidelines (waste) detail approval requirements	-generic guidelines describe approval requirements -generic guidelines refer to government surveillance responsibilities to ensure compliance; encourages proponent involvement -generic guidelines refer to the government issuing a certificate of authorization, with or without modification

Table 30 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part 1)

Criteria Groups	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec
Overall Impact Management	-generic guidelines address the consideration of other project approval requirements under Environmental Assessment Act -project guidelines cross references relationship to land use planning processes, to related studies, to growth management strategy and to concurrent permit review requirements; reference is also made to Federal EIA requirements -project guidelines include specific references to biodiversity and to ecological sustainability issues	-project guidelines cross references other regulatory approvals (federal, provincial - environmental and land use, municipal) -project guidelines require an environmental protection plan (includes mitigation, monitoring, management) -project guidelines include specific references to pertinent land use and resource policies and plans -project guidelines include *specific references* to maintaining bio-diversity, to greenhouse gas emissions, to 'no net loss' principle and to resource sustainability in accordance with resource management plan -project guidelines refer to participation in regional air monitoring networks, health studies and biomonitoring initiatives -project guidelines refer to establishment of integrated resource management fund	-generic guidelines refer to environmental protection plans - construction, operations, decommissioning, abandonment) -project guidelines refer to sustainable resource management and to biodiversity maintenance -project guidelines include specific references to land use and resource planning and plans; includes specific references to integrated resource management	-generic guidelines refer to listing all of the approvals and any other regulatory requirements of different levels of government -project guidelines refer to applicable resource and land use plans -project guidelines refer to an ecosystem-based planning approach; also refers to sustainability (a sustainability assessment) and to consistency with provincial sustainability strategy; refers to a range *of other related policies,* plans, strategies and procedures	-generic guidelines refer to an implementation strategy -generic guidelines (land use) identify relevant provincial policies and guidelines -generic guidelines (waste) describe relevant legislation, policies, guidelines and procedures	-generic guidelines refer to EIA being undertaken in accordance with sustainable development perspective -project guidelines refer to using a sustainable development approach -project guidelines indicate need to relate to other projects

Table 31 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Mitigation	-project guidelines refer to identifying methods of optimizing positive impacts and minimizing negative impacts -project guidelines refer to study describing methods of mitigating (eliminating, preventing and minimizing) negative impacts; clearly defined circumstances under which implemented -project guidelines identify subjects where possible mitigative measures should be considered	-project guidelines identify specific areas where proposed mitigation measures should be described ; refers to facility design, pollution prevention, siting constraints, mitigation and treatment procedures and technologies, operations and maintenance practices and decommissioning and site rehabilitation plans -project guidelines require a discussion of residual impacts and of impacts that cannot be avoided or mitigated -project guidelines include references to providing information on the effectiveness of proposed mitigation measures -project guidelines identify scope of remediation plans	-generic guidelines refer to the role of EIA in determining appropriate mitigation measures -generic guidelines refer to a requirement to provide information on the effectiveness of proposed mitigative measures -project guidelines refer to identifying methods of enhancing positive impacts and of minimizing negative impacts resulting from the undertaking; also refers to quantifying residual impacts which cannot be mitigated -project guidelines require a comprehensive mitigation and monitoring program to minimize negative impacts and to ensure environmental enhancements are realized; to be discussed in terms of VECs -project guidelines require documentation of mitigation measures for construction and operations (specific subject areas identified) -project guidelines require EIA to describe means by which environmental impacts will be prevented or mitigated; identifies specific areas where mitigation should be addressed	-generic guidelines refer to addressing actions necessary to alter or remedy environmental effects and to describe proposed measures to control, remedy or minimize all significant harmful effects -project guidelines include requirement to identify mitigative measures to minimize impacts on the biophysical and socio-economic environments; includes requirement to describe rationale for and effectiveness of measures; wherever possible measures will be incorporated into project design or into construction, operations or maintenance phases -project requirements include further details of subject areas where measures should be considered -project guidelines indicate that, in discussing anticipated effectiveness of proposed mitigative measures, should refer, where possible, to similar situations where have proven successful -project guidelines require explanation of how measures will reduce or eliminate negative impacts	-generic guidelines refer to role of screening in identifying the need for mitigation -general guidelines point out that screening report can identify specific mitigation measures -generic guidelines point out that comprehensive study may need to consider highly technical one-of-a-kind site-specific mitigation measures -generic guidelines define mitigation (elimination, reduction, control of adverse environmental effects, including restitution through replacement , restoration, compensation or other means); notes that mitigation considered part of project, should address all adverse effects (significant or not), are refined as likely effects become clear and are often part of code of good practice; indicates that developed in many ways and provides examples -generic guidelines require list and description of proposed mitigation measures -cumulative effects and physical and cultural heritage resources reference guides provide examples of mitigation measures -project guidelines detail areas where mitigation potential should be addressed -project guidelines refer to identifying the cost and feasibility of mitigative measures and identifying who will be responsible for implementing them; also indicates that should identify the legal recourses available to persons or groups that are directly or indirectly harmed -project guidelines note that proponent has to explain how will resolve jurisdictional problems when mitigating impacts that cross boundaries

Table 31 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Compensation	-project guidelines refer to compensation mechanisms to be used in the event that any accidental or residual impacts occur; requires that compensation plan must be developed through agency and other stakeholder consultation	-project guidelines include requirement to discuss compensation policies (e.g., for habitat loss, water supply loss or degradation, property value loss) -project guidelines refer to proposed performance / rehabilitation bonding in the event that the proponent is unable to meet financial commitments	-no specific reference	-project guidelines refer to strategies for compensating for habitat loss	-generic guidelines treat compensation as a form of mitigation -project guidelines identify specific subject areas to address with compensation commitments -project guidelines include references to dispute settlement and compensation mechanisms when discussing emergency planning

Table 31 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Monitoring and Post Auditing	-generic guidelines refer to evaluating the accuracy of impact predictions -project guidelines refer to predictions being amenable to testing where possible through ongoing monitoring -project guidelines refer to well defined monitoring program to test EIA predictions and to evaluate effectiveness of mitigation measures; notes monitoring program being based on accurate baseline information -project guidelines identify subject areas where monitoring plans should be defined	-project guidelines point to the need to demonstrate and detail a commitment to a well defined program for monitoring project effects -project guidelines identify specific areas where monitoring and environmental auditing is required -project guidelines identify areas where pre-development monitoring is required -project guidelines include requirements for compliance and effects monitoring; identifies subject areas where required and requires programs to be presented for examination by reviewers	-generic and project guidelines refer to a requirement to describe proposed methods / models for evaluating the accuracy of impact predicting -project guidelines include specific monitoring requirements -project guidelines require a comprehensive mitigation and monitoring program to minimize negative impacts and to ensure environmental enhancements are realized; to be discussed in terms of VECs -project guidelines require documentation of monitoring measures for construction and operations (specific subject areas identified) -project guidelines require monitoring commitments concerning those environmental components for which impacts are predicted to occur -project guidelines identify areas where monitoring is required	-generic guidelines refer to a proposal for a program to monitor all toxic substances and other harmful impacts produced by the undertaking during construction and operations -project guidelines require the description of monitoring programs to be implemented during construction and operations; descriptions to include details on objectives, methodology, sampling design, duration, and reporting procedures for each project phase -project guidelines refer to baseline, compliance and environmental effects monitoring -project guidelines identify specific monitoring requirements; further requirements included for component studies -project guidelines refer to requirement to assess the success of compensation strategies for habitat loss	-generic guidelines refer to a follow-up program to verify the accuracy of the EA and / or determine the accuracy of mitigation measure effectiveness; gives examples of when may be warranted (e.g., new or unproven technology , mitigation measure, setting or method or project schedule is subject to change with resulting environmental effects) -generic guidelines require details on need for and requirements of a follow-up program (monitoring) to evaluate the effectiveness of mitigation measures and to determine the accuracy of the EA -cumulative effects reference guide also refers to follow-up program and gives examples of role and when may be appropriate -project guidelines detail areas where monitoring should be addressed; includes provision for testing accuracy of impact predictions, ensuring mitigation measure are implemented, ensuring compliance and allowing a systematic post-audit of the assessment process; also refers to a monitoring plan (parameters, baseline requirements, sampling, methods, models, thresholds, frequency, location, approach for cumulative effects, variations, dissemination, roles, cooperation, impartiality), links to other projects, arrangements for compliance monitoring and independent audits of programs -project guidelines include detailed requirements for the monitoring and mitigation of socio-economic effects -project guidelines include requirement to describe monitoring systems for addressing cumulative effects -project guidelines include requirement that monitoring responsibilities be identified -project guidelines require the consideration of possible monitoring approaches and options; requires overall monitoring program

Table 31 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Emergency and Contingency Measures	-project guidelines refer to outlining contingency plans in the event of an environmental emergency and for use when significant effects are detected through monitoring; plan must be designed to be implemented should impacts be detected -project guidelines refer to considering the potential for accident frequency increase / reduction and risk levels from collisions or spills -project guidelines identify subject areas where contingency plans should be defined	-project guidelines identify areas where contingency measures will be implemented (e.g., accidental spills and shipping accidents); refers to operational, contingency, emergency and abandonment plans and procedures -project guidelines make specific reference to the need to demonstrate emergency response capability -project guidelines contain explicit references to assessing health implications, including routine operations and upset conditions and accidents -project guidelines make specific references to contingency plans to protect the environment in case of accidental events; also refer to training plans and equipment requirements for local emergency response and fire fighting personnel and to remediation plans for habitat damage as a result of an accidental event	-project guidelines require the consideration of human health and safety impacts	-project guidelines require a field usable (standalone) environmental protection plan; includes specific requirements (e.g., environmental protection terms and conditions) -project guidelines require a management plan for chemical use, a list of permits and certificates of approval and a contact list of regulatory persons -project guidelines require contingency plans (construction and operations) for environmentally-related accidents and unplanned situations -project guidelines include detailed requirements regarding a plan of proposed rehabilitation; includes scope, rationale, approach and schedule -project guidelines indicate that monitoring program will specify actions to be taken if monitoring indicates that they are required -project guidelines include requirement to discuss risk and severity of accidental events	-general guidelines point out need to address and mitigate human health effects -project guidelines detail areas where contingency planning should be undertaken -project guidelines describe concerns to be addressed through risk analysis and emergency response planning; includes risk identification planning, prevention and contingency plans -project guidelines contain detailed requirements related to worker health and safety and risks to the public -project guidelines include requirement that describe how will react to the data and conclusions emerging from the monitoring programme -project guidelines identify specific requirements for addressing various accidents and other risks -project guidelines provide detailed requirements regarding emergency planning (e.g., types of emergencies, levels of emergency response, responsibilities, equipment, accident scenarios, contingency planning)

Table 31 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Consensus Building and Conflict Resolution	-no specific references	-project guidelines refer to discussion of dispute arbitration process and policies	-no specific reference	-no specific references	-generic guidelines identify mediation as an approach for conflict resolution; defines, describes when more likely to be effective and highlights guiding principles; lists roles and responsibilities of participants in a mediation and in a panel review -generic guidelines provides questions to determine whether mediation is appropriate, discusses possible use of a facilitator, factors to include in a terms of reference, procedures for appointing a mediator or panel, the conduct of a public review by a mediator or a panel, the contents of a report by the mediator or panel and the scope of a decision by the responsible authority -generic guidelines provide a mediation procedures guide -project guidelines include references to dispute settlement and compensation mechanisms when discussing emergency planning

Table 31 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Public Involvement	-project guidelines refer to public consultation to ensure public well informed prior to decision of project effects and to ensure that public values and concerns incorporated and adequately addressed -project guidelines refer to the EIA study being conducted in consultation with area residents	-project guidelines require detailing of public information and consultation for all project phases; includes references to design, EIA review, operation, abandonment, site rehabilitation, post abandonment and monitoring; includes requirement to report on results of public information / consultation sessions	-project guidelines include specific public consultation requirements -project guidelines require that the public understand decisions and be fully consulted throughout the EIA process	-generic guidelines refer to a requirement for a public information program; requires that local residents be fully informed of the nature of the project and its environmental effects -project guidelines include specific public consultation requirements -project guidelines identify specific public concerns	-generic guidelines point out that public concerns should be addressed in all EIA steps; indicates need for two-way information flow, issue discussion and clarification, consensus building and informing participants of results -generic guidelines point to the need to notify public of course of action, mitigation measures and follow-up programs to be implemented as well as results of any follow-up programs -generic guidelines highlight public involvement opportunities; notes participant funding program -project guidelines include detailed consultation and public information requirements -project guidelines require dissemination of monitoring results to the public and descriptions of how public and agencies to be involved in design and implementation of monitoring program; also provides for involvement of communities and renewable resource users -project guidelines include provisions for involvement in monitoring of socio-economic effects

Table 31 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Implementation	-generic guidelines refer to possible stipulation of terms and conditions and to suspending or revoking approval if terms and conditions violated -project guidelines refer to requirement to specify how controls to be enforced	-project guidelines make specific reference to regulatory compliance (legislation, regulations, guidelines, policies, specifications) to be adhered to during design and construction that will lead to environmental impact mitigation -project guidelines include requirement to detail any commitments made during public information / consultation	-generic requirements refer to a proposal (if approved) proceeding subject to any mitigation measures proposed in the EIA and any other regulatory requirements -generic guidelines include a requirement to list the main permits, licenses, approvals and other forms of authorization required for the undertaking, together with the names of the responsible authorities -project guidelines refer to complying with mitigation and monitoring recommendations in specific codes of practice -project guidelines require monitoring commitments concerning those environmental components for which impacts are predicted to occur	-project guidelines refer to adhering to legislation from all levels of government; requires discussion of relationship between project and legislation and policies from all government levels; includes requirement to provide a comprehensive list of all permits and regulatory approvals required -project guidelines require submission of environmental protection plan to government for approval prior to onset of project activities -project guidelines point out that details of compliance monitoring will be determined by terms and conditions of permits and certificates of approval -project guidelines indicate that parameters, frequency and duration of monitoring to be negotiated with regulatory authorities -project guidelines identify specific regulatory requirements by level of government and agency	-generic guidelines describe regulatory requirements -generic guidelines point out class screening report may include specific conditions under which a project would have to undergo more detailed review and the terms and conditions under which a project could proceed -generic guidelines describe roles and responsibilities of major participants in a screening or comprehensive study -generic guidelines refer to responsible authorities having the power to ensure implementation of mitigation measures (e.g., through conditional approvals, hold back provisions of funding arrangements, contractual arrangements, performance bond by proponent) -generic guidelines describe implementation role of panel review -generic guidelines point out that responsible authority not obliged to follow panel or mediator's recommendations for follow-up activities but must justify decision publicly -procedural guidelines detail legal requirements and agency responsibilities

Table 31 - Application of Guidelines Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Groups	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Overall Impact Management	-no specific references	-project guidelines require a description of existing regulatory environment (Federal, Provincial, Municipal); includes all permitting, licensing and regulatory requirements, appropriate guidelines, land use zoning and municipal planning strategies - by proposal phase -project guidelines make specific reference to assessing potential greenhouse gas emissions	-generic guidelines include a general commitment to sustainable development -project guidelines identify VECs; includes references to sulphur dioxide agreement, national air quality agreement and federal emission guidelines	-project guidelines require that all relevant regional and municipal plan policies and zoning be discussed; provides examples	-generic guidelines point to need to address sustainable use of renewable resources -project guidelines require an integrated monitoring program to verify environmental predictions before, during and after operation and decommissioning -project guidelines require information on institutional framework (e.g., laws, regulations, policies, adequacy of monitoring and enforcement systems, First Nations' involvement, historical government involvement, consultation and involvement, regional natural processes and ecosystems)

Table A-32 - Criteria - Proposal Evaluation - Refining Impact Management Activities

Activity	Criteria
Mitigation	• stresses importance of prevention, protection and restoration
	• suggests a broad range of mitigative measures (Bass and Herson 1993)
	• develops a mitigation plan (Moore 1985)
	• makes purpose of each mitigative measure clear and provides a rationale for each measure (Bass and Herson 1993)
	• provides specifics of mitigative measures and how work (Bass and Herson 1993)
	• considers mitigation for all significant adverse effects (Wood 1995)
	• indicates costs of mitigation (Malik 1995)
	• assesses impacts of mitigative measures (CEARC 1988)
	• includes different mitigation forms (e.g., statutory, accepted practice, negotiated) (Armour 1987)
	• provides clear commitments to mitigation (Wood 1995)
	• specifies who is responsible for each measure (Bass and Herson 1993)
	• provides schedule for implementation of mitigative measures (Bass and Herson 1993)
	• provides for mitigation banking, where appropriate (Kukoy and Canter 1995)
Compensation	• provides compensation where warranted
	• only provides compensation after adverse impacts minimized through mitigation and consideration of impact acceptability (Wlodarczyk 1990; Armour 1987; Portney 1985)
	• provides for impact-related compensation (Wlodarczck 1990; Armour 1987)
	• provides explicit criteria for compensation (Skaburski 1988)
	• provides for local benefits, where warranted, to redress unfair distribution of costs and benefits (Wlodarczck 1990)
	• provides, where practical, for in-kind compensation to offset impacts
	• provides, where appropriate, for host community agreement (Zeiss and Lefsrud 1995)
Monitoring and Post Auditing	• establishes clear monitoring objectives (Krawetz, MacDonald and Nichols 1987)
	• employs rigorous monitoring approach (e.g., hypothesis testing, experimental design to evaluate hypotheses) (Rose and Smith 1992; Krawetz, MacDonald and Nichols 1987; Duinker 1985)
	• provides for compliance or surveillance (source) monitoring (Smith 1993; Canter 1993)
	• provides for monitoring of predicted impacts (versus actual) (Winder and Allen 1975; Smith 1993; Canter 1993)
	• takes into consideration natural variability (e.g., use of statistical procedures) (Power, Power and Dixon 1995; Duinker 1985)
	• provides for monitoring of effectiveness of mitigative measures (Winder and Allen 1975; Johnston and McCartney 1991)
	• provides for monitoring of public concerns (Smith 1993)
	• provides for monitoring of social impacts (Armour 1988; Krawetz, MacDonald and Nichols 1987)
	• provides data in a form suitable to refute or support claims for damage compensation (Duinker 1985)
	• provides for early detection of undesirable change (Duinker 1985)
	• ensures monitoring addresses interrelationships among monitored variables (Krawetz, MacDonald and Nichols 1987)
	• addresses system-level impacts (e.g., ecosystem integrity) (Woodley 1996)
	• formulates and documents well defined overall monitoring program or systems (Beanlands and Duinker 1983; Canter 1993; Woodley 1996a)
	• focuses monitoring on areas where greatest potential impact, environment most vulnerable and where greatest uncertainty
	• specifies institutional arrangements for monitoring (e.g., working groups)
	• provides for peer review of monitoring program
	• provides clear monitoring commitments (Wood 1995)
	• introduces baseline (ambient) monitoring early in EIA process (Wood 1995; Canter 1993)
	• commences monitoring early in project implementation (Spaling, Smit and Kreutzwiser 1993)
	• specifies who is responsible for monitoring
	• provides for independent monitoring where warranted
	• provides specifics of monitoring measures and how will work
	• publishes analysis of monitoring results (Wood 1995)
	• assesses proposal performance against environmental objectives; as a means improving predictions and mitigative measures (Culhane 1993)
	• includes a range of perspectives in post auditing assessment (Serafin, Nelson and Butler 1992)

Table A-32 - Criteria - Proposal Evaluation - Refining Impact Management Activities

Activity	Criteria
Emergency Measures / Contingency	• specifies threshold levels for introduction of contingency measures • provides financial security for environmental liability (e.g., security and emergency response funds or insurance) (Armour 1987) • provides emergency response plan • ensures coordinated approach to emergency planning • provides for community notification for non-recurrent events • provides for liaison with government (especially local) officials for emergency planning • provides technical assistance and training as needed • makes contingency and emergency response responsibilities explicit
Consensus Building and Conflict Resolution	• ensures full stakeholder involvement (Campbell and Floyd 1996; Susskind and Madigan 1988; Kartez and Bowman 1993) • emphasizes consensus building (Sadler 1995) • focuses on key issues and choices (Susskind, Richardson and Hildebrand 1978) • provides dispute resolution measures (e.g., facilitation, mediation, arbitration) where warranted • provides for third party involvement as needed (Sadler 1993) • provides appeal mechanisms as needed
Public Involvement	• disseminates impact management information to community in readily understandable form • provides a range of measures for incorporating community concerns into impact management (Armour 1987) • involves public in determination of mitigative measures • involves public in determination of compensation measures • involves public in determining of monitoring measures • involves public in determining if and form of conflict resolution measures • involves public in review of monitoring results • involves public in emergency and contingency planning • provides mechanisms for on-going community involvement (e.g., community monitoring committees) (Armour 1987) • specifies forms of public involvement in impact management strategy formulation and implementation
Implementa-tion	• directly demonstrates satisfaction of regulatory requirements (Malik and Bartlett 1993) • details enforceable terms and conditions (Gibson 1993) • ensures impact management responsibilities match available resources and capabilities (Krawetz, MacDonald and Nichols 1987) • provides penalties for non-compliance (Leu, Williams and Bark 1996)
Environmental Management	• identifies overall impact management principles and policies (Wlodarczck 1990) • provides overall impact management strategy that integrates individual measures (Elliott 1984) • provides for peer review of impact management strategy • places proposal monitoring within context of area-wide monitoring programs • ensures monitoring outputs in a form suitable for integration within larger programs or strategies (e.g., integrated monitoring) (Hicks and Brydges 1994) • links impact management measures to general plans and policies (Johnston and Madison 1994) • links impact management measures to sustainability objectives and priorities • considers co-management opportunities • establishes links to broader state-of-environment reporting • places in context of past and current resource and environmental planning and management efforts (Serafin, Nelson and Butler 1992)

Table A-33 - Scaling Levels - Refining Impact Management Activities - Proposal Evaluation

Scaling Levels	A	B	C	D	E
Mitigation	-provides an overall mitigation strategy or plan -mitigation incorporated into alternatives analysis -mitigation considered for each significant impact -details of mitigation measures presented -clear rationale for each measure -considers alternative mitigation measures and impacts of mitigation -responsibilities for mitigation measures clearly specified	-addresses 5 or 6 of Level A criteria	-addresses 3 or 4 of Level A criteria	-addresses 1 or 2 of Level A criteria	-addresses none of Level A criteria
Compensation	-defines and consistently applies criteria for providing compensation -provides impact compensation -provides equity-related compensation -provides, where appropriate, for host community agreement	-addresses 3 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	-addresses none of Level A criteria
Monitoring and Post Auditing	-identifies monitoring objectives and a focused overall monitoring program -undertakes baseline monitoring -commits to compliance monitoring -commits to undertake effects monitoring -commits to monitor mitigation effectiveness -commits to distribute monitoring results to agencies and public -commits to undertake evaluation of EIA effectiveness	-addresses 5, 6 or 7 of Level A criteria	-addresses 3 or 4 of Level A criteria	-addresses 1 or 2 of Level A criteria	-addresses none of Level A criteria
Emergency Measures / Contingency	-commits to provide contingency measures -specifies thresholds for introduction of contingency measures -identifies emergency response measures -provides emergency response plan, including details of approach, notification, training and responsibilities	-addresses 3 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	-addresses none of Level A criteria
Consensus Building and Conflict Resolution	-identifies and addresses major issues and potential sources of conflict -undertakes public consultation in a manner that is conducive to consensus building and conflict resolution -makes use of conflict resolution measures as needed -provides appeal mechanism when conflict resolution measures applied	-addresses 3 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	-addresses none of Level A criteria
Public Involvement	-involves public in each impact management component -documents role of public in impact management -commits to involve public during post approval -details how public to be involved during post approval	-addresses 3 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	-addresses none of Level A criteria

Table A-33 - Scaling Levels - Refining Impact Management Activities - Proposal Evaluation

Scaling Levels	A	B	C	D	E
Implementation	-identifies all regulatory requirements and demonstrates compliance -formalizes regulatory commitments in enforceable terms and conditions -formalizes commitments to community in host community agreement -clearly specifies implementation responsibilities	-addresses 3 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	-addresses none of Level A criteria
Overall Impact Management	-provides overall impact management plan -provides monitoring in a form suitable for incorporation into area-wide monitoring -places impact management interpretations within the context of broader environmental issues, policies and programs -provides for peer review of impact management measures	-addresses 3 of Level A criteria	-addresses 2 of Level A criteria	-addresses 1 of Level A criteria	-addresses none of Level A criteria

Table A-34 - Application of Scaling Levels - Refining Impact Management Activities -Proposal Evaluation

Criteria	Steepbank	McArthur	OSB	Candle	East Prince	Churchill	Laidlaw	Strait	Military	Salmon
Mitigation	C	C	C	C	C	C	B	B	B	C
Compensation	C	C	E	C	D	D	A	C	D	E
Monitoring and Post Auditing	B	B	C	C	C	C	C	B	B	C
Emergency Measures / Contingency	C	B	C	E	B	C	C	B	B	C
Consensus Building and Conflict Resolution	C	C	E	D	D	D	B	D	C	D
Public Involvement	C	C	E	D	C	D	A	B	C	E
Implementation	D	D	D	C	C	D	A	B	D	B
Overall Impact Management	B	C	D	D	D	D	C	D	D	D

Scaling Levels A to E

Table A-35 - Application of Proposal Evaluation Criteria - Refining Impact Management Activities (Part I)

Criteria Group	Steeprock Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Mitigation	-committed to using dry landscape reclamation so traditional use of land can be restored on all leases -identifies specific mitigation measures to be undertaken for each type of impact -provides table summarizing mitigation /monitoring measures for each impact type -provides detailed description of conservation and reclamation measures -impact analysis reports detail mitigation measures for each impact type	-details decommissioning and reclamation plans -mitigation measures provided for each environmental component -provides separate analysis detailing mitigation measures for tailings management	-describes baseline health and safety analyses (e.g., worker exposure, illumination, dust control, other emissions control, noise abatement) -identifies specific mitigation and enhancement measures by impact type; includes documentation of commitments and responsibilities -identifies engineering design measures that mitigate potential environmental impacts	-describes specific mitigation measures (e.g., vegetation and wildlife impacts, collisions of migrating birds with power lines, heritage resources); summarizes potential impacts and mitigation measures for each using text and summary table -provides a detailed description of compliance with environmental protection (mitigation) guidelines (guideline by guideline) -identifies specific mitigation measures arising from migratory bird study	-describes specific measures to manage ground and surface water runoff and migration and to maintain ground and surface water quality -describes gas migration preventing, monitoring and management measures -describes measures to minimize infiltration and leachate impacts -describes measures to mitigate and minimize surface water, biological, socio-economic, land use and transportation impacts -mitigative measures proposed for any potentially significant impact; allows for uncertainty in impact predictions -describes waste types controls, waste delivery control, surface runoff control, leachate control and treatment and gas emissions controls

Table A-35 - Application of Proposal Evaluation Criteria - Refining Impact Management Activities (Part I)

Criteria Group	Sleeprock Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Compensation	-has a local purchasing plan and a program for developing business opportunities and maximizing employment and training opportunities with local aboriginal communities -has a policy to give preference to local suppliers and purchasers -reached an agreement with local trappers who will be displaced from their traplines -promotes aboriginal training and hiring and sponsors summer training program for aboriginal students -supports employee involvement in community and supports a variety of activities through corporate donations program	-details revenues and monetary benefits to Government of Saskatchewan, Canada and northern Saskatchewan -identifies measures to maximize local and regional employment and benefits -reached agreement in principle with local communities; addresses environmental protection compensation / indemnification, jobs training and business and benefit sharing; with benefits sharing to identify benefits that community can agree on and that focus on training, infrastructure and cultural and social services / funds -financed safety related road improvements -participation in multi-party training plan -undertakes community support program (e.g., education support, stay-in-school programs, scholarships, promotion of science education) -provides for compensation for and remedy any environmental problems directly attributable to emissions, including accidents and upsets	-no specific references	-describes compensation for crop or land damage in accordance with terms of easements (construction or operations); part of a comprehensive landowner compensation package -provides detailed description of principles for the determination of compensation for power line easements; includes calculation formulae -indicates will seek to encourage contractors to hire local people	-provides a general discussion of compensation in the event of significant impacts (e.g., ground water use); compensation could be by financial / material restitution or remedial action -no compensation anticipated for community in which landfill to be developed

Table A-35 - Application of Proposal Evaluation Criteria - Refining Impact Management Activities (Part I)

Criteria Group	Steeprock Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Monitoring and Post Auditing	-identifies specific monitoring measures to undertake -identifies water, ground water and air sampling parameters, frequency and locations -describes other forms of monitoring (e.g., landform security, river levels, wetland systems, occupational health and safety, bio-monitoring) -presents an overview of environmental monitoring for each type of impact; baseline and impact ; includes both confirmatory studies and long term monitoring -provides table summarizing mitigation /monitoring measures for each impact type -impact analysis reports detail baseline monitoring undertaken and list areas where further environmental monitoring to be undertaken -describes source, ambient and receptor effects monitoring -describes baselines studies and surveys undertaken; detailed in over 20 technical reports -includes baseline, compliance and environmental monitoring -describes bio-monitoring program -details reclamation performance assessment and monitoring program (goals, specific guidelines and criteria, techniques); includes pilot testing and large-scale demonstrations	-describes baseline monitoring for each impact type; also describes regional baseline studies; details provided in status of the environment report (reviews baseline conditions, operational monitoring and links baseline conditions to monitoring data as a basis for recommended modifications) -undertakes employment monitoring (e.g., northern and aboriginal employment, affirmative action) -describes surface and ground water quality monitoring and revegetation -includes operational (source) monitoring -includes water quality, air quality, radiation, ground water, aquatic (biological effects) and worker health monitoring; identifies sample location, parameters and frequency -includes quality assurance / quality control programs to ensure quality of monitoring data reflects real conditions (includes copy of quality assurance / quality control manual) -provides details of workplace radiation monitoring program -provides separate analysis detailing monitoring measures and program for tailings management -monitoring data provided	-describes baseline health and safety analyses (e.g., worker exposure, illumination, dust control, other emissions control, noise abatement) undertaken at existing plant) -describes baseline environmental monitoring analyses (e.g., ground water, stream flow, water quality, meteorology); with the exception of groundwater relies on existing available data; provides data -detailed monitoring proposals to confirm predictions, evaluate effectiveness of environmental protection and mitigation measures, meet regulatory requirements and evaluate effective of corrective actions; can also be used to assess future emergency impacts and decommissioning plans -includes ambient air monitoring, stack testing, groundwater monitoring wells and health and safety monitoring -describes parameters, location, duration, frequency, methodology, sampling and analysis -describes preventative maintenance and plant inspections	-describes construction inspection procedures to ensure compliance with design, impacts minimized, mitigation undertaken as required and safety standards maintained -describes operational inspections and maintenance procedures -describes baseline surveys; includes migratory bird surveys and a groundwater study -construction to be inspected by an environmental monitor; includes provision for post-construction surveillance	-describes procedures for monitoring and enforcing truck movements -describes gas migration prevention, monitoring and management measures -describes leachate monitoring and management program -describes ground and surface water sampling procedures; also describes electro fishing spot checks and benthic invertebrate density and diversity data sampling -describes procedures for record keeping for complaints -provides for both compliance monitoring (ground water, surface water) and environmental effects monitoring (surface water - sediment, leachate, benthic invertebrates and aquatic resources, socio-economic impacts); identifies parameters, timing and location -describes environmental monitoring stations (water, gases) -describes post closure and maintenance plan and inspection reports

Table A-35 - Application of Proposal Evaluation Criteria - Refining Impact Management Activities (Part I)

Criteria Group	Steeprock Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Emergency Measures / Contingency	-describes emergency response preparedness including in-house emergency response team, mutual aid agreement and oil spill preparedness	-describes environmental and safety policy; includes emergency response, workplace environmental monitoring and medical surveillance -describes emergency types and related contingency plans; includes training, equipment and lines of responsibility -includes letter of credit and financial assurances for decommissioning and reclamation -provides basic radiation training program and emergency response contingency plan -provides separate analysis detailing contingency plans, safety programs and emergency planning related to tailings management	-describes emergency response training and procedures (attaches draft emergency response manual) -describes fire protection system and spill containment procedures	-no specific references	-describes gas migration prevention, monitoring and management measures -includes general commitment to undertake the appropriate remedial action should monitoring program identify potential for impact -describes hazardous waste handling procedures; includes emergency response procedures -describes applicable federal, provincial and municipal legislation and requirements -indicates the need for funding for closure and post closure care -describes emergency response planning -plan and guidelines
Consensus Building / Conflict Resolution	-provides general commitment to work with local community organizations to minimize potential impacts	-agreements with community appear to have been reached with direct discussions	-no specific references	-focuses on major issues and sources of conflict	-focuses on major issues and sources of conflict
Public Involvement	-signed public consultation memorandum of understanding with certain prime interested communities -undertook broad ranging public consultation program during EIA planning process; included financial support for environmental director staff position for First Nation community -provides general commitment to continue public consultation through review process, mine construction and operation -lists several issue areas where will work with various groups -indicates that future land users will participate in reclamation development -commits to continue to meet regularly with municipal and agency officials and representatives	-undertook extensive public and First Nation consultation program; included a community-based research program) -includes commitment to communicate and discuss monitoring results with local communities provides for environmental quality committees for each impact area -includes employee consultation; focus groups and surveys	-public consultation undertaken in EIA preparation; no reference to post approval consultation	-broad ranging public consultation program undertaken; no specific reference to post approval public involvement except with reference to landowner compensation -describes specific mitigation measures undertaken in response to public concerns	-provides for the establishment of an advisory committee to monitor site operations; includes provision for local citizen representation

Table A-35 - Application of Proposal Evaluation Criteria - Refining Impact Management Activities (Part I)

Criteria Group	Steeprock Mine Project	McArthur River Project	OSB Plant	Condie-Queen Elizabeth	East Prince
Implementation	-provides a detailed approvals guide; refers to applicable legislation, project applications and associated applications; includes table cross referencing to EIA reports	-describes regulatory framework -contingency plans are filed with government review agencies and updated as necessary -environmental monitoring subject to corporate audits and review by government inspectors -lists permits that currently address monitoring requirements; identifies proposed changes	-points out that forest management agreement will not be signed until the forest management plan EIA has received approval -specifies approval requirements (e.g., for waste disposal)	-identifies approval requirements; includes easement requirements -includes commitments to implement specific mitigation procedures -includes commitments to restore to same conditions as prior to entry in the event of decommissioning	-identifies regulatory requirements -indicates that post closure monitoring and maintenance will be defined by regulatory authorities as part of decommissioning process
Environmental Management	-places within context of corporate environmental protection policy and program -describes environmental management systems (organizational effectiveness, strategic planning, community consultation, employee awareness and training, auditing, monitoring and impact assessment, emergency preparedness) -addresses link to land use plan for integrated resource plan for area and to regional land use planning -provides general commitment to work with standing committee to minimize cumulative effects of industrial development -includes commitment to voluntary climate challenge and to energy efficiency improvements	-First Nations in process of co-management discussions with Provincial government for resource uses -provides a regional baseline analysis; includes ecosystem analysis and addresses sensitivity and vulnerability -assesses cumulative effects	-places within the context of a twenty year forest management plan also subject to an EIA	-places within the context of systems level planning, Saskatchewan Energy Strategy and environmental protection guidelines	-places within the context of an integrated waste management strategy and a waste watch pilot project

Table A-36 - Application of Proposal Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Mitigation	-identifies design modifications to prevent and minimize impacts -identifies how construction procedures reduce potential impacts -describes development schedule as a form of mitigation -describes general environmental protection measures -commits to preparation of a detailed site specific environmental protection plan -identifies specific mitigation measures for each impact type	-incorporates mitigation measures into alternatives analyses (net effects analysis) -incorporates mitigation into facility design, operations, closure and post closure -addresses mitigation potential for each potential impact; distinctions drawn - enhances benefit, readily mitigable, serious impacts associated with mitigation, partially mitigable, mitigation not warranted, partially mitigable -can specify extent, partially mitigable - cannot specify extent, not mitigable) -lists specific mitigation measure for each specific impact, where mitigation warranted and practical -identifies mitigation responsibilities for each mitigation measure -interprets net effect significance -consolidates mitigation measures within impact management strategy	-environmental management plan to outline the proposed environmental management activities and protection measures to be implemented through the life of the project -the ICE committee addressed the issue of ice-out delay -describes how design and operations prevent and reduce impact and impact potential -analysis of individual impacts includes measures to prevent and minimize potential impacts -describes standard environmental protection procedures for various project activities -highlights content of stage specific environmental protection plans -summarizes mitigation measures for each impact type (text and tables) -both design and protection procedures for staging areas, construction, operations and accidental event	-identifies how design and operations prevents and reduces many types of impacts -describes mitigation program; includes mitigation principles -commits to early implementation of mitigation -recognizes the long lead times needed for infrastructure and social service mitigation -describes general implementation of impact mitigation procedures (e.g., avoidance, site and area selection, problem-solving and conflict resolution, public information) -describes avoidance mitigation measures (e.g., notification, use and updating of GIS data base, improvements to avoidance practices - by resource use and resource type, implementation of measures) -describes how impacts to be reduced through site and area selection (e.g., siting criteria) -describes scope and content of environmental protection plan (objectives, environmental construction procedures, operational procedures, contingency plan, environmental inspections, education and training) -describes specific measures to implement to avoid and reduce biophysical and socio-economic impacts (by type of impact and environmental component) in text and tabular form	-describes how design and operations prevent and reduces impacts -identifies and describes specific mitigative measures for different impact types (land, freshwater, marine environment) for construction and operations -environmental protection plan (EPP) to include site specific protection procedures to address routine concerns and contingency plans to address accidental events -EPP to identify measures to mitigate potential impacts on terrain, vegetation, wildlife and freshwater and marine habitat and resources; also to address scheduling to avoid conflict with commercial fishing

Table A-36 - Application of Proposal Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Compensation	-commits to provide compensation to registered trapline holders for fur harvest losses resulting from construction	-provides damage claims resolution plan, property value protection plan, special compensation plan, community fund (per tonne contribution to facility neighbours), fund for municipality (per tonne contribution), reimbursement to municipality for extraordinary expenses and reimbursement to facility neighbours of waterline hook-up; all within a Good Neighbour Program	-describes how will seek to maximize local employment and procurement -includes a draft regional benefits implementation plan (procurement, technology, local engineering, labour) - a $10 million fisheries compensation fund established for construction period; to be overseen by fisheries liaison committee -comprehensive work force adjustment plan to be undertaken for ferry workers -a socioeconomic committee has been established to monitor socioeconomic issues , to address compensation issues and to ensure implementation of regional benefits implementation plan	-will seek to purchase and hire locally -compensation for loss, damage or injury from consolidated revenue fund -describes additional local training procedures -describes additional measures to address socio-economic impacts (e.g., hiring of social workers, making recreational facilities available to civilian use, cooperation in noise zoning restrictions, funding for a planner, joint fire protection arrangements)	-no specific reference

Table A-36 - Application of Proposal Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Monitoring and Post Auditing	-describes routine inspection procedures; indicates that will adhere to environmental guidelines for transmission line maintenance -commits to measure and predict electric and magnetic field (EMF) levels, conduct own EMF research and monitor world-wide scientific studies on subject -provides for an environmental inspector	-describes baseline monitoring - groundwater, surface water, air, odours, noise, dust, biomonitoring, property values -details provided of source monitoring - routine monitoring and testing procedures and environmental compliance monitoring; includes details of sites, media sampled and parameters -describes waste testing procedures and cap compaction testing -describes contents of environmental liability management program manual and scope of corporate internal audit program, corrective action review and facility inspection program -describes environmental effects monitoring - leachate management, surface water management, ground water management, routine emissions, dust control, noise control, odour detection and bio-monitoring -peer review undertaken of ground water and risk analyses; ground water analysis peer review addressed impact predictions and monitoring program -details of monitoring provided in individual disciplinary analyses (objectives, methods, parameters, frequency, location)	-provides for environmental inspector staff under the supervision of an environmental manager; details responsibilities -describes reporting procedures (environmental compliance reports, environmental summary report, annual project report, technical reports, accidental event and non-compliance reports and environmental inspection reports) - indicates frequency, duration, format and distribution for each -comprehensive work force adjustment plan to be undertaken for ferry workers -a socioeconomic committee has been established to monitor socioeconomic issues , to address compensation issues and to ensure implementation of regional benefits implementation plan -to undertake environmental compliance and effects monitoring -compliance monitoring to include regulatory surveillance and self regulatory monitoring; self regulatory to monitor environmentally sensitive activities against external requirements and standards and internal commitments; also includes coordination, advice and assistance -environmental effects monitoring to include terrestrial program, birds and bird migration, marshes, groundwater, ice climate, oceanography, marine species, fisheries, socio-economic effects and regional benefits; provides overview of timing, parameters and locations	-describes environmental inspection responsibilities and programs for construction and operational activities; includes the preparation of compliance reports -describes objectives of monitoring program (e.g., baseline data, impact prediction verification, impact identification, evaluation and mitigation, assessment of cumulative effects, assessment of mitigative measure effectiveness) -presents monitoring program framework (screening, scoping and conceptualization, detailed planning and design, implementation, project enhancement) -includes environmental compliance and environmental effects monitoring -describes monitoring approach for biophysical impacts (e.g., focus on VECs and cause-effect relationships, scientific validity, economic, appropriate for before and after comparisons, integration with socio-economic and public health) -describes socio-economic and public health monitoring approach (e.g., timely, suitable for decision-making, adequate resources, closely linked to impacts and priorities, coordinated) -provides selective examples of monitoring components	-details baseline oceanographic component study (e.g., parameters, sampling procedures, modelling, assumptions) -describes the EPP -includes both compliance and effects monitoring -compliance monitoring includes adherence to appropriate permits, approvals and authorizations -effects monitoring baseline survey and further survey following first year of full operation -describes parameters, methods, sampling procedures, locations and timing for oceanographic component study and SCUBA surveys; provides bacteriological water analysis and chemical analysis of wastewater

Table A-36 - Application of Proposal Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Emergency Measures / Contingency	-commits to mitigate potential electronic interference from electric and magnetic fields and to adhere to limits set by Canadian Standards Association -addresses safety with commitment to adhere to corporate safety procedures -describes contingency measures in the event of a spill; includes involvement of the on-site emergency response coordinator	-identifies risks, impacts and mitigation measures for on and off-site upset events (e.g., transportation spill overland, transportation spill into creek, chemical reaction on-site, landfill fire on-site) -provides description of occupational health and safety program and of emergency response procedures -describes closure and post closure surface and ground water contingency plans	-describes how design and operations minimizes potential for accidental events (e.g., progressive collapse) -describes contingency and emergency response procedures in environmental protection plans; includes training procedures, equipment and responsibilities -analysis of individual impacts includes the identification of measures to prevent and minimize accidental effects and the consequences of accidental events -describes risks of construction accidents and contingency measures -describes environmental orientation awareness and education program -identifies a range of potential accidental events; addresses how impacts of each on various environmental components to be minimized or prevented through design and protection procedures	-describes measures taken to minimize public safety risks (e.g., air traffic controls, noise mitigation, disaster response, public health) -describes emergency response procedures -describes procedures for managing hazardous waste -describes contingency plan for construction and operations (e.g., duties, responsibilities, communications links, emergency event activities, notification); addresses fires and spills) -describes accidental events (e.g., aircraft accidents, weapons and flares, fuel and hazardous materials spills) and addresses biophysical and socio-economic impacts and mitigation and contingency measures	-identifies unplanned events (power failures, iceberg scouring) and associated contingency measures -EPP includes contingency plans to address accidental events; will address such unplanned events as fuel and hazardous material spills on land and in the marine environment, wildlife encounters, heritage resource discovery and fires; will include a preliminary list of key contact persons
Consensus Building / Conflict Resolution	--focuses on major issues and sources of conflict	-facilitator was used to reach agreement with facility neighbours concerning details of Good Neighbour Program -focuses on issues and sources of conflict -open process conducive to consensus building	-focuses on major issues and sources of conflict	-describes mitigation problem-solving and conflict resolution procedures (e.g., citizen complaints, legal recourse, crown liability, claims orders) -describes issues resolution procedures related to monitoring (e.g., through dialogue and negotiation with groups and through committees)	-focuses on major issues and sources of conflict

Table A-36 - Application of Proposal Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Public Involvement	-describes public consultation program as part of EIA process; identifies issues raised and provides responses; no specific reference to post approval period except through site specific environmental management plan	-provide for on-going community involvement through a community liaison / advisory committee and through a complaints procedure -review process of draft and final documents allowed for public input into proposed impact management measures -public involved in impact management; role documented	-extensive public involvement over a series of reports; includes compliance and effects monitoring and safety issues -has established socioeconomic and fisheries liaison committees and will strike a ferry workers committee to address compensation issues -comprehensive work force adjustment plan to be undertaken for ferry workers -a socioeconomic committee has been established to monitor socioeconomic issues , to address compensation issues and to ensure implementation of regional benefits implementation plan -agencies and stakeholders involved in establishment of terms of reference for committees to supervise monitoring; also to be involved in document review	-describes mechanisms for dealing with complaints -commits to public and agency involvement in mitigation program -describes program to be implemented for consultation with communities to discuss practices, conditions and issues; includes local liaison committee, orientation sessions, public notification , information office (during construction) and newspaper column and other media -to provide toll-free phone-in system, advisory group, media announcements and contacts to aircraft companies, outfitters and government agencies -to establish local contact persons in resource communities -describes monitoring program process (stakeholder consultation, agency and group coordination, monitoring steering committee)	-describes issues raised at public meeting; no reference to post approval involvement
Implementation	-identifies regulatory requirements and guidelines (e.g., for stream crossings, forestry practices, fish resource protection) -points out permitting requirements (e.g., for clearing, for wood disposal)	-addresses implementation through draft terms and conditions -includes current provisional certificate of approval -identifies regulatory requirements -commitment formalized in host community agreement -identifies implementation responsibilities	-identifies regulatory approval requirements (e.g., laws, regulations, permits, authorizations, guidelines, standards) -describes environmental protection plans (field-useable documents) to implement environmental measures or procedures -describes administrative boundaries (mandates, resources) -environmental protection plans to be incorporated into contract documents	-describes organizational structure for impact mitigation -identifies all agencies potentially involved in impact management -describes implementation responsibilities for monitoring	-identifies regulatory requirements (permits, approvals, authorizations) -describes how EPP will ensure regulatory compliance during construction and operations; ensures site personnel aware of implement environmental requirements -EPP identifies policies, responsibilities, site-specific protection procedures, guideline references, required approvals and a contact list for permits, approvals, authorizations and key personnel -EPP to be submitted for government review prior to implementation

Table A-36 - Application of Proposal Evaluation Criteria - Refining Impact Management Activities (Part II)

Criteria Group	Churchill - Spaceport	Laidlaw Landfill	Strait Crossing	Military Flying	Salmon Cove
Environmental Management	-places in context of related developments and studies -commitment to conform to Manitoba Hydro's Environmental Protection Plan	-includes overall impact management strategy; includes guiding principles, proposed mitigation measures, good neighbour program and proposed terms and conditions -air quality monitoring linked into regional air quality monitoring; ground water, surface and bio-monitoring placed within a regional context	-places within the context of previous studies -addresses cumulative effects	-places in context of historical military activities, previous studies and land claims agreements and other projects	-places in context of previous studies, existing system and anticipated population growth

APPENDIX B

Copyright Permissions

Impact Assessment
Department of Resource Development
Michigan State University
East Lansing MI 48824-1222, USA

Daniel A. Bronstein, Nancy Gendell, Editors
Telephone: 517/432-1277
Fax: 517/353-8994
E-mail: impacts@pilot.msu.edu

1 March 1997

David Lawrence
Lawrence Environmental
PO Station A, Box 3475
Langley, B.C. V3A 4R8 CANADA

Dear Mr. Lawrence:

As I told you in our telephone conversation yesterday, section A of *transfer of copyright agreement* for articles published in *Impact Assessment* provides that authors have "the right to use, free of charge, all or part of this article in their own future works." Consequently, you may, of course, use any part of "EIA—do we know where we are going?" in your dissertation.

I have enclosed a clean copy of the copyright agreement with this letter for your files. And the very best of luck with your dissertation and defense.

If you need any further documentation, let me know. My phone number is 517-351-1459 and my email address is <gendell@pilot.msu.edu>.

Sincerely yours,

Nancy Gendell

Nancy Gendell, editor

CANADIAN INSTITUTE OF PLANNERS

INSTITUT CANADIEN DES URBANISTES

October 21, 1996

Mr. David Lawrence MCIP
P.O. Box 3475, Station A
Langley BC V3A 4R8

Fax: (604) 534-9889

Dear Mr. Lawrence:

As per our telephone conversation, I am pleased to grant you permission to use, in whole or in part, the following articles:

- "Planning and Environmental Assessment: Never the Twain Shall Meet?", by David P. Lawrence, published in the July 1992 issue of *Plan Canada* (vol. 32 #4)
- "The Characteristics and Aims of Environmental Impact Assessment", by David P. Lawrence, published in the March 1994 issue of *Plan Canada* (vol. 34 #2)

If possible, please give credit to the publisher (Canadian Institute of Planners), and the magazine (*Plan Canada*), mentioning the volume and issue number.

Please feel free to call us if you require the use of other Plan Canada articles.

Sincerely,

Denise Lind

Denise Lind
Administrative Assistant

:dl

541 Sussex Drive, 2nd Floor, Ottawa K1N 6Z6 Canada • Telephone (613) 562-4646 • 1-800-207-2138 • Fax (613) 562-4648
541, prom. Sussex, 2e étage, Ottawa K1N 6Z6 Canada • Téléphone (613) 562-4646 • 1-800-207-2138 • Télécopieur (613) 562-4648
general@cip-icu.ca • http://www.cip-icu.ca

CARFAX PUBLISHING COMPANY
PO BOX 25 ABINGDON OXFORDSHIRE OX14 3UE UK
Telephone : +44 (0)1235 401000 Fax : +44 (0)1235 401550

Facsimile

To: D Lawrence
Lawrence Environmental
PO Station A, Box 3475
Langley, BC
Canada V3A 4R8

Fax: 00 1 604 534 9889

From: Margaret Hutchinson
Permissions Department
Carfax Publishing Company

Date: 24 October 1996

No. pages inc. this: 1

Dear Mr Lawrence

Thank you for your fax of 21 October with your permission request to reproduce previously published material from one of our journals as follows:

"Approaches and Methods of Siting Locally Unwanted Waste Facilities" *Journal of Environmental Planning and Management* Volume 39 No.2 June 1996

As you are the author of the article that you wish to use, there will be no charge for the reproduction rights in this instance, provided that you acknowledge the publisher, giving our full address, and the source of the original publication.

We are grateful for your courtesy in seeking our permission before proceeding.

Yours sincerely

Margaret Hutchinson

Margaret Hutchinson (Mrs)
Permissions Department

Springer

Springer-Verlag
New York, Inc.
175 Fifth Avenue
New York, NY 10010-7858

October 29. 1996

D. Lawrence
LAWRENCE ENVIRONMENTAL
P.O. Station A Box 3475
Langley, B.C. Canada V3A 4R8

Dear D. Lawrence:

Environmental Management (forthcoming)

PERMISSION is granted for *one time use, in the English language only* and in the manner as specified in your request of October 21, 1996 for use of material from an article you wrote for a forthcoming issue of the above Springer-Verlag journal. This material will be used in your doctoral dissertation for submission to the University of Waterloo.

This grant does not extend to use in any medium other than that specifically requested. It does not enable additional use of said material in a data base, video-disk, or other electronic storage or reproduction system with the exception of a University Microfilms edition.

Full citation must be made with full bibliographic reference as appropriate to the scholarly style of the printed work.

This permission does not extend to any copyrighted material from other sources which may be incorporated in the Work.

If you have any questions, please feel free to call me at 212-460-1506.

Good luck!

Sincerely,

Sabrina R. Paris
Rights & Permissions

Telephone: (212) 460-1500 • Telex: 232 235 SPB UR • Fax: (212) 473-6272

C O V E R S H E E T

FAX

To: David P. Lawrence
Fax #: 604 534 9889
Subject: Copyright release
Date: November 14, 1996
Pages: 1, including this cover sheet.

This note confirms our phone conversation. You are granted permission to use part/all of your article "Cumulative Effects Assessment ... " which was published in Vol 12 #3 (Fall 1994) of *Impact Assessment* in your dissertation. IAIA releases its copyright for this purpose.

IAIA's mission is to disseminate quality information on impact assessment; republishing this material is in keeping with our mission.

Thank you for checking on IAIA's rights and privileges, and best wishes in completing your degree. If you need anything further, please do not hesitate to call.

(There is still time to submit an abstract for IAIA '97! Hope to see you in New Orleans.)

Rita R. Hamm

From the desk of...

Rita R. Hamm
Executive Director
International Association for Impact Assessment
PO Box 5256, Hastings Hall, NDSU
Fargo, ND 58105-5256, USA

+1 701 231 1006
Fax: +1 701 231 1007
<E-mail>

11-14-1996 12:03PM FROM NDSU-IBID/IAIA +01 701 231 1007 P.1

P55
10/29

LAWRENCE ENVIRONMENTAL

COURIER ADDRESS:
8043 - 240 STREET
LANGLEY, B.C. V3A 4R8
TEL: (604) 532-9889

MAILING ADDRESS:
P.O. STATION "A", BOX 3478
LANGLEY, B.C. V3A 4R8
FAX: (604) 534-9889

22 October 1996

Mr. John Steinkamp
Permissions Department
Elsevier Scientic
675 Avenue of the Americas
New York, New York, USA
10010-5107

Dear Mr. Steinkamp,

Copyright Permission - Impact Assessment Vol. 13 (1) 1993: pp. 3-12

I would like to use passages of an article I wrote in The Environmental Impact Assessment Review (Quantitative versus Qualitative Evaluation: A False Dichotomy - Volume 13, # 1) in my doctoral dissertation. However, under the thesis regulations at the University of Waterloo, Ontario, Canada, I require written permission from the copyright holder. Could you please fax me the written permission to 1-604-534-9889 or send it to the above postal address. If there are any difficulties please call me at 1-604-532-9889.

Yours Truly,

David Lawrence

Permission granted contingent upon: written consent of the author, user's verification that there is no statement in the article that the material was originally reproduced from another source; and the use of the following credit line: "Reprinted by permission of the publisher from (title and author), name of journal, Vol. No., pp. Copyright 1993 by Elsevier Science Inc." Elsevier Science Inc. 655 Ave. of the Americas, New York, NY 10010

11-8-96
Date

J. Steinkamp
Rights and Permissions

LAWRENCE ENVIRONMENTAL

COURIER ADDRESS:
6043 - 240 STREET
LANGLEY, B.C. V3A [illegible]
TEL: (604) 53[illegible]

MAILING ADDRESS:
P.O. STATION "A", BOX 3478
LANGLEY, B.C. V3A [illegible]
FAX: (604) 534-[illegible]

22 October 1996

Dr. John H. Perkins
Lab 1, Evergreen State College
2700 Evergreen Parkway NW
Olympia, Washington (98-505) USA

Dear Dr. Perkins,

Copyright Permission - Impact Assessment

I would like to use passages of an article I wrote in The Environmental Professional (Designing and Adapting the EIA Planning Process, Vol. 16, No. 1, March 1994) in my doctoral dissertation. However, under the thesis regulations at the University of Waterloo, Ontario, Canada, I require written permission from the copyright holder. Could you please fax me the written permission to 1-604-534-9889 or send it to the above postal address. If there are any difficulties please call me at 1-604-532-9889.

FAX =

Yours Truly,

David Lawrence

Permission granted to use article in doctoral dissertation.
(re: Lawrence, David P., Designing and adapting the EIA planning process, The Environmental Professional 16(1)(March 1994): 2-21.)

John H Perkins
Editor-in-Chief
The Environmental Professional
14 November 1996

REFERENCES

References

Ackoff, R.L. 1970. *A Concept of Corporate Planning.* New York: Wiley.

________. 1974. *Redesigning the Future.* New York: John Wiley and Sons.

Acres International Limited. 1986. *Funding of Environmental Impact Assessment Research in Canada.* Hull, Quebec: Canadian Environmental Assessment Research Council.

Aggens, L. 1983. Identifying different levels of public interest. In *Public Involvement Techniques: A Reader of Ten Years Experience at the Institute for Water Resources.* 193-199. Virginia: US Army Corps of Engineers.

Agger, S.G. 1979. *Urban Self Management.* White Plains, New York: M.E. Sharpe Inc.

Alberti, M. and J.D. Parker. 1991. Indices of environmental quality - the search for credible measures. *Environmental Impact Assessment Review.* 11.1. 95-101.

Albrecht, S.L. 1995. Equity and justice in environmental decision-making: a proposed research agenda. *Society and Natural Resources.* 8.1. 67-72.

Alexander, C. 1964. *Notes on the Synthesis of Form.* Cambridge, Massachusetts: Harvard University Press.

________, N. Neis, A. Anninou, and I. King. 1987. *A New Theory of Urban Design.* New York: Oxford University Press.

Alexander, E.R. and A. Faludi. 1989. Planning and plan implementation: notes on evaluation criteria. *Environment and Planning B: Planning and Design.* 16.1. 127-140.

Alexander, E.R. 1984. After rationality, what? *Journal of the American Planning Association.* 50.1. 62-69.

__________ 1985. From idea to action. *Administration and Society.* 16.4. 403-426.

__________, 1986. *Approaches to Planning.* New York: Gordon and Breach Science.

__________, 1992. A transaction theory of planning. *Journal of the American Planning Association.* 58. 190-200.

________, 1993. Inter-organizational coordination: theory and practice. *Journal of Planning Literature.* 7.4. 328-343.

_________, 1994. The non-Euclidian model of planning. *Journal of the American Planning Association.* 60.3. 372-379.

Allison, G.T. 1971. *Essence of Decision.* Boston: Little, Brown and Company.

Allison, R.C. 1988. Some perspectives on environmental auditing. *The Environmental Professional.* 10.1. 185-188.

Amy, D.J. 1990. Decision techniques for environmental policy: a critique. In *Managing Leviathan.* eds.

R. Paehlke and D. Torgerson, 59-80. Peterborough, Ontario: Broadview Press.

Altshuler, A.A. 1965. *The City Planning Process: A Political Process*. Ithaca, NY: Cornell University Press.

Alterman, R. and J. E. Page. 1973. The ubiquity of values and the planning process. *Plan Canada*. 13.1. 13-26.

Amir, S. 1990. Evaluation of environmental impacts of large scale physical development in central Galilee: role of experts and policy makers. *Environmental Management*. 14.6. 823-832.

Amy, D. J. 1990. Decision techniques for environmental policy. eds. R. Paehlke and D. Torgerson. *Managing Leviathan*. Peterborough, Ontario: Broadview Press.

Anderson, R.F. and M.R. Greenberg. 1982. Hazardous waste facility siting. *Journal of the American Planning Association*. 48. 2. 204-218.

Appelbaum, R.P. 1978. Planning as technique: some consequences of the rational-comprehensive model. In *The Structural Crisis of the 1970's and Beyond: The Need for a New Planning Theory*. eds. H. A. Goldstein and S.A. Rosenberry. 212-241. Virginia: Virginia Polytechnic Institute and State University.

Appiah-Opuku, S. 1994. Theoretical orientations of environmental assessment in Canada. *Environments*. 22.3. 103-110.

Argyris, C. and D.A. Schon. 1978. *Organizational Learning: A Theory of Action Perspective*. Reading, Massachusetts: Addison-Wesley Publishing Company.

Armitage, D. 1995. An integrated methodological framework for sustainable environmental planning and management. *Environmental Management*. 19.4. 469-479.

Armour, A. 1986. Issue management in resource planning. In *Integrated Approaches to Resource Planning and Management*. ed. R. Lang. 51-66. Calgary: University of Calgary Press.

_________. 1987. *Socially Responsible Impact Management - A Discussion Paper*. (unpublished) Toronto: Faculty of Environmental Studies, York University.

_____________. 1988. Methodological problems in social impact monitoring. *Environmental Impact Assessment Review*. 8.3. 249-265.

_______________, 1990. Integrating impact assessment in the planning process: from rhetoric to reality? *Impact Assessment*. 8:1-2.3-15.

________, March 1992. The co-operative process: facility siting the democratic way. *Plan Canada*.29-35.

Armour, A. and B. Sadler. 1990. Synopsis of workshop discussions. In *The Place of Negotiation in Environmental Assessment*. 69-72. Hull, Quebec: Canadian Environmental Assessment Research Council.

Arnstein, S.R. 1969. A ladder of citizen participation. *Journal of the American Institute of Planners*. 35.3. 216-224.

Arquiaga, M.C., LW Canter and D.I. Nelson. 1992. Risk assessment principles in environmental impact studies. *The*

Environmental Professional. 14.3. 204-219.

_________________________________. 1994. Integration of health impact considerations in environmental impact studies. *Impact Assessment.* 12.2. 175-198.

Babbie, E. 1995. *The Practice of Social Research.* Belmont, California: Wadsworth Publishing Company.

Baier, K. and N. Rescher. eds. 1969. *Values and the Future.* New York: The Free Press.

Balaban, V. 1994. Introduction to the special issue - environmental decision making in central and eastern Europe. *Environmental Impact Assessment Review.* 14.2/3. 75-79.

Bardwell, L.V. 1991. Problem-framing: a perspective on environmental problem-solving. *Environmental Management.* 15.5. 603-612.

Baldwin, J.H. 1985. *Environmental Planning and Management.* Boulder, Colorado: Westview Press.

Barbier, E. B. 1987. The concept of sustainable economic development. *Environmental Conservation* 14.2. 101-110.

Barnes, J. and D. Westworth. 1994. A methodological framework for cumulative effects assessment. In *Cumulative Effects Assessment in Canada: From Concept to Practice.* ed. A.J. Kennedy. 67-80. Calgary, Alberta: Alberta Society for Professional Biologists.

Barnett, J. 1986. *The Elusive City.* New York: Harper and Row.

Bartlett, R.V. 1986. Ecological rationality - reason and environmental policy. *Environmental Ethics.* 8. 3. 221-239.

_____________, 1990. Ecological reason in administrative environmental impact assessment and administrative theory. In *Managing Leviathan.* Eds. R. Paehlke and D. Torgerson, 81-96. Peterborough, Ontario: Broadview Press.

Bass, R.E. and Herson, A.I. 1991. *The California Environmental Quality Act: A Step-by-Step Approach.* Sacramento: Jones and Stokes Associates.

__________________, 1993. *Mastering NEPA: A Step-by-Step Approach.* Point Arena, California: Solano Press Books.

Baskerville, G. 1986. Some scientific issues in cumulative environmental impact assessment. In *Cumulative Environmental Effects: A Binational Perspective.* 9-21. The Canadian Environmental Assessment Research (CEARC), Ottawa, Ontario and U.S. National Research Council (NRC), Washington, D.C., Ministry of Supply and Services, Canada.

Bateson, G. 1972. *Steps to an Ecology of the Mind.* New York: Ballantine Books Inc.

Baum, H.S. 1977. Toward a post-industrial planning theory. *Policy Sciences.* 8. 401-421.

__________, 1996. Why the rational paradigm persists: tales from the field. *Journal of Planning Education and Research.* 15.2. 127-134.

Baxter, T. 1996. Mitigating adverse social impacts of light rail transit: a community perspective. *Plan Canada*. September. 28-33.

B.C. Environment. February 1993. *Special Waste Legislation Guide*. Environmental Protection Division.

Beanlands, G.E. and P.N. Duinker. 1983. *An Ecological Framework for Environmental Impact Assessment in Canada*. Federal Environmental Assessment Review Office. Hull, Quebec and Institute for Resource and Environmental Studies. Halifax, Nova Scotia.

Beanlands, G. 1985. Ecology and impact assessment in Canada. In *New Directions in Impact Assessment*. eds. J.V. Maclaren and J. Whitney. 1-20. Agincourt, Ontario: Methuen Publications.

Beatley, J.H. 1994. *Ethical Land Use: Principles of Policy and Practice*. Baltimore: John Hopkins University Press.

Beattie, R.B. 1995. Everything you already know about EIA (but don't often admit) *Environmental Impact Assessment Review*. 15.2. 109-114.

Beatley, T. 1989. Environmental ethics and planning theory. *Journal of Planning Literature*. 4.1. 1-32.

_________, 1992. Environmental ethics and hazardous waste management. *Hazardous Materials / Wastes: Social Aspects of Facility Planning and Management Conference Proceedings*. September 30 to October 3, 1990. The Institute of Social Impact Assessment. 228-236.

_________, 1995a. The many meanings of sustainability: introduction to a special issue of the Journal of Planning Literature. *Journal of Planning Literature*. 9.4. 339-342.

_________, 1995b. Planning and sustainability: the elements of a new (improved?) paradigm. *Journal of Planning Literature*. 9.4. 383-394.

Beauregard, R.A. 1971. Thinking about practising planning. *Paper Presented at Conference on Planning Theory and Practice*. Cornell University, Ithaca, New York. April 27-29.

_______________, 1978. Planning in an advanced capitalist state. In *Planning Theory in the 1980's*. eds. R. W. Burchell and G. Sternlieb. 235-254. New Jersey: Center for Urban Policy Research. .

_____________, 1980. Teaching planning theory: dilemmas beyond the rational model. *Bulletin of the Association of Collegiate Schools of Planning*. 18.1. 1-4.

_______________, 1987. The object of planning. In *Urban Geography*. 8.4. 367-373.

____________________, 1989. Between modernity and post modernity: the ambiguous position of US planning. *Environment and Planning D*. 7. 381-395.

_____________, 1990. Bringing the city back in. *Journal of the American Planning Association*. 56.2. 210-214.

__________________, 1991. Without a net: modernist planning and the postmodern abyss. *Journal of Planning Education and Research*. 10.3. 189-194.

____________, 1995. Edge critics. *Journal of Planning Education and Research.* 14.3. 163-165.

Becker, H. A. 1991. The future of impact assessment in the European community and their member countries. 9.4. *Impact Assessment Bulletin.* 69-80.

Bedford B.L. and E. M. Preston, 1988. Developing the scientific basis for assessing cumulative effects of wetland loss and degradation on landscape function: status, perspectives and prospects. *Environmental Management.* 12.5. 751-771.

Behn, R.D. 1988. Managing by groping along. *Journal of Policy Analysis and Management.* 7.4. 643-66.

Belbin, R.M. 1981. *Management Teams: Why They Succeed or Fail.* London: Heineman.

Bell, A. 1994. Non-human nature and the ecosystem approach: the limits of anthropocentrism in Great Lakes management. *Alternatives.* 20.3. 20-25.

Bendix, S. 1984. How to write a socially useful EIS. In *Improving Impact Assessment.* eds. S.L. Hart, G.A. Enk and W. F. Hornick. 271-288. Boulder, Colorado: Westview Press.

Benveniste, G. 1989. *Mastering the Politics of Planning.* San Francisco: Jossey Bass.

Berger, P. and T. Luckman. 1966. *The Social Construction of Reality.* Middlesex, England: Penguin Books, Inc.

Bergman, E. and J.L. Sarbib. 1980. Teaching radical planning. In *Urban and Regional Planning in an Age of Austerity.* eds. P. Clavel, J. Forester and W.G. Goldsmith. 343-354. New York: Pergamon Press.

Berke, P. 1994. Evaluating environmental plan quality: the case for planning for sustainable development in New Zealand. *Journal of Environmental Planning and Management.* 37.2 155-169.

_______. 1995. Natural hazard reduction and sustainable development: a global assessment. *Journal of Planning Literature.* 9.4. 370-382.

Berkes, F., P. George and R.J. Preston. 1991. Co-management: the evolution in theory and practice of the joint administration of living resources. *Alternatives.* 18.2. 12-19.

Birkeland, J. 1995. The relevance of ecofeminism to the environmental professions. *The Environmental Professional.* 17.1.55-71.

Bishop, A.B., 1983. Communication in the planning process. In *Public Involvement Techniques: A Reader of Ten Years Experience at the Institute for Water Resources.*81-98. Virginia: US Army Corps of Engineers.

Bismas, A.K. and S.B.C. Agardwale. 1992. *Environmental impact Assessment for Developing Countries.* Oxford Butterworth Heinemann Ltd.

Bisset, R. 1983. Introduction to methods for environmental impact assessment. In *Environmental Impact Assessment.* ed. PADC, EIA and Planning Unit. 131-147. The Hague: Martinus Nijhoff.

______, 1984. Post-development audits to investigate the accuracy of environmental impact predictions. *Zeitschrift* *furUmwelpolitik.* 7. April. 463-484.

Blanco, H. 1994. *How to Think About Social Problems. American Pragmatism and the Idea of Planning.* Westport, Connecticut: Greenwood Press.

__________, 1995. Community and the four jewels of planning. In *Planning Ethics.* ed. S. Hendler. 66-82. New Brunswick, New Jersey: Rutgers.

Blaug, E.A. 1993.The use of environmental assessment by Federal agencies in NEPA implementation. *The Environmental Professional.* 15.1. 57-65.

Boardman, R. ed. 1992. *Canadian Environmental Policy: Ecosystems, Politics and Process.* Oxford: Oxford University Press.

Boggs, J.P. 1991. EIA with democratic politics: contradictions in terms of emerging paradigm. *Impact Assessment Bulletin.* 9.2. 1-12.

Boggs, J.P. 1993. Procedural vs. substantive in NEPA law: cutting the gordian knot. *The Environmental Professional.* 15.1. 25-33.

Boguslaw, R. 1965. *The New Utopians.* Englewood Cliffs, N.J.: Prentice-Hall Inc.

Bolan, R. S. 1967. Emerging views of planning. *Journal of the American Institute of Planning.* 33.4. 233-245.

__________, 1973. Community decision behaviour: the culture of planning. *A Reader in Planning Theory.* ed. A. Faludi. 371-394. Oxford: Pergamon Press.

__________, 1974. Mapping the planning theory terrain. In *Planning in America: Learning from Turbulence.* ed. D.R. Godschalk. 13-34. Washington DC: American Institute of Planners. 13-34.

__________, 1980. The practitioner as theorist: the phenomenology of the professional episode. *Journal of the American Planning Association.* 46.3. 261-274.

__________ 1983. The structure of ethical choice in planning practice. *Journal of Planning Education.* 3. 23-34.

Bolton, K.E. and F.A. Curtis. 1990. An environmental assessment procedure for siting solid waste disposal facilities. *Environmental Impact Assessment Review.* 10.3. 285-296.

Bookchin, M. 1982. *The Ecology of Freedom: The Emergence and Dissolution of Hierarchy.* Palo Alto, California: Cheshire Books.

Boothroyd, P., N. Knight, M. Eberle, J. Kawaguchi J. and C. Gagnon. 1995. The need for retrospective impact assessment: the megaprojects examples. *Impact Assessment.* 13.5. 253-272.

Bord, R. 1992. The NIMBY syndrome: why is everyone so upset: the role of risk communications, knowledge, attitudes and power sharing on public reactions. *Hazardous Materials / Wastes: Social Aspects of Facility Planning and Management Conference Proceedings.* 30-35. The Institute for Social Assessment.

Bouwer, K., 1994. The integration of regional environmental planning and physical planning in the Netherlands. *Journal of Environmental Planning and Management.* 37.1. 107-116.

Boyer, M.C. 1983. *Dreaming the Rational City.* Cambridge, Massachusetts: MIT Press.

Branch, M.C. 1966. *Planning: Aspects and Applications.* New York: John Wiley and Sons.

Branch, K., D.A. Hooper, J. Thompson and J. Creighton. 1993. *Guide to Social Assessment - A Framework for Assessing Social Change.* Boulder, Colorado: Westview Press.

Braybrooke, D. and C. E. Lindblom 1963. *A Strategy of Decision.* New York: Free Press.

Bregman, J.I. and K.M. MacKenthan. 1995. *Environmental Impact Statements.* Boco Raton, Florida: Lewis Publishers.

Breheny, M.J. 1983. A practical view of planning theory. *Environment and Planning B: Planning and Design.* 10. 101-115.

Briassoulis. H. 1989. Theoretical orientations in environmental planning: an inquiry into alternative approaches. *Environmental Management.* 13.4. 381-392.

Brion, D. 1991. *Essential Industry and the Nimby.* Boulder, Colorado: Westview Press.

Brocking, S. 1994. Visions of nature and society: a history of the ecosystem. *Alternatives.* 20.3. 12-19.

Brooks, H. 1992. The concept of sustainable development and environmentally sound technology In *Environmentally Sound Technology for Sustainable Development.* Advanced Technology Assessment System, Issue # 7, New York: United Nations. 19-25.

Brooks, M.P. 1990. The city may be back in, but where is the planner. 1990. *Journal of the American Planning Association.* 56.2. 218-221.

__________, 1993. A plethora of planners. *Journal of the American Planning Association.* 59.2. 142-144.

Brown, A.L. 1990. Environmental impact assessment in a development context. *Environmental Impact Assessment Review.* 37. 1 and 2. 135-144.

Brown, A.L. and J.S. De Loache. 1978. Skills, plans and self-regulation. In *Children's Thinking: What Develops?* ed. R.S. Siegler. 18-32. New Jersey: Hillsdale, New Jersey. Lawrence Erlbaum and Associates.

Brown, A.L., R. A. Hindmarsh and G.T. McDonald. 1991. Environmental assessment procedures and issues in the Pacific-Southeast Asia Region. *Environmental Impact Assessment Review.* 11.2. 143-156.

Brown, G.L. and M.D. Treissman. 1994. Consideration of cumulative effects in human health and ecological risk assessments of air emissions. In *Cumulative Effects Assessment in Canada: From Concept to* Practice. ed. A.J. Kennedy. 81-92. Alberta: Alberta Society of Professional Biologists.

Brown, N.J. and P. Quiblier. eds. 1994. *Ethics and Agenda 21.* United Nations Environment Program. United New York, N.Y.: Nations Publications.

Brown, P. and S. Masterson-Allen. 1994. The toxic waste movement: a new type of activism. *Society and Natural Resources*. 7.3. 269-288.

Bryson, J.M. and A.L. Delbecq 1979. A contingent approach to strategy and tactics in project planning. *Journal of the American Planning Association*. 45.2. 167-179.

Bryson, J.M. and B.C. Crosby. 1989. The design and use of strategic planning arenas. *Planning Outlook*. 32.1. 5-13.

Bryson, J.M., B.C. Crosby and A.R. Carroll. 1991. Fighting the not-in-my-backyard syndrome in Minneapolis. *Journal of Planning Education and Research*. 11.1. 66-74.

Bryson, J.M. 1990. *Strategic Planning for Public and Nonprofit Organizations - A Guide to Strengthening and Sustaining Organizational Achievement*. San Francisco: Jossey-Bass.

Bullard, R.D. 1990. *Dumping in Dixie: Race, Class and Environmental Quality*. Boulder, Colorado: Westview Press.

Burchell, R. W. and J.W. Hughes. 1978. Introduction. In *Planning Theory in the 1980's*. eds. R.W. Burchell and G. Sternlieb. xv-liii. New Brunswick, New Jersey: Center for Urban Policy Research.

Burdge, R.J., 1991. The benefits of social impact assessment in third world development. *Environmental Impact Assessment Review*. 10.1/2. 123-134.

__________, 1994. *A Conceptual Approach to Social Impact Assessment*. Middleton, Wisconsin: Social Ecology Press.

Burdge, R. J. and S. Johnson. 1977. Sociocultural aspects of the effects of resource development. In *Handbook for Environmental Planning - The Social Consequences of Environmental Change*. eds. J. McEvoy III and T. Dietz. 243-278. New York: John Wiley and Sons.

Burdge, R. J. and V. Vanclay. 1996. Social impact assessment: a contribution to the state of the art series. *Impact Assessment*. 14.1. 59-86.

Burton, D. J. And M.B. Murphy. 1980. Democratic planning in austerity: practices and theory. In *Urban and Regional Planning in the Age of Austerity*. eds. P. Clavel, J. Forester and G. Goldsmith. 177-205. New York: Pergamon Press. 177-205.

Bush, M. 1990. *Public Participation in Resource Development After Project Approval*. Hull, Quebec: Canadian Environmental Assessment Research Council.

Cada, G.F. and C.T. Hunsaker. 1990. Cumulative impacts of hydropower development: reaching a watershed in impact assessment. *The Environmental Professional*. 12.1.2-8.

Cairns, J., Jr. and B.R. Niederlehner. 1993. Ecological function and resilience: neglected criteria for environmental impact assessment and ecological risk assessment. *The Environmental Professional*. 15.1. 116-124.

Cairns, J. Jr. and W.H. van den Schalie. 1980. Biological monitoring. Part I - early warning systems. *Water Research*. 14. 1179-1196.

Caldwell, L.K. 1989. Understanding impact analysis. In *Policy Through Impact Assessment.* ed. R.V. Bartlett. 7-16. New York, N.Y: Greenwood Press.

_____________, 1991. Analysis-assessment-decision: the anatomy of rational policymaking. *Impact Assessment Bulletin.* 9.4. 81-92.

_________, 1994. Disharmony in the Great Lakes Basin: institutional jurisdictions frustrate the ecosystem approach. *Alternatives.* 20.3. 26-31.

___________, 1995. *Environment as a Focus for Public Policy.* College Station, Texas: A & M University Press.

Campbell, S. 1996. Green cities, growing cities, just cities? *Journal of the American Planning Association.* 62.3. 296-312.

Campbell, T. 1981. *Seven Theories of Human Society.* Oxford: Clarendon Press.

Campbell, M.C. and D.W. Floyd. 1996. Thinking critically about environmental mediation. *Journal of Planning Literature.* 10.3. 235-247.

Campbell, S. and S.S. Fainstein. 1996. The structure and debates of planning theory. In *Readings in Planning Theory.* eds. S. Campbell and S. Fainstein. 1-14. Oxford: Blackwell Publishers Inc.

Cambris, M. 1979. *Planning Theory and Philosophy.* London: Tavistock Publications.

Canter, L. W. 1977. *Environmental Impact Assessment.* New York: McGraw-Hill.

__________, 1983. Methods for environmental impact assessment: theory and application. *Environmental Impact Assessment.* ed. PADC, EIA and Planning Unit. 165-227. Martinus Nijhoff: The Hague.

_____________, 1993a. Pragmatic suggestions for incorporating risk assessment principles in EIA studies. *The Environmental Professional.* 15. 1. 125-138.

_________, 1993b. The role of environmental monitoring in responsible project management. *The Environmental Professional.* 15.1. 76-87.

_________, 1996. *Environmental Impact Assessment.* Second Edition. New York: McGraw Hill.

Canter, L.W., A. Atkinson and L. Leistritz. 1985. *Impact of Growth.* Chelsea, Michigan: Lewis Publishers, Inc.

Canter, LW and G.W. Canty. 1993. Impact significance determination - basic considerations and a sequenced approach. *Environmental Impact Assessment Review.* 13.5. 275-298.

Canter, LW and J. Kamath 1995. Questionnaire checklists for cumulative impacts. *Environmental Impact Assessment Review.* 15.4. 311-340.

Carley, M. and I. Christie. 1993. *Managing Sustainable Development.* Minneapolis: University of Minnesota Press.

Carpenter, R. A. 1981. Balancing economic and environmental objectives: the question is still how. *Environmental Impact Assessment and Review*. 2.2.

__________, 1982. Environmental conflict management practitioners' workshop. *Environmental Impact Assessment Review*. 3.4/. 387-396.

______________, 1995a. Communicating environmental science uncertainties. *The Environmental Professional*. 17.4. 127-136.

________________, 1995b. Risk assessment. *Impact Assessment*. 13.2. 153-188

Carpenter, S.L. and W.J.D. Kennedy. 1988. *Managing Public Disputes: A Practical Guide to Handling Disputes and Reaching Agreement*. San Francisco: Jossey-Bass Publishers.

Carroll, J.M. 1982. The adventure of getting to know a computer. *Computer*. November. 49-58.

Cartwright, T. J. 1973. Problems, solutions and strategies: a contribution to the theory and practice of planning. *Journal of the American Institute of Planners*. 39.3. 179-187.

____________, 1974. The manager as politician: revisited. *Optimum*. 5.4.

____________, 1991, Planning and chaos theory. *Journal of the American Planning Association*. 57.1. 44-56.

Castells, M. 1972. *City, Class and Power*. London: McMillan Press Ltd.

__________, 1977. *The Urban Question*. London: Edward Arnold.

Casti, J.L. 1994. *Complexification*. New York: Harper Collins Publishing Inc.

(CEAA) Canadian Environmental Assessment Agency. 1994. *The Canadian Environmental Assessment Act Training Compendium*. Canadian Environmental Assessment Agency. Ottawa: Ministry of Supply and Services.

(CEARC) Canadian Environmental Assessment Research Council (CEARC) and U.S. National Research Board on Basic Biology. 1986. *Proceedings of the Workshop on Cumulative Environmental Effects: A Binational Perspective*. Hull, Quebec: CEARC.

____, 1988a. *The Assessment of Cumulative Effects: A Research Prospectus*. Ministry of Supply and Services, Canada.

____. 1988b. *Evaluating Environmental Impact Assessment: An Action. Prospectus*. Hull, Quebec: Ministry of Supply and Services Canada.

____ ,*1988c. Mitigation and Compensation Issues in the Environmental Assessment Process: A Research Prospectus*. Ottawa: Ministry of Supply and Services.

Cenzatti, M. 1987. Marxism and planning theory. In *Planning in the Public Domain*. J. Friedmann. 437-447. Princeton: Princeton University Press.

(CEQ) Council on Environmental Quality. 1978. 40 CFR, Parts 1508.7 and 1508.8.

__________________________, 1981. *Memorandum: Scoping Guidance*. Washington, D.C.: CEQ.

__________________________, 1983. Guidance regarding NEPA regulations. *Federal Register*. 48.146. 34263-34268.

__________________________, 1987. 40 Code of Federal Regulations, Ch. V, Washington, D.C.: U.S. Government Printing Office. 919-971.

__________________________, 1993. *Incorporating Biodiversity Considerations into Environmental Impact Analysis Under the National Environmental Policy Act*. Washington, D.C.: CEQ.

Certo., S. C. and J.J. Peter. 1988. *Strategic Management - Concepts and Applications*. New York: Random House.

Chadwick, G.F. 1971. *A Systems View of Planning: Towards a Theory of the Urban and Regional Process*. Oxford: Pergamon Press.

Chapin, F.S. Jr. 1965. *Urban Land Use Planning*. Urbana: University of Chicago Press.

Checkoway, B. 1994. Paul Davidoff and advocacy planning in retrospect. *Journal of the American Planning Association*. 60.2. 139-143.

Chermayeff, S. and A. Tzonis. 1971. *Shape of Community*. Middlesex, England: Penguin Books Ltd.

Christensen, K.S. 1985. Coping with uncertainty in planning. *Journal of the American Planning Association*. 51. 1. 63-73.

Christoforidis, A. 1994. New alternatives to the suburb: neo-traditional developments. *Journal of Planning Literature* 8.4. 429-440.

Clark, B.D. 1983a. The aims and objectives of environmental impact assessment. In *Environmental Impact Assessment*. ed. PADC, EIA and Planning Unit. 3-11. The Hague: Martinus Nijhoff.

_______, 1983b. EIA manuals: general objectives and the PADC manual In *Environmental Impact Assessment*. Eds. PADC, EIA and Planning Unit. 149-64. The Hague: Martinus Nijhoff.

Clark, R. 1994. Cumulative effects assessment: a tool for sustainable development. *Impact Assessment*. 12.3. 319-331.

Clark, R. and P. Lepperd-Slack. 1994. Cumulative effects assessment under the National Environmental Policy Act. In *Cumulative Environmental Assessment in Canada*. ed. A.J. Kennedy. 37-46. Edmonton, Alberta: Alberta Association of Environmental Biologists.

Clavel, P. 1980. Opposition planning. In *Urban and Regional Planning in an Age of* Austerity. eds. P. Clavel, J. Forester and W.G. Goldsmith. 206-218. Oxford: Pergamon Press.

_______, 1994. The evolution of advocacy planning. *Journal of the American Planning Association*. 60.4. 146-149.

Clow, M. 1992. Round tables taken with a grain of salt. *Alternatives*. 19.1. 29-30.

Coates, J.F. 1976. Technology assessment - a tool kit. *Chemtech*. June. 372-383.

________, 1990. Impacts we will be assessing in the 21st century. *Impact Assessment Bulletin*. 9.4. 9-26.

Cochrun, S.E. 1994. Understanding and enhancing neighbourhood sense of community. *Journal of Planning Literature*. 9.1. 92-99.

Cohen, J.L. and D.L. Marks. 1975. A review and evaluation of multi-objective programming techniques. *Water Resources Research*. 11.2. 208-220.

Coleman, D.J. 1977. Environmental impact assessment methodologies: a critical review. In *Environmental Impact Assessment in Canada: Processes and Approaches*. eds. M. Plewes and J. B.R. Whitney. 35- 60. Proceedings of a Symposium held at the Institute for Environmental Studies. Toronto: Institute for Environmental Studies.

Conacher, A.J. 1994 / 1995. The integration of land use planning and management with environmental impact assessment: some Australian and Canadian perspectives. *Impact Assessment*. 12.4. 347-372.

Contant, C. K. 1984. *Cumulative Impact Assessment: Design and Evaluation of an Approach for the Corps Permit Program at the San Francisco District*. PhD Thesis. Stanford, CA: Stanford University.

Contant, C.K. and L.L. Wiggins. 1991. Defining and analysing cumulative environmental impacts. *Environmental Impact Assessment Review*. 11.3. 297-309.

Cooke, P.N. 1983. *Theories of Planning and Spatial Development*. London: Hutchinson.

Cormick, G.W. 1987. The myth, the reality, and the future of environmental mediation. In *Resolving Locational Conflict*. ed. R.W. Lake. New Brunswick, New Jersey: Center for Urban Policy Research.

__________, 1990. Commentary II. In *The Place of Negotiation in Environmental Assessment*. 39-44. Canadian. Hull, Quebec: Environmental Assessment Research Council.

Cordova, T. 1994. Refusing to appropriate: the emerging discourse on planning and race. *Journal of the American Planning Association*. 60.2. 242-243.

Costanza, R. , S.O. Funtowicz and J.R. Ravetz. 1992. Assessing and communicating data quality in policy-related research. *Environmental Management*. 16.1. 121-131.

Coughton, B.A.K. , N. Burkardt and D. Fulton. 1993. Assessing the " need to negotiate" in FERC licensing consultations: a study of two hydropower projects. *Environmental Impact Assessment Review*. 13.6. 331-351.

Covello, V., P. Sandman, and P. Slovic. 1988. *Risk Communication, Risk Statistics and Risk Comparisons: A Manual for Plant Managers*. Washington, D.C. : Chemical Manufacturers Association.

Covello, V.T. 1989. Informing people about risks from chemicals, radiation, and other toxic substances: a review of obstacles to public understanding and effective risk communications. In *Prospects and Problems in Risk Communications*. ed. W. Leiss. 1-50. Waterloo, Ontario: University of Waterloo Press.

Craib, I. 1984. *Modern Social Theory*. Brighton, Sussex: Wheatsheaf Books Ltd.

Craig, D. 1990. Social impact assessment: politically - oriented approaches and applications. *Environmental Impact Assessment Review*. 10. 1 / 2. 37-54.

Craig, P.N. 1992. Siting a liquid hazardous waste incinerator: experience with California's Tanner *Act. Environmental Impact Assessment Review*. 12.4. 363-386.

Crance, C. and D. Draper. 1996. Socially cooperative choices: an approach to achieving resource sustainability in the coastal zone. *Environmental Management*. 20.2. 175-184.

Creighton, J.L. 1983a. An overview to the research conference on public involvement and social impact assessment. In *Public Involvement and Social Impact Assessment*. eds. G.A. Daneke, M.W. Garcia and J. D. Priscoli. 1-10. Boulder, Colorado: Westview Press.

______________, 1983b. The use of values: public participation in the planning process. In *Public Involvement and Social Impact Assessment*. eds. G.A. Daneke, M.W. Garcia and D. Priscoli. 143-160. Boulder, Colorado: Westview Press.

__________, 1983c. Identifying publics / staff identification techniques. In *Public Involvement Techniques: A Reader of Ten Years Experience at the Institute for Water Resources*. 199-206. Virginia: US Army Corps of Engineers.

___________, 1983d. Acting as a conflict conciliator. In *Public Involvement Techniques: A Reader of Ten Years Experience at the Institute for Water Resources*. 453-470. Virginia: US Army Corps of Engineers.

Creighton, J.L., J.A. Chalmers and K. Branch. 1983. Integrating planning and assessment through public involvement. In *Public Involvement and Social Impact Assessment*. eds. G. A. Daneke, M.W. Garcia and D. Priscoli. 177-184. Boulder, Colorado: Westview Press.

Creighton, J.L. and A.L. Shorett. 1988. Dispute resolution in the Nuclear Waste Repository Program. *Waste Management '88*. ed. R. G. Post. 447-451. Tucson Arizona.

Creswell, J.W. 1994. *Research Designs Qualitative and Quantitative Approaches*. Thousand Oaks, California: Sage Publications, Inc.

Cross, N., J. Naughton and D. Walker. 1981. Design method and scientific method. *Design Studies*. 2.4. 195-202.

Crowe, T. 1996. Healthy, wealthy and wise: the community economic evolution. *Plan Canada*. 30.3.8-9.

Culhane, P.J., H.P. Friesema and J.A. Beecher. 1987. *Forecasts and Environmental Decision-Making*. Boulder, Colorado: Westview Press.

Culhane, P.J. 1993. Post-EIS environmental auditing: a first step to making rational environmental assessment a reality. *The Environmental Professional*. 15.1. 66-75.

Cuthbertson, I. D. 1983. Evaluating public participation: an approach for government practitioners. In *Public Involvement and Social Impact Assessment*. eds. G.A. Daneke, M.W. Garcia and J.D. Priscoli. 101-110.

Boulder, Colorado: Westview Press.

Dahl, R.A. and C.E. Lindblom. 1953. *Politics, Economics and Welfare*. New York: Harper and Brothers.

Dale, A.P. and M.B. Lane. 1994. Strategic perspectives analysis: a procedure for participatory and political impact assessment. *Society and Natural Resources*. 7.3. 253-268.

Dale, N. and S. Kennedy. 1981. Towards a socially relevant process of impact assessment. In *Social Impact Assessment*. eds. F.J. Tester and W. Mykes.43-54. Calgary, Alberta: Detselig Enterprises.

Dalton, L.C. 1986. Why the rational planning paradigm persists - the resistance of professional education and practice to alternative forms of planning. *Journal of Planning Education and Research*. 5.2. 147-153.

_________, 1993. The dilemmas of the times. *Journal of the American Planning Association*. 59.2.149-151.

Damasio, A.B. 1995. *Descartes' Error*. New York: Avon Books.

Damman, D.C., D.R. Cressman and M.H. Sadar. 1995. Cumulative effects assessment: the development of practical frameworks. *Impact Assessment*. 13.4. 433-454.

d'Amore, L.J. 1981. An overview of SIA. In *Social Impact Assessment*. eds. F.J. Tester and W. Mylas. Calgary, Alberta: Kananskis Centre for Environmental Research, University of Calgary.

Daneke, G.A. 1983. An adaptive-learning approach to environmental regulation. *Policy Studies Review*. 3.1. 7-12.

Daneke, G.A., M.C. Garcia and J.V. Priscoli. 1983. *Social Impact Assessment*. Boulder, Colorado: Westview Press.

Daniels, S.E. and G.B. Walker. 1996. Collaborative learning: improving public deliberation in ecosystem-based management. *Environmental Impact Assessment Review*. 16. 2. 71-102.

Davidoff, P. 1965. Advocacy and pluralism in planning. *Journal of the American Institute of Planners*. 31. 331-338.

Davidoff, P., L. Davidoff and N.N. Gold. 1970. Suburban action: advocate planning for an open society: *Journal of the American Institute of Planners*. 28. 331-115.

Davidoff, P. and T.A. Reiner. 1962. A choice theory of planning. *Journal of the American Institute of Planners*. 28.2. 102-109.

Davies, K. 1991. *Towards Ecosystem-Based Planning: A Perspective on Cumulative Environmental Effects*. Toronto: Canadian Waterfront Resource Centre. WP 8.

Davis, K. 1993. *Addressing Cumulative Environmental Effects: A Reference Guide for the Canadian Environmental Assessment Act* (draft), March 8, 1993.

Day, J.C., R.F. Brady, K.C. Bridges, B.F. Friesen and S.E. Peet. 1977. A strategy for hindsight evaluation of environmental impacts. In *Environmental Impact Assessment in Canada: Processes and Approaches*. eds. M. Plewes and J.B.R. Whitney. 171-180. Toronto: Institute for Environmental Studies.

Dear, M. 1992. Understanding and overcoming the NIMBY syndrome. *Journal of the American Planning Association.* 58 .3. 288-300.

Dekema, J.B. 1981. Incommensurability and judgment. *Theory and Society.* 10. 4. 521-546.

Delacourt, T. 1990. *Beyond Bruntland.* New York: New Horizons Press.

Dello, P. 1985. Strategic choice and evaluation: some methodological considerations. In *Evaluation of Complex Policy Problems.* eds. A. Faludi and H. Voogd. 109-125. Delft, Netherlands: Delftsche Uitgevers Masstschappij.

Diamond, H.L. and P.F. Noonan. 1996. *Land Use in America.* Washington, D.C. : Island Press.

Dias, O. and B. Chinery. 1994. Addressing cumulative effects assessment in Alberta: the role of integrated resource planning. In *Cumulative Effects Assessment in Canada: From Concept to Practice.* 303-318. Edmonton, Alberta: Alberta Society of Environmental Biologists.

Dickerson, W. and J. Montgomery. 1993. Substantive scientific and technical guidance for NEPA analysis: pitfalls in the real world. *The Environmental Professional.* 15. 1. 7-11.

Dickert, T.G. 1974. Methods for environmental impact assessment: a comparison. In *Environmental Impact Assessment: Guidelines and Commentary.* eds. T. G. Dickert and K. R. Domeny. 127-144. Berkeley, California: University of California.

Dickert T. G. and A.E. Tuttle. 1985. Cumulative impact assessment in environmental planning: a coastal wetlands watershed example. *Environmental Impact Assessment Review.* 5.1. 37-66.

Dickman, M. 1991. Failure of an environmental impact assessment to predict the impact of mine tailings in Canada's most northerly hypersaline lake. *Environmental Impact Assessment Review.* 11.2. 181-193.

Diffenderfer, M. and D. Birch. 1994. Bioregionalism: a comparative study of the Adirondacks and the Sierra Nevada. *Society and Natural Resources.* 10.1. 3-16.

Dooley, J.E. 1985. Risk and environmental management. In *New Directions in Environmental Impact Assessment in Canada.* eds. V.W. Maclaren and J. B. Whitney. 87-116. Toronto: Methuen.

Dorcey, A.H.J. and C.L. Riek. 1990. Negotiation-based approaches to the settlement of environmental disputes in Canada. In *The Place of Negotiation in Environmental Assessment.* 7-36. Hull, Quebec: Canadian Environmental Assessment Research Council.

Dorney, R.S. 1973. Role of ecologists as consultants in urban planning and design. *Human Ecology.* 1.3. 183-200.

_________, 1989. *The Professional Practice of Environmental Management.* ed. L. Dorney. New York: Springer-Verlag.

Douglas, M. 1972. Environment at risk. In *Ecology: The Shaping Inquiry.* ed. J. Benthal. Toronto: Longman.

Doyle, D. and B. Sadler. 1996. Frameworks, procedures and attributes of effectiveness. *Environmental Assessment in Canada.* A Report in Support of the International Study of the Effectiveness of Environmental Assessment.

Canadian Environmental Assessment Agency. Ottawa: Ministry of Supply and Services.

Drouin, C. and P. Leppert-Slack. 1994. The Canadian Environmental Assessment Act and cumulative environmental effects. In *Cumulative Environmental Assessment In Canada: From Concept to Practice*. ed. A.J. Kennedy. 25-36. Edmonton, Alberta: Alberta Association of Professional Biologists.

Dror, Y. 1963. The planning process: a facet design. *International Review of Administrative Sciences*. 29. 46-58.

Duffy, D. M., M. Roseland and T.I. Gunton. 1996. A preliminary assessment of shared decision-making in land use and natural resource planning. *Environments*. 23.2. 1-16.

Duffy, P. 1992. EIA as a catalyst to sustainable development in Mozambique. *Impact Assessment Bulletin*. 10.3. 67-73.

Duinker, P. N. 1985a. Effects monitoring in environmental impact assessment. In *New Directions in Environmental Impact Assessment in Canada*. eds. V. W. Maclaren and J.B. Whitney. 117-143. Toronto: Methuen.

_____________, 1985b. *Audit and Evaluation in Environmental Assessment and Management - Canadian and International Experience*. Proceedings of the Conference on Follow-up Audit of EIA Results. Environmental Protection Service of Environment Canada and the Banff Centre, School of Management. ed. B. Sadler. The Banff Centre, October 13-16.

_____________, 1994. Cumulative effects assessment: what's the big deal? In *Cumulative Effects Assessment in Canada: From Concept to Reality*. ed. A.J. Kennedy. 11-24. Edmonton, Alberta: Alberta Association of Professional Biologists.

Dunn, E.S. 1971. *Economic and Social Development*. Baltimore: John Hopkins Press.

Dunster, J.A. 1990. Integrating environmental assessment with forest planning: the province of Ontario example. *Impact Assessment Bulletin*. 8.1/2. 119-130.

Dyckman, J.W. 1961. *Planning and Decision Theory*. 28. 3. 335-345.

Eagles, P.F.J. 1984. *The Planning and Management of Environmentally Sensitive Areas*. London: Longman.

Eccles, R., J. Green, R. Morrison and A. Kennedy. 1994. Approaches to cumulative effects assessment of petroleum development in Alberta. In *Cumulative Effects Assessment: From Concept to Practice*. ed. A.J. Kennedy. 189-198. Edmonton, Alberta: Alberta Society of Environmental Biologists.

(ECE) Economic Commission for Europe. 1990.*Post-Project Analysis in Environmental Impact Assessment*. Geneva, Switzerland: ECE / ENVWA. United Nations.

Edelstein, M.R. and D.A. Kleese. 1995. Cultural relativity of impact assessment: native Hawaiian opposition to geothermal energy development. *Society and Natural Resources*. 8.1. 19-34.

Edmunds, S.W. 1981. Environmental policy: bounded rationality applied to unbounded ecological problems. In *Environmental Policy Formation*. ed. D.E. Mann. Lexington, Massachusetts: Lexington Books.

Edwards, P. ed. 1981. *The Encyclopaedia of Philosophy*. New York: The Macmillan Company.

Egan, A.F., S.B. Jones, A.E .Luloff and J.C. Finley J.C. 1995. The value of multiple methods: an illustration using survey focus group and Delphi techniques. *Society and Natural Resources*. 8.5. 457-466.

Egre, D. and P. Senecal. 1990. Resettlement studies and human EIA at water control projects. *Impact Assessment Bulletin*. 8.3. 5-18.

Ehrenfeld, D. 1978. *The Arrogance of Humanism*. Oxford: Oxford University Press.

________, 1993. *Beginning Again*. New York: Oxford University Press.

Ehrmann, J.R. and B.L. Stinson. 1994. Human health impact assessment (HHIA): the link with alternative dispute resolution. *Environmental Impact Assessment Review*. 14. 5/6. 517-526.

Elkin, T.J. 1990. State of the environment reports and national conservation strategies - the linkage. *Alternatives*. 16.4./17.1. 52-61.

Elliott, M. L. 1981. Pulling the pieces together: amalgamation in environmental impact assessment. *Environmental Impact Assessment Review*. 1: 11-38.

Elliott, M.L.P. 1984. Improving community acceptance of hazardous waste facilities through alternative systems for mitigating and managing risk. *Hazardous Waste*. 1.3. 397-410.

Ellis, D. 1989. *Environments at Risk*. New York: Springer-Verlag.

Ellison, R.L. 1988. Review of coal strip-mining EA: The accuracy of an analysis. *Environmental Impact Assessment Review*. 8.3. 221-232.

(ELUS) Environment and Land Use Secretariat, Working Group on Mitigation and Compensation. 1980. *Environmental and Social Compensation / Mitigation Guidelines*. Victoria, B.C.: Province of British Columbia.

Emery, F. 1967. The next thirty years: concepts, methods, and anticipations. *Human Relations*. 20.

Emery, F.E. and E.L. Trist. 1963. The causal texture of organizational environments. Presented at *XVII International Congress of Psychology*. Washington, DC 20-26.

____________________, 1965. The causal texture of organizational environments. *Human Relations*. 18.

Emond, D.P. 1990. Accommodating negotiation-based to the settlement of environmental disputes in Canada. In *The Place of Negotiation in Environmental Assessment*. 45-52. Hull, Quebec: Canadian Environmental Assessment Research Council.

Enk, G.A. and W.F.Hornick. 1983. Human values and impact assessment. In *Integrated Impact Assessment* eds. F.A. Rossini and A.L. Porter. Boulder, Colorado: Westview Press.

Ensminger, J.T. and R.B. McLean. 1993. Reasons and strategies for more effective NEPA implementation. *The Environmental Professional*. 15.1. 46-56.

(EPA) U.S. Environmental Protection Agency, 1986a. *Environmental Auditing Policy Statement.* 51(131).F.R. 25004.

________________________________, 1986b. *Guidance on Public Involvement in the RCRA Permitting Program.*

__________, 1988. *Community Relations in Superfund - A Handbook.* Washington, D.C. : Office of Emergency and Remedial Response.

Erickson, P.A. 1994. *A Practical Guide to Environmental Impact Assessment.* San Diego: Academic Press.

Estrin D. and J. Swaigen. 1978. *Environment on Trial.* Toronto: Canadian Environmental Law Association.

Etzioni, A. , 1967. Mixed-scanning: a "third" approach to decision-making. *Public Administration Review.* 27. 385-392.

_______, 1968. *The Active Society.* New York: The Free Press.

_______, 1986. Mixed scanning revisited. *Public Administration Review.* 46.1. 8-14.

_________, 1993. *The Spirit of Community.* New York: Simon and Schuster.

_________, 1995. *Rights and the Common Good.* New York: St. Martin's Press.

European Bank for Reconstruction and Development. 1995. The case for "soft" harmonization. *Environmental Impact Assessment Review.* 15.4. 289-294.

Evernden, N.1985. *The Natural Alien - Humankind and Environment.* Toronto: University of Toronto Press.

Fainstein, N.I. and S.S. Fainstein. 1978. New debates in urban planning: the impact of Marxist theory. In *The Structural Crisis of the 1970's and Beyond.* eds. H. A. Goldstein and S. Rosenberg. 8-32. Virginia: Virginia Polytechnic Institute and State University.

__________________, 1982. New debates in urban planning: the impact of Marxist theory within the United States. In *Critical Readings in Planning Theory.* ed. C. Paris.147-174. Oxford: Pergamon Press.

_______________________, 1985. Economic restructuring and the rise of urban social movements. *Urban Affairs Quarterly.* 21.2. 187-206.

Fainstein, S.S. 1992. Planning in a different voice. *Planning Theory.* 7/8.

Fainstein, S.S. and N. Fainstein. 1996. City planning and political values: an updated view. In *Readings in Planning Theory.* Oxford: Blackwell Publishers. 265-287.

Faludi, A. 1970. The planning environment and the meaning of "planning". *Regional Studies.* 4. 1-9.

______, 1973. *Planning Theory.* Oxford: Pergamon Press.

_______, 1975. Review of *On Learning to Plan - and Planning to Learn* by D. Michael. *Journal of the American Institute of Planners.* 41. 218.

_________, 1978. *Essays on Planning Theory and Education.* Oxford: Pergamon Press.

_________, 1982a. Towards a combined paradigm of planning theory? A rejoinder. In *Critical Readings in Planning Theory.* ed. C. Paris. 27-40. Oxford: Pergamon Press.

_________, 1982b Three paradigms of planning theory. In *Planning Theory.* eds. P. Healey, G. McDougall and M. J. Thomas. 81-101. Oxford: Pergamon Press.

_________, 1983. Critical rationalism and planning methodology. *Urban Studies.* 20. 265-278.

_________, 1986. *Critical Rationalism and Planning Methodology.* London: Pion.

_________, 1989. Procedural rationality and ethical theory. *Planning Outlook.* 32.1.55-65.

Faludi, A. And H. Voogd. 1985. Evaluation of complex policy problems: some introductory remarks. In *Evaluation of Complex Policy Problems.* eds. A. Faludi and H. Voogd. 1-6. Delft, Netherlands: Delftsche Uitgevers Maatschappij.

Fearnside, P. M. and R. I. Barbosa. 1996 a. Political benefits as barriers to assessment of environmental costs in Brazil's Amazonian development planning: the example of the Japuta dam in Roraima. *Environmental Management.* 20.5. 615-630.

_____________________________, 1996 b. The Cotingo dam as a test of Brazil's system for evaluating proposed developments in Amazonia. *Environmental Management.* 20.5. 631-648.

(FEARO) Federal Environmental Assessment Review Office. 1985. *Initial Assessment: Procedures and Practices.* Toronto, Ontario, Canada. 8-20.

____, 1993. *Addressing Cumulative Environmental Effects: A Reference Guide for the Canadian Environmental Assessment Act.* Hull, Quebec: FEARO.

Ferguson, M. 1980. *The Aquarian Conspiracy.* Boston: Houghton Mifflin.

Feyerabend, P. 1975. *Against Method.* London: New Left Books.

Finney, C. and R.E. Polk. 1995. Developing stakeholder understanding, technical capability, and responsibility: the New Bedford Harbour superfund forum. *Environmental Impact Assessment Review.* 15.4. 517-541.

Finsterbusch, K. 1980. *Understanding Social Impacts - Assessing the Effects of Public Projects.* Beverley Hills, California: SAGE Publications, Inc.

_______________, 1981. A survey of methods for evaluating social impacts. In *Methodology of Social Impact Assessment.* 2nd Edition. eds. K. Finsterbusch and C.P. Wolf. Stroudsburg, Pennsylvania: Hutchinson Ross Publishing Company.

__________, 1995. In praise of SIA. *Impact Assessment*. 13.3. 229-252.

Fischoff, B. S. Lichtenstein, P. Slovic, S.L. Derby and R.L. Keeney. 1981. *Acceptable Risk*. Cambridge: Cambridge University Press.

Fishman, R. 1982. *Urban Utopias in the Twentieth Century: Ebenezer Howard, Frank Lloyd Wright, Le Corbusier*. Cambridge, Massachusetts: MIT Press.

Flew, A. 1979. *A Dictionary of Philosophy*. New York: St. Martin's Press.

Flynn, S. and T. Gunton. 1996. Resolving natural resource conflicts through alternative dispute resolution: a case study of the Timber Fish Wildlife Agreement in Washington State. *Environments*. 23.2. 101-112.

Foley, D. L. 1964. In *Explorations into Urban Structure*. ed. M.M. Webber. Philadelphia: University of Pennsylvania Press. 21-78.

Forester, J. 1980. Critical theory and planning practice. *Journal of American Planning Association*. 46. 275-286.

__________, 1981. Questioning and organizing attention: toward a critical theory of planning and administrative practice. *Administration and Society*. 13.2. 161-205.

__________, 1984 a. Bounded rationality and the politics of muddling through. *Public Administration Review*. 44.1. 23-31.

__________, 1984 b, Practical rationality in planning. In *Rationality in Planning*. eds. M. Breheny and A. Hooper. 48-59. London: Pion. 48-59.

__________, 1987. Planning in the face of conflict: negotiation and mediation strategies in local land use regulations. *Journal of the American Planning Association*. 53.3. 303-314.

__________, 1989. *Planning in the Face of Power*. Berkeley: University of California Press.

__________, 1993. *Critical Theory, Public Policy, and Planning Practice: Toward a Critical Pragmatism*. Albany: State University of New York Press.

__________, 1996. Learning from practice stories: the priority of practical judgment. In *Readings in Planning Theory*. eds. S. Campbell and S. Fainstein. 507-528. Oxford: Blackwell Publishers.

Formby, J. 1990. The politics of environmental impact assessment. *Impact Assessment Bulletin*. 8.1/2. 191-196.

Foster, H.D. 1986. Multiple hazard mapping: a technique for reducing life loss and injury. In *Risk Assessment and Management: Emergency Planning Perspectives*. eds. L.R.G. Martin and G. Laford. 3-19. Waterloo, Ontario: University of Waterloo Press.

Foy, G. 1990. Economic sustainability: the preservation of environmental assets. *Environmental Management*. 14.6. 771-778.

Fox, I.K. 1986. Cumulative assessment - the freshwater environment. commentary 1. In *Cumulative Environmental*

Effects: A Binational Perspective. 67-69. Canadian Environmental Assessment Research Council (CEARC), Ottawa, Ontario and U.S. National Research Council (NRC), Washington, D.C., Ministry of Supply and Services.

Freemuth, J. 1996. The emergence of ecosystem management: reinterpreting the gospel? *Society and Natural Resources*. 9. 4. 411-417.

French, W. and C.H. Bell. 1978. *Organizational Development*. Englewood Cliffs, N.J.: Prentice-Hall Inc.

Freudenburg, W.R. 1983. The promise and peril of public participation in social impact assessment. In *Public Involvement and Social Impact Assessment*. eds. G.A. Daneke, M. W. Garcia and J.D. Priscoli. 227-234 Boulder, Colorado: Westview Press.

Friedman, J. , J. Kossy and M. Regan. 1980. Working within the state: the role of the progressive planner. In *Urban and Regional Planning in an Age of Austerity*. eds. P. Clavel, J. Forester and W.W. Goldsmith. Oxford: Pergamon Press. 251-278.

Friedmann, J. and B. Hudson. 1974. Knowledge and action: a guide to planning theory. *Journal of the American Institute of Planners*. 40. 2-15.

Friedmann, J. and C. Weaver 1977. *Territory and Function: The Evolution of Regional Planning Doctrine*. Unpublished.

Friedmann, J. 1973. *Retracking America*. Garden City, New York: Anchor Press/Doubleday.

__________, 1976. *Innovation, Flexible Response and Social Learning: A Problem in the Theory of Meta-Planning*. Reading Geographical Papers. Reading England: University of Geography.

__________, 1987. *Planning in the Public Domain: From Knowledge to Action*. Princeton, New Jersey: Princeton University Press.

__________, 1992a. *Empowerment: The Politics of Alternative Development*. Boston, Massachusetts: Basil Blackwell Publishers.

__________, 1992b. Feminist and planning theories: the epistemological connection. *Planning Theory*. 7/8.

__________, 1993. Toward a non-Euclidian mode of planning. *Journal of the American Planning Association*. 59.4. 482-484.

__________, 1995. Teaching planning theory. *Journal of Planning Education and Research*. 14.3. 156-162.

Friend, J.K. 1983. Reflections on rationality in strategic choice. *Environment and Planning B: Planning and Design*. 10. 63-69.

__________, 1993. The strategic choice approach to environmental policy-making. *The Environmental Professional*. 15.2. 164-175.

Friend, J.K. and W. Jessop. 1969. *Local Government and Strategic Choice*. London: Tavistock Publications.

Friend, J.K. and J.M.H. Hunter. 1970. Multi-organisational decision processes in the planned expansion of towns. *Environment and Planning*. 2. 33-54.

Friend, J.K., J.M. Power, and C. J.L. Yewlett. 1974. *Public Planning: The Inter-corporate Dimension*. London: Tavistock Publications.

Friend, J.K. and A. Hickling. 1987. *Planning Under Pressure - The Strategic Choice Approach*. Oxford: Pergamon Press.

Frohnen, B. 1996. *The New Commutarians and the Crisis of Modern Liberalism*. Topeka, Kansas: University of Kansas.

Fuggle, R.F. 1990. Integrated environmental management: an appropriate approach to environmental concerns in developing countries. *Impact Assessment Bulletin*. 8.1/2. 31-46.

Fu-Keung, D. 1991. Difficulties in implementing social impact assessment in China: methodological considerations. *Environmental Impact Assessment Review*. 10.1/2. 113-122.

Gagnon, C., P. Hirsch and R. Howitt. 1993, Can SIA empower communities? *Environmental Impact Assessment Review*. 13.4. 229-254.

Garcia, M.W. 1983. The future of social impact assessment and public involvement. In *Public Involvement and Social Impact Assessment*. eds. G.A. Daneke, M.W. Garcia and J. D. Priscoli. 283-298. Boulder, Colorado: Westview Press.

Gardner, J.E. 1989. Decision-making for sustainable development: selected approaches to environmental assessment and management. *Environmental Impact Assessment Review*. 9. 337-366.

Gartner, J. and M. Roseland. 1989. Part 1: Thinking globally: the role of social equity in sustainable development and Part II - Acting locally: community strategies for equitable sustainable development. *Alternatives* 16.3: 26-49.

Gartner, J.F., T. Hilditch and R. Hubbard. 1994. Functional assessment framework for cumulative effects assessment in southern Ontario. In *Cumulative Effects Assessment in Canada: From Concept to Practice*. ed. A.J. Kennedy. 135-148. Edmonton, Alberta: Alberta Society of Environmental Biologists.

Gawthorpe, L.C. 1983. Organizing for change. Annals. *American Academy of Political and Social Science*. 466. 119-34.

Geisler, C.C 1993. Rethinking SIA: why ex ante research isn't enough. *Society and Natural Resources*. 6.4. 327-338.

George, R.V. 1994. Formulating the right planning problem. *Journal of Planning Literature*. 8.3. 240-259.

George, V. and P. Wilding. 1985. *Ideology and Social Welfare*. London: Routledge and Kegan Paul.

Gerrard, M.B. 1995. *Whose Backyard, Whose Risk*. Cambridge, Massachusetts: The MIT Press.

Gibbs, D. , J. Longhurst and C. Braithwaite. 1996. Moving towards sustainable development? Integrating economic development and the environment in local authorities. *Journal of Environmental Planning and Management*.

39.3. 317-332..

Gibson, B. 1975. The value of participation. In *Environmental Management and Public Participation.* ed. P.S. Elder. 7-39. Toronto: Canadian Environmental Law Research Foundation.

_______, 1991. ERS 241 Introduction to environmental assessment course. In *Introduction to Environmental Impact Assessment - Readings.* Waterloo: University of Waterloo, Department of Environment Resource Studies.

_______, 1992a. Responding to land-use and environmental conflict: environmental assessment and land-use planning in southern Ontario. In *Growing Demands on a Shrinking Heritage.* eds. M. Ross and J.O. Saunders. 304-321. Calgary, Alberta: Canadian Institute for Resources Law.

______, 1992b. Respecting ignorance and uncertainty. In *Achieving Environmental Goals: The Concept and Practice of Environmental Performance Review.* ed. E. Lykke. 158-178. London: Belhaven.

_________, 1993. Environmental assessment design: lessons from the Canadian experience. *The Environmental Professional.* 15.1. 12-24.

Gillingwater, D. 1975. *Regional Planning and Social Change.* Lexington, Mass. : D.C. Heath & Co.

Gilpin, A. 1995. *Environmental Impact Assessment: Cutting Edge for the Twenty - First Century.* Cambridge, U.K.: Cambridge University Press.

Ginger, C. and P. Mohai. 1993. The role of data in the EIS process: evidence from the BLM wilderness. *Environmental Impact Assessment Review.* 13.2. 109-139.

Glasson, J. 1974. *An Introduction to Regional Planning.* London: Hutchinson and Co.

Glasson, J. 1995. Socio-economic impacts 1: overview and economic impacts. In *Methods of Environmental Impact Assessment.* eds. P. Morris and R. Therivel. 9-28. Vancouver: UBC Press.

Gleick, J. 1987. *Chaos - Making a New Science.* London: Penguin Books.

Goffman, E. 1974. *Frame Analysis.* New York. Harper and Row.

Goldstein, B.E. 1992. Can ecosystem management turn an administrative patchwork into a Greater Yellowstone Ecosystem? *The Northwest Environmental Journal.* 8.3. 285-324.

Goldstein, H.A. 1984. Planning as argumentation. *Environment and Planning B: Planning and Design.* 11. 297-312

Gonzalez, O.J. 1996. Formulating an ecosystem approach to environmental protection. *Environmental Management.* 20.5. 597-605.

Goodin, R.E. 1982. *Political Theory and Public Policy.* Chicago: Chicago University Planning.

Goodland, R. 1993. Definition of environmental sustainability. *International Association for Impact Assessment.* 5.2. 1.

__________. 1994. Environmental sustainability and the power sector. *Impact Assessment* 12.3. 275-304.

Goodman, R. 1971. *After the Planners*. New York: Simon and Schuster.

Gouldner, A.W. 1970. *The Coming Crisis of Western Sociology*. New York: Basic Books Inc.

Government of Canada. 1991. *The State of Canada's Environment*. Ottawa: Ministry of Supply and Services.

Gould, J.S. 1996. *Full House*. New York: Harmony Press.

Gow, D.D. 1992. Poverty and natural resources: principles for environmental sustainability and sustainability development. *Environmental Impact Assessment Review*. 12.1 and 2. 49-65.

Grabow, S. and A. Heskin. 1973. Foundation for a radical concept of planning. *Journal of the American Institute of Planners*. 39.2. 106-114.

Grant, J. 1992. Round tables and the role of business. *Alternatives*. 19.1. 30-33.

_____, 1994. Rhetoric and response: sustainable development in residential environments. *Environments*. 22.3. 2-12.

Greenall, J. W. 1977. The core group as a method for integrating the work of the multi-disciplinary environmental team. *Environmental Impact Assessment in Canada: Processes and Approaches*. 145-158. Institute for Environmental Studies. Toronto: University of Toronto.

___________, 1978. Integrating the work of the multidisciplinary environmental team. In *Geographical Inter-University Resource Management Series*. ed. H.E. Parson. 8. 23-43. Waterloo: Wilfred Laurier University.

______________, 1985. Organizing and managing the planning team. Presentation to *Seminar on Integrated Approaches to Resource Planning*. Banff, Alberta: Banff Centre School of Management.

Greenberg, K. and A. Gabor. 1992. The integration of urban design and planning. *Plan Canada*. May. 26-28.

Greene, J., C. Caracelli, V.J. and W.F. Graham. 1989. Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*. 11.3. 255-274.

Gregory, R. 1989. Political rationality or 'incrementalism'? *Policy and Politics*. 17.2. 139-153.

Grima, A.P. 1977. The role of public participation in the environmental impact assessment process. In *Environmental Impact Assessment in Canada: Processes and Approaches*. eds. M. Plewes and J.B.R. Whitney. 61-76. Toronto: Institute for Environmental Studies.

Grima, A.P., P. Timmerman, C.D. Fowle, P. Byer. 1986. *Risk Management and EIA: Research Needs and Opportunities*. Environmental Assessment Research Council. Ottawa: Ministry of Supply and Services.

Gurstein, P. and J. Curry. 1993. Implementing concepts of sustainable community planning: a case study of Bamberton, British Columbia. *Plan Canada*. March. 7-15.

Habermas, J. 1984. *The Theory of Communicative Action*. Boston: Massachusetts: Beacon Press.

Hadden, S. , J. Chiles, P. Ansejionu and K. Cerny 1981. *High Level Nuclear Waste Management*. Austin: Texas:

Energy and Natural Resources Advisory Council.

Hague, C. 1991. A review of planning theory in Britain. *Town Planning Review*. 62.3. 295-310.

Hall, D. 1990. *Science as a Process*. University of Chicago Press: Chicago.

Hall, P. 1988. *Cities of Tomorrow*. Oxford: Basil Blackwell.

Halstead, J.M., R.A. Chase, S.H. Murdock and F.L.Leistritz, 1984. *Socioeconomic Impact Management - Design and Implementation*. Boulder, Colorado: Westview Press.

Hampden-Turner, C. 1970. *Radical Man - The Process of Psycho-Social Development*. Cambridge: Schrenkman Publishing House.

Hanchey, J.R. 1983a. The objective of public participation. In *Public Involvement Techniques: A Reader of Ten Years Experience at the Institute for Water Resources*. 15-26. Virginia: US Army Corps of Engineers.

____________, 1983b. Involving the public in planning and decision making. 117-126. In *Public Involvement Techniques: A Reader of Ten Years Experience at the Institute for Water Resources*. Virginia: US Army Corps of Engineers.

Hanson, L. 1995. Turning rivals into allies - understanding the wise use movement. *Alternatives*. 21.3. 26-31.

Harashina, S. 1995. Environmental dispute resolution process and information exchange. *Environmental Impact Assessment Review*. 15.1. 69-80.

Harper, T.L. and S.M. Stein. 1992. The centrality of normative ethical theory to contemporary planning Theory. *Journal of Planning Education and Research*. 11.2. 105-116.

____________, 1993. Normative ethical theory - is it relevant to contemporary planning practice? *Plan Canada*. September 6-12.

______________________, 1995a. A classical liberal (libertarian) approach to planning. *A Reader in Planning Ethics*. ed. S. Hendler, 1-29. New Jersey: Centre for Policy Research.

______________________, 1995b. Out of the postmodern abyss: preserving the rationale for liberal planning. *Journal of Planning Education and Research*. 14.4. 233-244.

Harraway, D. 1991. Situated knowledge: the science question in feminism and the privilege of partial perspective, *Simians, Cyborgs and Women - The Reinvention of Women*. New York: Routledge.

Harris, J. 1991. Temagani Stewardship Council: an interview with Mary Laronde. *Alternatives*. 17.4. 7-8.

Hart, S.L. 1984. The costs of environmental review: assessment methods and trends. In *Improving Impact Assessment*. eds. S.L. Hart, G.A. Enk and W.F. Hornick. 333-358. Boulder, Colorado: Westview Press.

Hart, S.L., G.A. Enk and W.F. Hornick. eds. 1984. *Improving Impact Assessment*. Boulder, Colorado: Westview Press.

Hartman, C.W. 1978. Social planning and the political planner. In *Planning Theory in the 1980's*. eds. R.W. Burchell and G. Sternlieb. 73-82. New Brunswick, N.J.: Center for Urban Policy Research.

Harvey, D. 1973. *Social Justice and the City*. Baltimore: John Hopkins University Press.

________, 1978. On planning the ideology of planning. In *Planning Theory in the 1980's*. eds. R.W. Burchell and G. Sternlieb. 213-233. New Brunswick, N.J.: Rutgers University.

__________, 1985. *Consciousness and the Urban Experience.: Studies in the History and Theory of Capitalist Urbanization*. Baltimore, Maryland: John Hopkins University Press.

___________, 1989a. *The Urban Experience*. Baltimore: John Hopkins University Press.

___________, 1989b. *The Conditions of Postmodernity*. Oxford: Basil Blackwell.

__________, 1996. Social justice, postmodernism and the city. In *Readings in Urban Theory*. eds. S. Fainstein and S. Campbell. 415-435. Oxford: Blackwell Publishers. 415-435.

Hawkes, S. 1996. The Gwaii Haanes Agreement: from conflict to consensus. *Environments*. 23.2. 87-100.

Healey, P. G. McDougall and M.J. Thomas. 1982. Theoretical debates in planning: toward a coherent dialogue: conference position paper. In *Planning Theory*. eds. P. Healey, G. McDougall and M.J. Thomas. 5-22. Oxford: Pergamon Press.

Healey, P. 1992. A planner's day - knowledge and action in communicative practice. *Journal of the American Planning Association*. 58.1. 9-20.

_________, 1996. Planning through debate: the communications turn in planning theory. In *Readings in Planning Theory*. eds. S. Campbell and S. Fainstein. 234-258. Cambridge, Massachusetts: Blackwell Publishers Inc.

Hearn, J. 1982. Decrementalism: the practice of cuts and the theory of planning. In *Planning Theory*. eds. P. Healey, G. McDougall and M.J. Thomas. 161-179. Oxford: Pergamon Press.

Hebbert, M. 1982. The new decrementalism - a critique of the territorial approach. In *Planning Theory*. eds. P. Healey, G. McDougall and M.J. Thomas. 102-119. Oxford: Pergamon Press.

Hegmann, G.L. and G.A. Yarranton. 1995. *Cumulative Effects and the Energy Resources Conservation Board's Review Process*. Working Paper #1. Calgary: Macleod Institute for Environmental Analysis.

Heiman, M. 1990. From 'Not in my background' to Not in anyone's backyard!: grassroots challenge to hazardous waste facility siting. *Journal of the American Planning Association*. 56.3. 359-362.

Hendler, S. 1990. Moral theories in professional practice: do they make a difference? *Environment*. 20.3. 20-30.

_______, ed. 1995. *Planning Ethics - A Reader in Planning Theory, Practice and Education*. New Brunswick, New Jersey. Center for Urban Policy Research.

Henshaw, R.E. 1984. The impact judgment: a technical impasse? In *Improving Impact Assessment*. eds. S.L. Hart, G.A.

Enk and W.F. Hornick. 313-324. Boulder, Colorado: Westview Press.

Herman, J.L. , L.L. Morris and C. T. Fitz-Gibbon. 1987. *Evaluator's Handbook.* Newbury Park: Sage Publications.

Heskin, A.D. 1980. Crisis and response. *Journal of the American Planning Association.* 46.1.50-63.

__________, 1991. *The Struggle for Community.* Boulder, Colorado: Westview Press.

Hessing, M. 1993. Women and sustainability - ecofeminist perspectives. *Alternatives.* 19.4. 14-21.

Hickling, A. 1985. Evaluation is a five-finger exercise. In *Evaluation of Complex Policy Problems.* eds. A. Faludi and H. Voogd. 125-134. Delft, Netherlands: Delftsche Uitgevers Maatschappij.

Hicks, B.B. and T.G. Brydges. 1994. A strategy for integrated monitoring. *Environmental Management.* 18.1. 1-12.

Hietkamp, F. 1996. Using stewardship as a guide for planning. *Plan Canada.* July. 28-32.

Hightower, H.C. 1969. Planning theory in contemporary professional education. *Journal of the American Institute of Planners.* 35.3. 326-329.

Hill, D.R. 1992. America's disorganized organicists. *Journal of Planning Literature.* 7.1.3-21.

Hill, M. 1968. A goals-achievement matrix for evaluating alternative plans. *Journal of American Institute of Planners.* 34.1. 19-29.

_____________, 1985. Decision-making contexts and strategies for evaluation. In *Evaluation of Complex Policy Problems.* eds. A. Faludi and H. Voogd. 9-34. Delft, Netherlands: Delftsche Uitgevers Masstschappij.

Hirsch, A. 1988. Regulatory context for cumulative impact research. *Environmental Management.* 12. 5. 715-723.

Hirschman, A.O. and C. Lindblom. 1962. Economic development, research and development, policy making: some converging views. *Behavioural Sciences.* 7.2. 211-222.

Hirschman, D.J. 1994. Peer review and the contrast between science and society. *The Environmental Professional.* 16.1. 79-89.

Hobbs, B.F. 1985. Choosing how to choose: comparing amalgamation methods for environmental impact assessment. *Environmental Impact Assessment Review.* 5. 301-309.

Hobbs, B.F. and A.H. Voelker. *1978. Analytical Multiobjective Decision-Making Techniques and Power Plant Siting: A Survey and Critique.* Prepared for the Department of Energy. Oak Ridges, Tennessee: Oak Ridges National Laboratory.

Hobbs, B.F. , M.D. Rowe, B.L. Pierce and P.M. Meir. 1984. Comparisons of methods for evaluating multi-attributal alternatives in environmental assessments. In *Improving Impact Assessments.* eds. S.L. Hart, G.A. Enk and W.F. Hornick. 227-251. eds. Boulder, Colorado: Westview Press.

Hoch, C. 1984. Doing good and being right. *Journal of the American Planning Association.* 48.4. 333-345.

______, 1992. The paradox of power in planning practice. *Journal of Planning Education and Research*. 11.3. 206-215.

________, 1993. Racism and planning. *Journal of the American Planning Association*. 59.4. 451-460.

________, 1995. *What Planners Do: Power, Politics and Persuasion*. Chicago: APA Planners Press.

Hodge, T., S. Holtz, C. Smith and K.H. Baxter. eds. 1995. *Pathways to Sustainability: Assessing Our Progress*. Ottawa: National Round Table on the Environment and Economy.

Hodge, G. 1991. *Planning Canadian Communities*. Second Edition. Scarborough, Ontario: Nelson Canada.

Hofstadter, D.R. 1980. *Godel, Escher, Bach: An Eternal Golden Braid*. New York: Vintage Books.

Hollick, M. 1981. The role of quantitative decision-making methods in environmental impact assessment *Journal of Environmental Management*. 12.1. 65-78.

__________, 1993. Self organizing systems and environmental management. *Environmental Management*. 17.5. 621-628.

Holling, C.S. ed. 1978. *Adaptive Environmental Assessment and Management*. International Series on Applied Systems Analysis. Chichester: John and Wiley and Sons.

Hoole, A. and G. Milne. 1995. Defining the features of sustainable development for a developing country: the Zimbabwe case. *Journal of Environmental Planning and Management*. 38.4. 505-515.

Hope, B.K. 1995. Ecological risk assessment in a project management context. *The Environmental Professional*. 17.1. 9-19.

Hopkins, L. 1977. Methods for generating land suitability maps: a comparative evaluation. *Journal of the American Institute of Planners*. 43.4. 368-400.

________, 1984. Evaluation of methods for exploring ill-defined problems. *Environment and Planning B: Planning and Design*. 11.3. 339-348.

Hough, M. 1984. *City Form and Natural Process*. New York: Van Nostrand Reinhold.

________, 1990. *Out of Place - Restoring Identity to the Regional Landscape*. London: New Haven.

Howe, E. 1980. Role choices of urban planners. *Journal of the American Planning Association*. 46.4. 398-409.

Howe, E. 1990. Normative ethics in planning. *Journal of Planning Literature*. 5.2. 123-148.

_______, 1992. Professional roles and the public interest. *Journal of Planning Literature*. 6.3. 230-248.

Howell, R.E., M.E. Olsen and D. Olsen. 1987. *Designing a Citizen Involvement Program*. Corvallis, Oregon: Western Rural Development Center. Oregon State University.

Howlett, M. 1992. Differences of opinion: round tables, policy networks and the failure of Canadian environmental strategy. *Alternatives*. 19.1. 25-28.

Htun, N. 1990. EIA and sustainable development. *Impact Assessment Bulletin*. 8.1/2. 16-24.

Huang, S.L. 1990. A land use suitability approach for integrating impact assessment with impact assessment with development planning. *Impact Assessment Bulletin*. 8.1-2. 233-247.

Hubbell, L.K. and T.M. Selden. 1994. The environmental failures of central planning. *Society and Natural Resources*. 7.2.169-180.

Hudson, B.M. 1979. Comparison of current planning theories: counterparts and contradictions. *Journal of the American Planning Association*. 45.4. 387-403.

Hunsaker, Jr., D.B. and D.W. Lee. 1985. Environmental impact assessment of abnormal events: a follow-up study. In *Auditing and Evaluation in Environmental Assessment and Management: Canadian and International Experience*. Proceedings of the Conference on Follow-up / Audit of EIA Results. ed. B. Sadler. 379- 398. Environmental Protection Service of Environment Canada and The Banff Centre, School of Management, Banff, Alberta: The Banff Centre.

Hurst, D. and H. Blank. 1992. Alternative approaches, methods and techniques - role of incentives and compensation. In *Hazardous Materials / Wastes: Social Aspects of Facility Planning and Management*. 471-475. Winnipeg, Manitoba: The Institute for Social Impact Assessment.

Hyman, E. 1984. Land use planning to help sustainable tropical forest resources. *World Development*. 12.4. 837-847.

Hyman, E.L., B. Stiftel, D.H. Moreau and R.C. Nichols. 1988. *Combining Facts and Values in Environmental Impact Assessment*. Boulder, Colerado: Westview Press.

(IJC) International Joint Commission. 1992. *Monitoring for Integrating Analysis. Final Report of the Expert Group on Monitoring to the International Air Quality Advisory Board of the International Joint Commission.*

Inhaber, H. 1992. Of NIMBYs, LULUs, and NIMTOOs. *Public Interest*. 107. 52-64.

Innis, J. E. 1995. Planning theory's emerging paradigm: communicative action and interactive practice. *Journal of Planning Education and Research*. 14.3. 183-190.

________, 1996. Planning through consensus building: a new view of the comprehensive planning ideal. *Journal of the American Planning Association*. 62.4. 460-472.

Interorganizational Committee. 1994. Guidelines and principles for social impact assessment. *Impact Assessment*. 12.2. 107-152.

Interorganizational Committee on Guidelines and Principles for Social Impact Assessment. 1995. Guidelines and principles for social impact assessment. *Environmental Impact Assessment Review* 15.1.11-44.

International Associates. 1986. *Conflict Resolution in Organizations*. Handout from the third national conference in peace-making and conflict resolution. June 1986. Denver, Colorado.

(IISD) International Institute for Sustainable Development. 1992. *Business Strategy for Sustainable Development.* Winnipeg, Manitoba.

Irving, J. S. *et. al.* 1986. *Cumulative Impacts - Real or Imagined?* Conf-8603104-1, Washington D.C.: U.S. Department of Energy.

Isaacs, C.F.W. 1990. Commentary II. In *The Place of Negotiation in Environmental Assessment.* 67-68. Hull, Quebec: Canadian Environmental Assessment Research Council.

(IUCN) 1980. *World Conservation Strategy: Living Resources Conservation for Sustainable Development.* Gland, Switzerland. IUCN.

Jacobs, J. 1961. *The Death and Life of Great American Cities.* New York: Random House.

Jacobs, M. 1991. *The Green Economy.* Vancouver: UBC Press.

Jacobs P. and B. Sadler. 1986. *Sustainable Development and Environmental Assessment: Perspective on Planning for a Common Future.* A Background Paper Prepared for the Canadian Environmental Assessment Advisory Council. Ottawa: Government of Canada.

Jain, R. K. , L.V. Urban and G.S. Stacey. 1977. *Environmental Impact Analysis.* New York: Van Nostrand Reinhold Company.

Jantsch, E. 1971. Inter- and transdisciplinary university: a systems approach to education and innovation. *Ekistics.* 32.193. 430-437.

________, 1975. *Design for Evolution.* New York: George Braziller.

_______, 1980. *The Self Organizing Universe.* Oxford: Pergamon Press.

Jay, J.T. and E. Schneider. 1994. Embracing complexity: the challenge of the ecosystem approach. *Alternatives.* 20.3. 32-46.

Jeffery, M.I. 1990. Commentary 1. In *The Place of Negotiation in Environmental Assessment.* 53-58. Hull, Quebec: Canadian Environmental Assessment Research Council.

Jeltes, R. and P.A.H. Hermens. 1990. Towards a systematic approach of effect prediction: a handbook as guide and aid for environmental prediction. a review. *Environmental Management.* 14.2. 161-166.

Jeltes, R. 1991. Information for environmental impact assessment. *Impact Assessment Bulletin.* 9.2. 99-108.

Jin, X., K. Hui and A.L. Porter 1992. Urban economic development on a grand scale: impact assessment. *Impact Assessment Bulletin.* 10.1. 79-88.

Johnston, R.A. and M.E. Madison. 1994. Tying mitigation requirements to local general plans. *Environmental Impact Assessment Review.* 14.1. 61-74.

Johnston, R.A. and W.S. McCartney. 1991. Local government implementation of mitigation requirements under the

California Environmental Quality Act. *Environmental Impact Assessment Review*. 11.1. 53-67.

Johnston, R.J. 1983. *Philosophy and Human Geography*. London: Edward Arnold.

Jonas, H. 1959. The practical uses of theory. *Social Research*. 26.2. 65-90.

Jones, A. 1996. The psychology of sustainability: what planners can learn from attitude research. *Journal of Planning Education and Research*. 16.1. 56-65.

Julien, B. 1995. Current and future directions for structured impact assessments. *Impact Assessment*. 13. 4. 403-432

Junker, K. 1994. Understanding the rhetorical nature of science in the implementation of Agenda 21. *The Environmental Professional*. 16.4. 349-355.

Kain, L. 1993. *Compass and Gyroscope: Integrating Science and Politics for the Environment*. Washington D.C. : Island Press.

Kakonge, J.O. and A.M. Imevbore. 1993. Constraints on implementing environmental impact assessments in Africa. *Environmental Impact Assessment Review*. 13.5. 299-308.

Kakonge, J.O. 1994. Monitoring of environmental impact assessments in Africa. *Environmental Impact Assessment Reviews*. 15.3. 275-285.

_________, 1995. Dilemmas in the design and implementation of agricultural projects in various African countries: the role of environmental impact assessment. *Environmental Impact Assessment Review*. 15.3. 275-285.

Kamath, J. 1993. *Cumulative Impacts: Concepts and Assessment Methodology*. MSCE Thesis. January. Norman, Oklahoma: University of Oklahoma.

Kamrin, M.A. 1993. The need for risk assessment by consensus. *Impact Assessment*. 11.2. 167-174.

Kaplan, A. 1964. *The Conduct of Inquiry*. San Francisco: Chandler Publishing Company.

Kartez. J.D. 1989. Rational arguments and irrational audiences. *Journal of the American Planning Association*. 55.4.445-456.

Kartez, J.D. and P. Bowman. 1993. Quick deals and raw deals: a perspective on abuses of public ADR principles in Texas resource conflicts. *Environmental Impact Assessment Review*. 13.5. 319-330.

Kasperson, R.E. 1985. *Rethinking the Siting of Hazardous Waste Facilities*. Worchester, Maine: Clark University, Center for Technology, Environment and Development.

Kateb, G. 1963. *Utopia and Its Enemies*. New York: Schocken Books.

Kaufman, J.L. 1985. Land planning in an ethical perspective. In *Ethics in Planning*. ed. M. Wachs. 291-298. New Brunswick, New Jersey: Rutgers State University of New Jersey.

Kaufman, J.L. and H.M. Jacobs. 1996. A public planning perspective on strategic planning. In *Readings in Planning*

Theory.eds. R.W. Burchell and G. Sternlieb. 323-343. Oxford: Blackwell Publishers.

Kautz, S. 1996. *Liberalism and Community*. Ithaca, N.Y.: Cornell University Press.

Kay, J.J. and E. Schneider. 1994. Embracing complexity: the challenge of the ecosystem approach. *Alternatives*. 20.3. 32-46.

Keating, L. 1978. A defense of the rational model. In *The Structural Crisis of the 1970's and Beyond: The Need for a New Planning Theory*. eds. H. A. Goldstein and S.A. Rosenberry. 186-193. Virginia: Virginia Polytechnic and State University.

Keith, R.F., D.W. Fischer, C.E. De'Ath, E. J. Farkas G.R. Francis and S.L. Lerner. 1976. *Northern Development and Technology Assessment Systems: A Study of Petroleum Development Programs in the Mackenzie Delta-Beaufort Sea, Region and Arctic Islands*. Science Council of Canada. Background Study # 34. Ottawa: Information Canada.

Kellas, H. 1992. Greater Vancouver: sustainability a liveable region. *Plan Canada*. November. 28-30.

Kemp, R. 1982. Critical planning theory - review and critique. In *Planning Theory*. eds. P. Healey, G. McDougall and M.J. Thomas. 59-65. Oxford: Pergamon Press.

Kennedy, A.J. and W.A. Ross. 1992. An approach to integrate impact scoping with environmental impact assessment. *Environmental Management*. 16.4. 475-484.

Kennett, S.A. and A. Perl. 1995. Environmental impact assessment of development-oriented research. *Environmental Impact Assessment Review*. 15.4. 341-360.

Kennett, S.A. 1990. Federalism and sustainable development. *Alternatives*. 17.3. 32-38.

Kent, T.J. 1964. *The Urban General Plan*. San Francisco: Chandler.

Kiernan, M. 1982. Ideology and the precarious future of the Canadian planning profession. *Plan Canada*. 22.1. 14-25.

King, N. 1974. *Planning Theory, An Examination of the Linkages Between Implementation, Knowledge and Action*. Los Angeles: University of California.

Klein, J.T. 1990. *Interdisciplinarity: History, Theory and Practice*. Detroit: Wayne State University.

Klosterman, R.E. 1978. Foundations for normative planning. *Journal of the American Institute of Planners*. 44.1. 37-45.

__________, 1980. A public interest criterion. *Journal of the American Planning Association*. 46.3. 323-340.

__________, 1983. Fact and value in planning. *Journal of the American Planning Association*. 49.3. 216-225.

__________, 1985. Arguments for and against planning. *Town Planning Review*. 56.1.5-19.

Kofinas, G. and J. Griggs. 1996. Collaboration and the B.C. round table: an analysis of a "better way" of deciding. *Environments*. 23.2. 17-40.

Krawetz, N.M. 1981. *Intentions and Practice Reviewed with Reference to Monitoring Prototypes*. Huntly Monitoring Project Final Project No. 10. Hamilton, New Zealand: University of Waikato.

Krawetz, N. M. , W.R. MacDonald and R. Nichols. 1987. *A Framework for Effective Monitoring*. Canadian Environmental Assessment Research Council. Ottawa: Ministry of Supply and Services Canada.

Kreiger, M.H. 1974. Some new directions for planning theories. *Journal of the American Institute of Planners*. 40.3. 156-163.

__________, 1981. *Advice and Planning*. Philadelphia: Temple University Press.

Krober, G. 1992. Environmentally sound technology in the context of sustainable development In *Environmentally Sound Technology for Sustainable Development*. Advanced Technology Assessment System. 25-29. Issue # 7. New York: United Nations.

Krumholz, N. 1982. A retrospective view of equity planning: Cleveland, 1969-1979. *Journal of the American Planning Association*. 48.4.

________, 1994. Advocacy planning: can it move the center. *Journal of the American Planning Association*. 60.2. 150-151.

Krumholz, N. and J. Forester. 1990. *Making Equity Planning Work: Leadership in the Public Sector*. Philadelphia, Pennsylvania: Temple University Press.

Kuik, O. and H. Verbruggen. 1991. *In Search of Indicators of Sustainable Development*. Vol. 1, Boston: Kluwer Academic Publishing.

Kukoy, S.J. and L.W. Canter. 1995. Mitigation banking as a tool for improving wetland preservation via Section 404 of the Clean Water Act. *The Environmental Professional*. 17.4. 301-308.

Kurian, P.A. 1995. Environmental impact assessment in practice - a gender critique. *The Environmental Professional*.17.3. 167-178.

Kunstler, J.H. 1993. *The Geography of Nowhere*. New York: Simon and Schuster.

Kuusinen, T., A. Lesperance and G. Bilyard. 1994. Toward integrated strategies for achieving environmental quality. *The Environmental Professional*. 16.1.22-27.

Lachavanne, J.B. 1991. The environmental integration study (eis): an essential adjunct to the environmental impact study (eis). *Impact Assessment Bulletin*. 9.3. 89-98.

Lake, R.W. 1993. Planners' alchemy: transforming NIMBY to YIMBY: rethinking NIMBY. *Journal of the American Planning Association*. 59.1. 87-92.

Landre, B.K. and B.A. Knuth. 1993. Success of citizen advisory committees in consensus-based water resources planning in the Great Lakes Basin. *Society and Natural Resources*. 6.3. 229-258.

Lane, P. A., R.R. Wallace, R.J. Johnson and D. Bernard. 1988. *A Reference Guide to Cumulative Effects Assessment.* Volume 1, Prepared for the Canadian Environmental Assessment Research Council.

Lang, R. and A. Armour. 1977. The process of environmental impact assessment: making it work for Canada. In *Environmental Impact Assessment in Canada: Processes and Approaches*.eds. M. Plewes and J.B.R. Whitney. Toronto: University of Toronto, Institute for Environmental Studies.

__________________. 1981. *The Assessment and Review of Social Impacts.* Technical Report # 1. Hull, Quebec: Federal Environmental Assessment Review Office.

Lang, R. 1986. Achieving integration in resource planning. In *Integrated Approaches to Resource Planning and Management.* ed. R. Lang. 27-50. The Banff Centre School of Management. Calgary, Alberta: The University of Calgary Press.

______, 1990. Equity in siting solid waste management facilities. *Plan Canada.* 30.2. 5-13.

Lant, C. and C. Sherrill. 1995. The role of NIMBY groups in 22 sanitary landfill sitings in Illinois. *The Environmental Professional.* 17. 3. 243-250.

Lasswell, H.D., 1971. *A Preview of Policy Sciences.* New York: American Elsevier.

Lauria, M. and M. J. Soll. 1996. Communicative action, power and misinformation in a site selection process. *Journal of Planning Education and Research.* 15. 3. 199-211.

Lawrence, D. 1992. Planning and environmental assessment: never the twain shall meet? *Plan Canada.* July. 22-26.

________, 1993. Quantitative versus qualitative evaluation: a false dichotomy? *Environmental Impact Assessment Review.* 13.1. 3-13.

________, 1994 a. The characteristics and aims of environmental impact assessment. *Plan Canada.* March. 6-10.

________, 1994 b. Cumulative effects assessment at the project level. *Impact Assessment.* 12.3. 253-274.

_______, 1994 c. Designing and adapting the EIA planning process. *The Environmental Professional.* 16 1. 2-21.

_______, 1996. Approaches and methods of siting locally unwanted waste facilities. *Journal of Environmental Planning and Management.* 39.2. 165-188.

______, 1997a. Integrating sustainability and environmental impact assessment. *Environmental Management.* 21.1. 23-42.

_______, 1997b. EIA - Do we know where we are going? *Impact Assessment.* 15.1. 3-14.

Lawrence, P.R. and J. W. Lorsch. 1967. *Organization and Environment: Managing Differentiation and Integration.* Boston: Harvard University Graduate School of Business Administration, Division of Research.

Leaning, J. 1994. Questions late in the day. *Environmental Impact Assessment Review*. 14.5. 321-326.

Lee, B. , L. Haworth, L. and C. Brunk. 1995. Values and science in impact assessment. *Environments*. 23.1. 93-100.

Lee, N. and R. Colley. 1991. Reviewing the quality of environmental statements: review methods and findings. *Town Planning Review*. 62.2. 239-248.

Lein, J.K. 1992. Expressing environmental risk using fuzzy variables: a preliminary examination. *The Environmental Professional*. 14. 3. 257-267.

_____, 1993. Formalizing expert judgement in the environmental impact assessment process. *The Environmental Professional*. 15.1. 95-102.

Leiss, W. 1974. *The Domination of Nature*. Boston: Beacon Press.

_______, ed. 1987. *Prospects and Problems in Risk Communications*. Waterloo, Ontario: University of Waterloo Press.

Leistritz, F.R. 1994. Economic and fiscal impact assessment. *Impact Assessment*. 12.3. 305-318.

Leitmann, J. 1993. Rapid urban environmental assessment: toward environmental management in cities of the developing world. *Impact Assessment*. 11.3.225-260.

Lemons, J. 1995. Shrader-Frechette's schemata for scientific research: implications for environmental professionals. *The Environmental Professional*. 17.1. 72-77.

Lemons, K.E. and A. L.Porter. 1992. A comparative study of impact assessment methods in developed and developing countries. *Impact Assessment Bulletin*. 10.3. 57-66.

Lemons, J. and E. Saboski. 1994. The scientific and ethical implications of Agenda 21: Biodiversity. in *Ethics and Agenda 21*. Eds. N.J. Brown and P. Quiblier. 61-68. New York: United Nations.

Lerman, P. 1994. *Physical Planning Linked to EIA: A Method for Processing Knowledge That Promotes Sustainability and Efficient Procedures*. Third EU (European Union) Workshop on EIA, Methodology and Research. Delphi, Greece: European Community. Director General XI, 173-176.

Lerner, S. 1994. Local stewardship: training ground for an environmental vanguard. *Alternatives*. 20.2. 14-19.

Leu, W.S., W.P. Williams and A. W. Bark. 1996. Development of an environmental assessment evaluation model and its application: Taiwan case study. *Environmental Impact Assessment Review*. 16. 2. 115-133.

Leung, H.L. 1985. *Toward a Subjective Approach to Policy Planning and Evaluation: Common Sense Structured*. Winnipeg, Manitoba: Ronald P. Fyre and Company.

Lewis, W.C. 1982. The environmental assessment and review process: a practitioner's critique. *Impact Assessment Bulletin*. 2.1. 63-74.

Lichfield, N. 1985. From impact assessment to impact evaluation. In *Evaluation of complex policy problems*. eds. A.

Faludi and H. Voogd. 51-66. Delft, Netherlands: Delftsche Uitgevers Maatschappij.

_________, 1996. *Community Impact Evaluation.* London: University College Press.

Lichfield, N., P. Kettle and M. Whitbread. 1975. *Evaluation in the Planning Process.* Oxford: Pergamon Press.

Liebow, E. 1993. Who is expert at interpreting environmental hazards? a commentary on the disabling effects of an expert / layperson dichotomy. *The Environmental Professional.* 15.3. 288-292.

Liggett, H. 1992. Knowing women / planning theory. *Planning Theory.* 7/8.

Lindblom, C. 1959. The science of muddling through. *Public Administrative Review.* 19.2. 79-88.

___________, 1965. *The Intelligence of Democracy: Decision Making Through Mutual Adjustment.* New York: Free Press.

_________, 1968. *The Policy Making Process.* Englewood Cliffs, N.J.: Prentice Hall Inc.

_________, 1973. Incrementalism and environmentalism. In *National Conference on Managing the Environment. Final Report.* Washington, DC : Environmental Research Center, US Environmental Research Center.

____________, 1977. *Politics and Markets: The World's Political Economic Systems.* New York: Basic Books, Inc.

_________, 1979. 'Still muddling , not yet through' *Public Administration Review.* 39.6. 517-526.

Linder, S.H. and B.G. Peters. 1986. From social theory to policy design. *Journal of Public Policy.* 4.3. 237-259.

Livingston, J.A. 1981. *The Fallacy of Wildlife Conservation.* Toronto: McClelland and Stewart Ltd.

Lober, D.J. 1995. Resolving the siting impasse: modelling social and environmental locational criteria with a geographic information system. *Journal of the American Planning Association.* 61.4. 482-495.

_________, 1996. Why not here?: the importance of context, process and outcome on public attitudes toward siting of waste facilities. *Society and Natural Resources.* 9.4. 375-394.

Lohani, B.N. and N. Halim. 1987. Recommended methodologies for rapid environmental impact assessment in developing countries. In *Environmental Impact Assessment for Developing Countries.* eds. A.K. Birwas and Q. Geping. 65-111. London: Tycooly International.

Lowrance, W.W. 1976. *Of Acceptable Risk - Science and the Determination of Safety.* Los Altos, California: William Kaufmann, Inc.

Lucy, W. 1985. Equity and planning for local services. *Journal of the American Planning Association.* 47.4. 447-457.

Lynch, K. 1981. *Good City Form.* Cambridge, Massachuesetts: MIT Press.

Lyon, K.A. 1990. Factors influencing public policy makers' interpretation of impact assessments. *Impact Assessment*

Bulletin. 8.1/2. 249-260.

MacBurnie, I. 1992. Reconsidering the dream: alternative design for sustainable suburban development. *Plan Canada.* September. 19-23.

MacDonald, D. 1991. *The Politics of Pollution.* Toronto: McClelland and Stewart Inc.

Maclaren, V.W. 1985. Multi-criteria evaluation methods. In *New Directions in Environmental Impact Assessment.* eds. V.W. Maclaren and J.B. Whitney, 221-245. Toronto: Methuen.

__________, 1996. Urban sustainabilty indicators. *Journal of the American Planning Association.* 62.2. 184-202. Maclaren V.W. and J.B. Whitney. 1985. *New Directions in Environmental Impact Assessment in Canada.* Toronto: Methuen.

Malik, M. and R.V. Bartlett. 1993. Formal guidance for the use of science in EIA: analysis of agency procedures for implementing NEPA. *The Environmental Professional.* 15.1. 34-45.

Malik, M. 1995. Environmental procedures of international organizations: a preliminary evaluation. *The Environmental Professional.* 17.2. 93-102.

Manitoba. 1996. *White Paper on the Sustainable Development.* Sustainability Manitoba.

Mann, L and P. Weirs. 1973. Practicable planning theory for the 70's. Presented at *Confer-In- 73 American Institute of Planners.*

Mannheim, K. 1935. *Man and Society in an Age of Reconstruction.* New York: Harcourt Brace and Co.

__________, 1936. *Ideology and Utopia.* New York: Harcourt Brace Jovanovich.

Manning, E.W. 1990. Conservation strategies - providing the vision for sustainable development. *Alternatives* 16.4 and 17.1, 24-28.

Manning, N., P.C. West and P. Bidol. 1990. Social impact assessment and environmental conflict management: potential for integration and application. *Environmental Impact Assessment Review.* 10.3. 253-266.

Manuel, F. ed. 1965. *Utopias and Utopian Thought.* Boston: Beacon Press.

March, J.G. 1979. Bounded rationality, ambiguity and the engineering of choice. *Bell Journal of Economics.* 9.2. 587-608.

________, 1982. Theories of choice and making decisions. *Society.* November-December. 29-39.

Marcus, L.G. 1979. *A Methodology for Post-EIS (Environmental Impact Statement) Monitoring.* Geological Survey Circular 782. Washington, D.C. : U.S. Geological Survey.

Marcuse, P. 1976. Planning ethics and beyond: values in planning. *Journal of American Institute of Planning.* 42.3. 264-274.

Margerum, R.D. and S.N. Born. 1995. Integrated environmental management: moving from theory to practice. *Journal of Environmental Planning and Management.* 38.3. 371-392.

Marris, P. 1982. *Community Planning and Conceptions of Change.* London: Routledge and Kegan.

Marshall, D., B. Sadler, J. Sector and J. Wiebe. 1985. *Environmental Management and Impact Assessment: Some Lessons and Guidance for Canadian and International Experience.* Prepared for Workshop on Environmental Impact Assessment Procedures in Australia, Canada and New Zealand. Wellington, New Zealand: Federal Environmental Assessment Review Office.

Marshall, D.W. and L.S. Wolfe. 1985. Identification and analysis of environmental issues associated with Beaufort Sea hydrocarbon production and transportation. In *Proceedings of 8th Annual Meeting of the International Society of Petroleum Industry Biologists.* 101-107. Banff, Alberta, Canada.

Marshall, G. 1994. *The Concise Oxford Dictionary of Sociology.* Oxford: Oxford University Press.

Marvin, E.O. , D. G. Lodwick and R.E. Dunlap.1992. *Viewing the World Ecologically.* Boulder, Colorado: Westview Press.

Massam, B.H. 1980. *Multi-Criteria Decision Making (MCDM) Techniques in Planning.* Oxford: Pergamon Press.

______, 1988a. *Spatial Search.* Oxford: Pergamon Press.

______, 1988b. *Multi-Criteria Decision Making (MCDM) Techniques in Planning.* Oxford: Pergamon Press.

______, 1993. *The Right Place.* Harlow, England: Longman Scientific and Technical.

Mayda, J. 1996. Reforming impact assessment: issues, premises and elements. *Impact Assessment.* 14.1. 87-96.

Mayer, R.B. and E. Greenwood. 1980. *The Design of Social Policy Research.* Englewood Cliffs, New Jersey: Prentice Hall.

Maynes, C. 1989. *Public Consultation: A Citizens Handbook.* Toronto: Ontario Environmental Network.

Mazmanian, D.A. and D. Morrell. 1994. The "NIMBY" syndrome: facility siting and the fabric of democratic discourse In *Environmental Policy in the 1990's.* eds. N.J. Vig and M.E. Kraft. 233-249. Washington, D.C. : C.Q. Press.

Mazziotti, D.F. 1982. The underlying assumptions of advocacy planning: pluralism and reform. In *Critical Readings in Planning Theory.* ed. C. Paris. 207-225. Oxford: Pergamon Press.

McAllister, D.M. 1980. *Evaluation in Environmental Planning.* Cambridge, Massachesetts: The MIT Press.

McCold, L. and J. Holman. 1995. Cumulative impacts in environmental assessments: how well are they considered? *The Environmental Professional.* 17.1. 2-8.

McConnell, S. 1995. Rawlsian planning theory. In *Planning Ethics.* ed. S. Hendler. New Brunswick, New Jersey: Centre for Policy Research. 30-49.

McCullough, R.S. and I. Burton. 1982. The nature of risk and risk management. In *Living with risk: environmental risk management in Canada*. eds. I. Burton, C.D. Fowle and R.S. McCullough. 1-6. Environmental Monograph No. 3. Toronto: Institute for Environmental Studies.

McDonald, G.T. 1991. Regional economic and social impact assessment. *Environmental Impact Assessment Review*. 10.1/2. 25-36.

__________, 1996. Planning as sustainable development. *Journal of Planning Education*. 15.3. 237-241.

McDonald, G.T. and L. Brown. 1995. Going beyond environmental impact assessment: environmental input to planning and design. *Environmental Impact Assessment Review*. 15.6. 483-496.

McDougall, G. 1978. Theory and practice: a critique of the political economic approach to planning. In *Planning Theory*. eds. P. Healey, G. McDougall and M.J. Thomas. 258-271. Oxford: Pergamon Press.

McElliott, C.R. 1978. The HUD area wide environmental impact statement: an innovation. *EIA Review*. 18-22.

McGee, K.D. 1992. Overcoming "NIMBY" in municipal waste management planning. In *Municipal Solid Waste Management*. ed. M.E. Haight. 331-351. Waterloo: University of Waterloo.

McGlennon, J.A.S. and L. Susskind. 1990. Responsibility, accountability and liability in the conduct of environmental negotiations. In *The Place of Negotiations in Environmental Assessment*. 61-64. Hull, Quebec: Canadian Environmental Assessment Research Council.

McHarg, I. 1968. A comprehensive highway route selection method. *Highway Research Record*. 26.1. 1-15.

________, 1969. *Design with Nature*. Garden City, N.J. : Doubleday.

McKenney, M.J. 1988. Water resources planning: a collaborative, consensus-building approach. *Society and Natural Resources*. 1.4. 335-40.

McLain, R.J. and R.G. Lee. 1996. Adaptive management: promises and pitfalls. *Environmental Management*. 20.4. 437-448.

McLoughlin, J.B. 1969. *Urban and Regional Planning: A Systems Approach*. London: Faber and Faber.

Meadows, D.H., D. L. Meadows and J. Randers. 1992. *Beyond the limits*. Toronto: McClelland and Stewart Inc.

Mennell, S. 1974. *Sociological Theory - Uses and Critics*. London: Thomas Nelson and Sons Ltd.

Meredith, T. 1991 Environmental impact assessment and monitoring. In *Resource Management and Development*. ed. B. Mitchell. 224-245. Toronto: Oxford University Press.

Merton, R.K. 1949. *On Theoretical Sociology*. New York: The Free Press.

Metzger, J.T. 1996. The theory and practice of equity planning: an annotated bibliography. *Journal of Planning Literature*. 11.1. 112-126.

Meyerson, M. and E. C. Banfield. 1955. *Politics, Planning and the Public Interest.* New York: Free Press.

Michael, D. N. 1973. *On Learning to Plan - and Planning to Learn.* San Francisco: Jossey-Bass.

___________, 1989. Forecasting and planning in an incoherent context. *Technological Forecasting and Social Change.* 36. 79-87.

Michaelson, W.H. 1970. *Man and His Urban Environment.* Reading, Massachuesetts: Addison-Wesley Publishing Company.

Mier, R. 1994. Some observations on race in planning. *Journal of the American Planning Association.* 60.2. 235-240.

Milbraith, L.W. 1989. *Envisioning a Sustainable Society.* Albany: State University of New York Press.

Miller, A. 1993. The role of analytical science in natural resources decision-making. *Environmental Management.* 17.5. 563-574.

Miller, D.J. 1985. Equity and efficiency effects of investment decisions: multicriteria methods for assessing distributional implications. In *Evaluation of Complex Policy Problems.* eds. A. Faludi and H. Voogd. 35-50.Delft, Netherlands Delftsche Uitgevers Mastschappij.

Miller, R.E. 1984. The EIS and the decision maker: closing the gap. In *Improving Impact Assessment.* eds. S.L. Hart, G.A. Enk and W.F. Hornick. 289-311. Boulder, Colorado: Westview Press.

Mills, C. W. 1959. *The Sociological Imagination.* London: Oxford University Press.

Milroy, B.M. 1991. Into postmodern weightlessness. *Journal of Planning Education and Research.* 10.3. 181-188.

Ministry for the Environment. 1992. *Scoping of Environmental Effects: a Guide to Scoping and Public Review Methods in Environmental Assessment.* MfE, Wellington.

Mitchell, B. 1986. The evolution of integrated resources management. In *Integrated Approaches to Resource Planning and Management.* ed. R. Lang. 13-26. Calgary: University of Calgary Press.

___________, 1991a. 'BEATing' conflict and uncertainty in resource management and development. In *Resource Management and Development.* ed. B. Mitchell. 268-286. Oxford: Oxford University Press.

___________, ed. 1991b. *Resource Management and Development.* Toronto: Oxford University Press.

Mitchell, B. And R. Turkheim. 1977. Environmental impact assessment: principles, practice and Canadian experiences. In *Managing Canada's Resources.* eds. R. Krueger and B. Mitchell. Toronto: Methuen.

Mitzberg, H. 1994. *The Rise and Fall of Strategic Planning.* New York: Free Press.

Moore, R.C. 1985. Strategies for successful mitigation of socioeconomic impacts. *Waste Management '85.* Proceedings of the Symposium on Waste Management. Tuscon, Arizona: The U.S. Department of Energy. 101-107.

Moore, S.A. 1996. Defining "successful" environmental dispute resolution: case studies from public land planning in the United States and Australia. *Environmental Impact Assessment Review*. 16. 2. 151-169.

Morell, D. 1984. Siting and the politics of equity. *Hazardous Waste*. 1.4. 555-571.

Morris, E.W. 1996. Community in theory and practice: a framework for intellectual renewal. *Journal of Planning Literature*. 11.1. 127-150.

Morris, P. and J. Biggs. 1995. Water. In *Methods of Environmental Impact Assessment*. eds. P. Morris and R. Therivel. 161-196. Vancouver, B.C. : UBC Press.

Morris, P. and R. Therivel. 1995. *Methods of Environmental Impact Assessment*. Vancouver: UBC Press.

Morrone, M. 1992. Walking a tight rope: planning and the environmental movement. *Journal of Planning Literature*. 7.1.100-107.

Mostert, E. 1996. Subjective environmental impact assessment: causes, problems and solutions. *Impact Assessment*. 14.2. 191-214.

Moudon, A. V. 1992. A catholic approach to organizing what urban designers should know. *Journal of Planning Literature*. 6.4. 331-349.

Muller, J. 1982. Promotive planning: towards an approach to planning for the disadvantaged (Case Study: Soweto). In *Planning Theory*. eds. P. Healey, G. McDougall and M.J. Thomas. Oxford: Pergamon Press. 246-257.

Munn, R.E. 1975. *Environmental Impact Assessment: Principles and Procedures*. Paris: SCOPE Secretariat.

________, ed. 1979. *Environmental Impact Assessment: Principles and Procedures*.2nd. Ed. SCOPE 5. Toronto: John Wiley and Sons.

Munro, D.A., T.J. Bryant and A. Matte-Baker. 1986. *Learning from Experience: A State-of-the-Art Review and Evaluation of Environmental Impact Assessment Audits*. Ottawa: Supply and Services Canada.

Munro, D.A. 1986. Environmental impact assessment as an element of environmental management. In. *Cumulative Environmental Effects: A Binational Perspective*. 25-36. The Canadian Environmental Assessment Research Council (CEARC), Ottawa, Ontario and the United States National Research Council (NRC), Washington, D.C., Ministry of Supply and Services, Canada.

Munro, D.A., T.J. Byrant and A. Matte-Baker. 1986. *Learning from Experience: A State-of-the-Art Review and Evaluation of Environmental Impact Assessment Audits*. Canadian Environmental Assessment Research Council. Ottawa: Ministry of Supply and Services.

Mygatt, S.G. 1984. The uses of scoping: the Massachusetts Experience. In *Improving Impact Assessment: Principles and Procedures*. eds. S.L. Hart, G.A. Enk and W.F. Hornick. 399-402. Boulder, Colorado: Westview Press.

Myles, E. 1992. New concepts in community involvement in hazardous waste facility siting. *Hazardous Materials / Wastes: Social Aspects of Facility Planning and Management Conference Proceedings*. 452-457. The Institute for Social Impact Assessment.

Nagel, J.H. 1987. *Participation.* Englewood Cliffs, New Jersey: Prentice-Hall Inc.

Nelson, J.G. and R. Serafin. 1995. Post hoc assessment and environmental planning. *Environments I.* 23.1. 3-9.

Nesbitt, T.H.D. 1990. Environmental planning and environmental, social IA methodology in the cross-ultural context. *Impact Assessment Bulletin.* 8.3. 33-44.

Neuman, W.L. 1997. *Social Research Methods.* Third Edition. Boston: Allyn and Bacon.

Nicholas, G. and I. Prigogine. 1989. *Exploring Complexity.* New York: W.H. Freeman and Co.

Nichols, R. and E. Hyman. 1988. *A Review and Analysis of Fifteen Methodologies for Environmental Assessment.* Chapel Hill, North Carolina: Center for Urban and Regional Studies.

Nijkamp, P. 1985. Evaluation and information: a spatial perspective. In *Evaluation of Complex Policy Problems.* eds. A. Faludi and H. Voogd. 79-88. Delft, Netherlands: Delftsche Uitgevers Maatschappij.

Niu, W., J.J. Lu and A.A. Khan. 1993. Spatial systems approach to sustainable development: a conceptual framework. *Environmental Management.* 17.2. 179-186.

Nixon, J. 1980. The importance of communication in the implementation of government policy at local level. *Policy and Politics.* 8.2. 127-144.

Novek, J. 1995. Environmental impact assessment and sustainable development: case studies of environmental conflict. *Society and Natural Resources.* 8.2. 145-160.

Nowlan, D.M. 1974. *The Use of Criteria Weights in Rank Ordering Techniques of Project Evaluation.* Research Report # 19. Toronto: University of Toronto - York University Joint Program in Transportation.

O'Brien, M.H. 1994. The scientific imperative to move beyond "just not quite fatal". *The Environmental Professional.* 16.4. 356-365.

Ochsner, M and C. Chess. 1996. Pollution prevention's promise, limits, and relevance to planners. *Journal of Planning Literature.* 11.1. 5-16.

O'Hare, M. 1977. Not on my block you don't: facility siting and the strategic importance of compensation. *Public Policy.* 25.4. 407-458.

Okrainetz, G. 1994. The integration of traditional ecological knowledge and scientific knowledge in the assessment of cumulative effects: the experience of the Hudson Bay Programme. In *Cumulative Effects Assessment: From Concept to Practice.* ed. A.J. Kennedy. 149-158. Edmonton, Alberta: Alberta Society of Environmental Biologists.

O'Neill, H.J., R. A. Bingham, G.D. Howell, F. C. Deirden and C. Roberts. 1993. Development of an integrated environmental data base. *Environmental Management.* 17.2. 257-265.

Orians, G.H. 1986. Opening discussions - cumulative effects: setting the stage. In. *Cumulative Environmental Effects: A Binational Perspective.* 1-6. The Canadian Environmental Assessment Research Council (CEARC) Ottawa, Ontario and The United States National Research Council (NRC), Washington, D.C., Ministry of Supply and Services, Canada.

O'Riordan, T. and R. Hey. eds. 1976. *Environmental Impact Assessment*. Farnborough: Saxon Press.

O'Riordon, T. 1988. The politics of sustainability. In *Sustainable Environmental Management*. ed. R.K. Turner. 29-50. London: Belham Press.

Ortolano, L. 1993. Controls on project proponents and environmental impact assessment effectiveness. *The Environmental Professional*. 15. 4. 352-363.

Ortolano L. and A. Shepherd. 1995. Environmental impact assessment: challenges and opportunities. *Impact Assessment*. 13.1. 3-30.

Oxford. 1990. *The Concise Oxford Dictionary*. Oxford: Clarendon Press.

Ozawa, C.P. 1991. *Recasting Science: Consensual Procedures in Public Policy Making*. Boulder, Colorado: Westview Press.

Ozbekhan, H. 1969. Toward a general theory of planning. In *Perspective of Planning*. ed. E. Jantsch, 47-154. Proceedings of the OECD Working Symposium on Long Range Forecasting and Planning. Paris: OECD.

Paehlke, R. C. 1989. *Environmentalism and the Future of Progressive Politics*. New Haven: Yale University Press.

Paehlke, R.C. and D. Torgerson. 1990. eds. *Managing Leviathan - Environmental Politics and the Administrative State*. Peterborough, Ontario: Broadview Press.

Parenteau, R. 1988. *Public Participation in Environmental Decision-Making*. Federal Environmental Assessment Review Office. Ottawa: Ministry of Supply and Services.

Paris, C. ed. 1982. *Critical Readings in Planning Theory*. Oxford: Pergamon Press.

Partidario, M.R. 1996. Strategic environmental assessment: key issues emerging from recent practice. *Environmental Impact Assessment Review*. 16.1. 31-56.

Pateman, C. 1970. *Public Participation and Democratic Theory*. Cambridge: Cambridge University Press.

Patton, B.K., K. Griffin and E.N. Patton. 1989. *Decision-Making Group Interaction*. New York: Harper Collins Publishers Inc.

Patton, C.V. and D.S. Sawicki. 1993. *Basic Methods of Policy Analysis and Planning*. Englewood Cliffs, New Jersey: Prentice Hall.

Patton, M. 1987. *Creative Evaluation*. Newbury Park: Sage Publications.

Peacock, K.A. 1995. Sustainability as symbiosis. *Alternatives*. 21.4. 16-22.

Peat, Marwick, Stevenson and Kellogg. 1993. 1993 *Environmental Scan - Evaluating Our Progress Towards*

Sustainable Development. Vancouver: Canadian Council of Ministers of the Environment.

Peattie, L.R. 1994. Communities and interests in advocacy planning. *Journal of the American Planning Association.*60.2. 151-153.

Percivel, R.V. 1992. The ecology of environmental conflict: risk, uncertainty and the transformation of environmental policy disputes. In *Studies in Law, Politics and Society.* 12. eds. S.S. Silbey and A. Sarat. Greenich, Connecticut: JAI.

Perks, W. and D.V. Vliet. 1993. Sustainable community: restructuring and demonstration. *Plan Canada.* November. 30-36.

Peterson, E.M., Y.H. Chin, N.M. Peterson, G.A. Constable, R.B. Caton, C.S. Davis, R.R. Wallace and G.A. Yarranton. 1987. *Cumulative Effects Assessment in Canada: An Agenda for Action and Research.* Canadian Environmental Assessment Research Council. Ministry of Supply and Services.

Pickvance, C. 1985. The rise and fall of urban movements and the role of comparative analysis. *Environment and Planning D: Society and Space.* 3. 31-53.

Pinkerton, E.W. 1993. Co-management efforts as social movements: the Tin Wis coalition and the drive for forest practices legislation in British Columbia. *Alternatives.* 19.3. 33-46.

_______, 1996. The contribution of watershed-based multi-party co-management agreements to dispute resolution: the Skeena Watershed Committee. *Environments.* 23.2.51-68.

Piven, F.F. and R. A. Cloward. 1978. Social movements and social conditions: a response to Roach and Roach. *Social Problems.* 26.2. 172-178.

________________________, 1979. *Poor People's Movements: Why They Succeed. How They Fail.* New York: Vintage Books.

Pollock, L. 1996. *The Free Society.* Boulder, Colorado: Westview Press.

Popper, K. 1972. *Objective Knowledge: An Evolutionary Approach.* Oxford: Oxford University Press.

_______, 1986. [1957]. *The Poverty of Historicism.* London: Routledge and Kegan Paul.

Porter, A.L. 1995. Technology assessment. *Technology Assessment.* 13.2. 135-152.

Portney, K.E. 1983. *Citizen Attitudes Towards Hazardous Waste Facility Siting: Public Opinion in five Massachusetts Communities.* Medford, Maine: Tufts University, Lincoln Filene Centre for Citizenship and Public Affairs.

__________, 1985. The potential of the theory of compensation for mitigating public opposition to hazardous waste treatment facility siting: some considerations in five Massachusetts communities. *Policy Studies Journal.* 14. 181-189.

Power, M., G. Power and D.G. Dixon. 1995. Detection and decision-making in environmental effects monitoring. *Environmental Monitoring.* 19.5. 629-639.

Praxis. 1988. *Public Involvement - Planning and Implementing Public Involvement Programs*. Calgary, Alberta: Praxis.

Pressman, J.L. and A. Wildavsky. 1973. *Implementation*. Berkeley: University of California Press.

Preston, E. M. and B. L. Bedford. 1988. Evaluating cumulative effects on wetland functions: a conceptual overview and generic framework. *Environmental Management*. 12.5. 563-583.

Principles and Guidelines. 1983. *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implications Studies*. Washington, D.C.: Executive Office of the President.

Priscoli, J.D. 1983. Public involvement and social impact assessment: a union seeking a marriage. In *Public Involvement and Social Impact Assessment*. Eds. G.A. Daneke, M.W. Garcia and J.D. Priscoli. 271-282. Boulder, Colorado: Westview Press.

Priscoli, J.D. and P. Homenuck. 1986. Consulting the public. In *Integrated Approaches to Resource Planning and Management*. 67-80. Calgary, Alberta: University of Calgary Press.

Province of British Columbia. July 1995. *Guide to the British Columbia Environmental Assessment Office*. Victoria, B.C: Environmental Assessment Office.

________________________, February 18, 1988. *Waste Management Act - Special Waste Regulations*. B.C. Reg. 63/88. O.C. 268/88.

Province of Nova Scotia. 1995. *Regulations Respecting Environmental Assessment Made by the Governor in Council Pursuant to Section 49 of Chapter 1 of the Statutes of Nova Scotia, 1994-95, The Environment Act*, Schedule A.

Pushchak, R. and I. Burton. 1983. Risk and prior compensation in siting low level nuclear waste facilities: dealing with the NIMBY syndrome. *Plan Canada*. 25.3. 68-80.

Quade, E.S. 1975. *Analysis of Public Decisions*. New York: Elsevier North Holland Inc.

Rabe, B.G. 1995. *Beyond NIMBY*. Washington, D.C.: Brookings Institution.

Rabl, A. and B. Peuportier. 1995. Impact pathway analysis: a tool for improving environmental decision processes. *Environmental Impact Assessment Review*. 15. 5. 421-442.

Ramchandami, R. and D. Pearce. 1992. *Alternative Approaches to Setting Effluent Quality Standards: Precautionary, Critical Load and Cost Benefit Approaches*. Centre for Social and Economic Research on the Global Environment. Working Paper W14.92.04. London: University College.

Rapport, D.J., H.A. Regier and T.C. Hutchinson. 1985. Ecosystem behaviour under stress. *American Naturalists*. 125:617-640.

Rapoport, A. 1990. *History and Precedent in Environmental Design*. New York: Plenum Press.

Rawls, J. 1971. *A Theory of Justice*. Cambridge, Massachusetts: Harvard University Press.

______, 1985. Justice as fairness: political not metaphysical. *Philosophy and Public Affairs*. 14. 223-251.

Rau, J.G. and D.C. Wooten. 1980. *Environmental Impact Assessment Handbook*. New York: McGraw Hill Publishing Company.

Reade, E.J. 1982. The theory of town and country planning. In *Planning Theory*. eds. P. Healey, G. McDougall and M. J. Thomas. 43-59. Oxford: Pergamon Press.

Reckhow, K. H. 1994. Importance of scientific uncertainty in decision making. *Environmental Management*. 18.2. 161-166.

Reed, M.G. 1994. Locally responsive environmental planning in the Canadian hinterland: a case study in northern Ontario. *Environmental Impact Assessment Review*. 14.4. 245-270.

Rees, W. 1990a. Sustainable development and the biosphere concepts and principles. *Teilhard Studies*. 23.

____________, 1990b. The ecology of sustainable development. *Ecologist* 20.1. 18-23.

________, 1995a. Achieving sustainability: reform or transformation. *Journal of Planning Literature*. 9.4. 343-361.

_________, 1995b. Cumulative environmental assessment and global change. *Environmental Impact Assessment Review*. 15. 4. 295-309.

Regier, H. A. 1985. Concepts and methods of AEAM and Holling's ' science of surprise' In *New Directions in Environmental Impact Assessment in Canada*. eds. V. W. Maclaren and J. B. Whitney. 43-52. Methuen: Toronto.

________, 1986. Commentary II on Freshwater Systems by J. Cairns Jr. In *Cumulative Environmental Effects: A Binational Perspective*.49-52. CEARC and U.S. National Research Council, Ministry of Supply and Service, Canada.

Reid, D. 1995. *Sustainable Development*. London: Earthscan Publications Ltd.

Rein, M. 1971. Policy analysis as the interpretation of beliefs. *Journal of the American Institute of Planners*. 37.5. 297-310.

Rennick, P.H. 1994. A cumulative effects monitoring system for the Niagara Escarpment Plan Area. In *Cumulative Effects Assessment in Canada: From Concept to Practice*. ed. A.J. Kennedy. 119-134. Edmonton, Alberta: Alberta Association of Environmental Biologists.

Resendiz-Nunez, D. 1992. Sustainability and the nature of development. In *Environmentally Sound Technologyfor Sustainable Development*. Advanced Technology Assessment System. 19-25. Issue # 7. New York: United Nations.

Rich, G. 1993. *The Professional Practice of Urban and Regional Planning in Canada*. San Francisco: E.M. Text.

Richards, A. 1992. Implementing a voluntary and responsive siting process in rural and urban settings. *Impact*

Assessment Bulletin. 10.1. 89-98.

__________, 1996. Implementing a voluntary process for difficult-to-site projects. *Plan Canada.* January. 31-32.

Richardson, N. 1994. Moving toward planning for sustainability: integrating environmental assessment and land use planning in Ontario. *Plan Canada.* March 1994. 18-23.

___________, 1996. What is a "sustainable city" ? *Plan Canada.* September. 34-38.

Rickson, R.E., J.S.Western and R.J. Burdge. 1990. Social impact assessment: knowledge and development. *EnvironmentalImpact Assessment Review.* 10. 1/2. 11-24.

Rickson, R.E., J.S. Burdge, T. Hundloe and G.T. McDonald. 1991. Institutional constraints to adoption of social impact assessment as a decision-making and planning tool. *Environmental Impact Assessment Review.* 10.1/2. 233-322.

Rigby, B. 1985. Post development audits in environmental impact assessment. In *New Directions in Environmental Impact Assessment in Canada.* eds. V. W. Maclaren and J. B. Whitney. 179-220. Toronto: Methuen.

Rittel, H. W. and M.M. Webber. 1973. Dilemmas in a general theory of planning. *Policy Sciences.* 4. 155-169.

Rivas, V., A. Gonzalez, D.W. Fischer and A. Cendrero. 1994. An approach to environmental assessment within the land use planning process: northern Spanish experiences. *Journal of Environmental Planning and Management.* 37.3. 305-322.

Roberts, J.A. 1974. Just what is an environmental impact statement? *Urban Land Institute.* February.

Robertson, J. 1978. *The Sane Alternative.* St. Paul, Minnesota: River Basin Publishing Company.

Robinson, R.M. 1991. New developments in federal environmental assessment. *Impact Assessment Bulletin.* 9.4. 57-68.

Robinson, J.G., G. Francis, R. Legge and S. Lerner. 1990. Defining a sustainable society. *Alternatives.* 12.2. 36-46.

Rochberg-Halton, E. 1982. Situation, structure and the context of meaning. *The Sociological Quarterly.* 23. 455-476.

Rodriguez-Bachiller, A. 1995. Geographical information systems. In *Methods of Environmental Impact Assessment.* eds. P. Morris and R. Therivel. 320-327. Vancouver: UBC Press.

Rodwin, M.A. 1982. Can bargaining and negotiation change the administrative process? *Environmental Impact Assessment Review.* 3.4. 373-386.

Roe, E. 1996. Why ecosystem management can't work without social science: an example from the California northern Spotted Owl controversy. *Environmental Management.* 20.5. 667-674.

Roots, F. 1986. Closing remarks: a current assessment of cumulative assessment. In *Proceedings of the Workshop on Cumulative Environmental Effects: A Binational Perspective.* Ottawa: The Canadian Environmental Assessment Research Council and The United States National Research Council: Ottawa: Ministry of Supply and Services Canada.

Rose, K.A. and E.P. Smith. 1992. Experimental design: the neglected aspect of environmental monitoring. *Environmental Management.* 16.6. 691-700.

Rosen, S.J. 1976. *Manual for Environmental Impact Evaluation.* Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

Rosener, J. B. 1983. User-oriented evaluation: a new way to view citizen participation. In *Public Involvement and Social Impact Assessment.* eds. G.A. Daneke, M.W. Garcia and J.D. Priscoli. 45-60. Boulder, Colorado: Westview Press.

Ross, W.A. 1987. Evaluating environmental impact statements. *Journal of Environmental Management.* 25.2. 137-147.

Rossi, P. H. and H.E. Freeman. 1985. *Evaluation A Systematic Approach.* Third Edition. Beverly Hills: Sage Publications.

Rothblatt, D.N. 1978. Multiple advocacy: an approach to metropolitan planning. *Journal of the American Institute of Planners.* 44.2. 193-199.

Rowe, P.G. 1987. *Design Thinking.* Cambridge Massachusetts: MIT Press.

Royal Commission on the Future of the Toronto Waterfront. 1992. *Regeneration.* Toronto: Queen's Printer of Ontario.

Runyon, D. 1977. Tools for community - managed impact assessment. *Journal of the American Institute of Architecture.* 43.2. 125-135.

Saaty, T.L. 1980. *The Analytic Hierarchy Process.* New York: McGraw-Hill.

________, 1986. Axiomatic foundations of the analytic hierarchy process. *Management Science.* 32.4. 841-855.

Sachs, A. 1982. Nationwide study identifies barriers to environmental negotiation. *Environmental Impact Assessment Review.* 3.1. 95-101.

Sachs, A. And P.B. Clark. 1980. *Scoping the Content of Environmental Impact Assessments: An Evaluation of Agencies' Experience.* Draft report for the Council on Environmental Quality and Geological Survey. U.S. Department of the Interior.

Sadar, M.H. and H.J. Dirschl. 1996. Generic environmental impacts from water impoundment projects in the western Canadian plains region. *Impact Assessment.* 14.1. 41-58.

Sadar, M.H. 1996. *Environmental Impact Assessment.* Second Edition. Ottawa: Carleton University Press Inc.

Sadler, B. 1986. Impact assessment in transition: a framework for redeployment. In *Integrated Approaches to Resource Planning and Management.* ed. R. Lang, 99-132. Calgary, Alberta: The University of Calgary Press.

________,1990a. Sustainable development and water resource management. *Alternatives* 17.3. 14-19.

_______, 1990b. Appendix I : building mediation into the Federal Assessment and Review Process. In *The Place of Negotiation in Environmental Assessment.* 75-84. Hull, Quebec: Canadian Environmental Assessment Research Council.

_______, 1993. Mediation provisions and options in Canadian environmental assessment. *Environmental Impact Assessment Review.* 13.4. 375-390.

_______, 1994. *International Study of the Effectiveness of Environmental Assessment: Proposed Framework.* Hull, Quebec: Federal Environmental Assessment Review Office.

_________, 1995. *Environmental Assessment: Toward Improved Effectiveness - Interim Report and Discussion Paper.* Hull, Quebec: Canadian Environmental Assessment Agency.

_______, 1996. *Environmental Assessment in a Changing World: Evaluating Practice to Improve Performance.* Canadian Environmental Assessment Agency and International Association for Impact Assessment. Ottawa: Ministry of Supply and Services.

Sadler, B. and M. Davies. 1988. *Environmental Monitoring and Audit: Guidelines for Post-Project Analysis of Development Impacts and Assessment Methodology.* Aberdeen, Scotland: Aberdeen University.

Sadler, B. and P. Jacobs. 1990. A key to tomorrow: on the relationship of environmental assessment and sustainable development. 3-31. In *Sustainable Development and Environmental Assessment: Perspectives for a Common Future.* Ottawa, Canada: Canadian Environmental Assessment Research Council.

Sager, T. 1981. Evaluation methods in local participatory planning. *Town Planning Review,* 4.4. 417-432.

______, 1994. *Communicative Planning Theory.* Brookfield, Vermont: Avebury Press.

________, 1995a. Teaching planning theory as order or fragments? *Journal of Planning Education and Research.* 14.3. 166-172.

______, 1995b. From impact assessment to recommendation: how are the impact assessment results presented and used? *Environmental Impact Assessment Review.* 15.4. 377-397.

Sallenave, J.D. ed. 1994. *Towards the Assessment of Cumulative Impacts in Hudson Bay.* Ottawa: Canadian Arctic Resources Committee and the Municipality of Sanikiluaq. The Hudson Bay Programme.

Sammy, G.K. and L.W. Canter. 1982. Environmental impact assessment in developing countries: what are the problems? *Impact Assessment Bulletin.* 2.1.29-43.

Sandbach, F. 1980. *Environment, Ideology and Policy.* Oxford, England: Basil Blackwell.

Sandercock, L. 1995. Voice from the borderlands: a meditation on a metaphor. *Journal of Planning Education and Research.* 14.2. 77-88.

Sandercock, L. and A. Forsyth. 1992. A gender agenda - new directions for planning theory. *Journal of the American Planning Association.* 58.1. 49-59.

Sandford, R. 1996. International environmental treaty secretariats: a case of neglected potential? *Environmental Impact Assessment Review*. 16.1 3-12.

Sargent, W. B. 1996. *Toward Integration of Planning and Environmental Assessment in Ontario*. Unpublished PhD Thesis. Waterloo, Ontario: University of Waterloo.

Saul, J.R. 1992. *Voltaire's Bastards*. Toronto: Penguin Books.

Saylor, R.E. and L.N. McCold. 1994. Bounding analysis in NEPA documents: when are they appropriate? *The Environmental Professional*. 16.4. 285-291.

Schibuola, S. and P.H. Byer. 1991. Use of knowledge-based systems for the review of environmental impact assessments. *Environmental Impact Assessment*. 11.1. 11-27.

Schneider, P. and E. Tohn. 1985. Success in negotiating environmental regulations. *Environmental Impact Assessment Review*. 9.1. 67-77.

Schon, D.A. 1971. *Beyond the Stable State*. New York: W.W. Norton and Company.

_________, 1982. Some of what a planner knows: a case study of knowing-in-practice. *Journal of the American Planning Association*. 48.3. 351-364.

___________, 1983. *The Reflective Practitioner: How Professionals Think in Action*. New York: Basic Books.

___________, 1987. *Educating the Reflective Practitioner*. San Francisco: Jossey Bass.

Schon, D.A. and M. Rein. 1994. *Frame Reflection*. New York: Basic Books.

Schubert, G. 1983. The concept of the public interest. In *Public Involvement Techniques: A Reader of Ten Years Experience at the Institute for Water Resources*. 37-40. Virginia: US Army Corps of Engineers.

Schweitzer, G.E. 1981. Risk assessment near uncontrolled hazardous waste sites: role of monitoring data. *Proceedings of National Conference on Management of Uncontrolled Hazardous Waste Sites*. Silver Springs, Maryland: Hazardous Materials Control Research Institute.

Scott, A.J. and T.S. Roweis. 1977. Urban planning theory: a re-appraisal. *Environment and Planning A*. 9. 1097-1119.

Seasons, M. 1989. Strategic planning in the public sector environment: addressing the realities. *Plan Canada*. 29.6.19-27.

Seley, J.E. 1983. *The Politics of Public Facility Planning*. Lexington, Massachusetts: Lexington Books, D. C. Heath and Company.

Selman, P. 1994. Systematic environmental reporting and planning: some lessons from Canada. *Journal of Environmental Planning and Management*. 37.4. 461-475.

Sennett, R. 1974. *The Fall of Public Man*. New York: W.W. Norton and Company.

_______ , 1990. *The Conscience of the Eye*. New York: W.W. Norton and Company.

Serafin, R., G. Nelson and R. Butler. 1992. Post hoc assessment in resource management and environmental planning. *Environmental Impact Assessment Review*. 12.3. 271-294.

Sewell, J. 1993. *The Shape of the City - Toronto's Struggles with Modern Planning*. Toronto: University of Toronto Press. Shefer, D. and L. Kaess. 1990. Evaluation methods in urban and regional planning. *Town Planning Review*. 61.1. 75-88.

Shearman, R. 1990. The meaning and ethics of sustainability. *Environmental Management*. 14.1. 1-8.

Shefer, D. and L. Kaess. 1990. Evaluation methods in urban and regional planning. *Town Planning Review*. 61.1.75-88.

Shillington, T. and P. LeBlanc. 1995. Towards an environmental assessment network. *International Study of the Effectiveness of Environmental Assessment*. Canadian Environmental Assessment Agency and International Association for Impact Assessment. Ottawa: Ministry of Supply and Services.

Shoemaker, D.J. 1994. *Cumulative Environmental Assessment*. Waterloo, Ontario: Department of Geography. Publications Series #42. University of Waterloo.

Shopley, J.B. and R.F. Fuggle. 1984. A comprehensive review of current environmental impact assessment methods and techniques. *Journal of Environmental Management*. 18.1. 25-47.

Shrader-Frechette, K. 1994. An apoligia for activism: global responsibility, ethical advocacy and environmental problems. In *Ethics and Environmental Policy: Theory Meets Practice*. eds. F. Ferre and P. Hartel. Athens Georgia: University of Georgia Press.

Shrader-Frechette, K. and E. D. McCoy. 1994. Ecology and environmental problem-solving. *The Environmental Professional*. 16.4. 342 - 348.

Shrybman, S. 1986. Environmental mediation. In *Integrated Approaches to Resource Planning and Management*. ed. R. Lang. 81-98. Calgary, Alberta: University of Calgary Press.

Shapere, D. 1984. *Reason and Scientific Knowledge*. Dordrecht: Reidel.

Shearman, R. 1990. The meaning and ethics of sustainability. *Environmental Management*. 14.1. 1-8.

Shoemaker, D.J. 1994. *Cumulative Environmental Assessment*. Waterloo, Ontario: Department of Geography

Simon, H. [1946] 1976. *Administrative Behaviour*. New York: Free Press.

Simpson, S.L. and S.A. Shaheen. 1992. The role of mitigation in NEPA decision making. In *Proceedings of the 1992 Conference of the National Association of Environmental Professionals - Changing and Innovative Strategies for Environmental Protection*. Seattle, Washington.

Sinclair, J. and A. Diduck. 1995. Public education: an undervalued component of the environmental assessment public involvement program. *Environmental Impact Assessment Review*. 15.1. 219-240.

Singh. B. 1992. Environmental audit of the Junction Triangle. In *Hazardous Materials / Wastes: Social Aspects of Facility Planning and Management.* 10-19. Conference Proceedings. Winnipeg: Institute for Social Impact Assessment.

Sipe, N.G. and B. Stiftel. 1995. Mediating environmental enforcement disputes: how well does it work? *Environmental Impact Assessment Review.* 12.2. 139-156.

Skaburskis, A. 1988. Criteria for compensating the impacts of large projects: the impact of British Columbia's Revelstoke Dam on local government services. *Journal of Policy Analysis and Management.* 7.4. 668-686.

Slocombe, D.S. 1993. Environmental planning, ecosystem zones and ecosystem approaches for integrating environment and development. *Environmental Management.* 17.3. 289-304.

Slocombe, S. 1992. Making a difference: sectors, disciplines and sustainability. *Environments.* 21.3. 65-68.

Smit, B. and H. Spaling. 1995. Methods for cumulative effects assessment. *Environmental Impact Assessment Review.* 15.1. 81-106.

Smith, L.G. 1993. *Impact Assessment and Sustainable Resource Management.* Essex, England: Longman Scientific and Technical.

Smith, M.P. 1979. *The City and Social Theory.* New York: St. Martin's Press.

Sonntag, N.C., R.R. Everitt, L.P. Rattin, D.L. Colnett, C.P. Wolf, J.C. Truett, D.H.C. Dorcey and C.S. Holling. 1987. *Cumulative Effects Assessment: A Context for Further Research and Development.* Canadian Environmental Assessment Research Council. Ottawa: Ministry of Supply and Services.

Sorenson, A.D. and M.L.Auster. 1989. Fatal remedies - the sources of ineffectiveness in planning. *Town Planning Review.* 60.1. 29-42.

Sorenson, A.D. and R.A. Day 1981. Libertarian planning. *Town Planning Review.* 52.4. 390-402.

Spain, D. 1995. Sustainability, feminist visions and the utopian tradition. *Journal of Planning Literature.* 9.4. 362-369.

Spirn, A.W. 1984. *The Granite Garden - Urban Nature and Human Design.* New York: Basic Books, Inc.

Spaling, H. 1994. Cumulative effects assessment: concepts and principles. *Impact Assessment.* 12.3. 231-252.

Spaling, H. B. Smit and R. Kreutzwiser. 1993. Evaluating environmental impact assessment: approaches, lessons and prospects. *Environments.* 22.1. 63-74.

Spaling, H. and B. Smit. 1993. Cumulative environmental change: conceptual framework, evaluation approaches and institutional perspectives. *Environmental Management.* 17.5. 587-600.

Spellerberg, I.F. 1991. *Monitoring Ecological Change.* Cambridge, England: Cambridge University Press.

Stackelburg, K.V. and D.E. Burmaster. 1994. A discussion of the use of probabilistic risk assessment and human health impact assessment. *Environmental Impact Assessment Review.* 14. 5.6. 385-402.

Stakhiv, E.Z. 1988. An evaluation paradigm for cumulative impact analysis. *Environmental Management.* 12.5. 725-748.

Starr, C. 1996. Sustaining the human environment: the next two hundred years. *Deadalus.* 125.3. 235-253.

Stauth, R., M. Sowman and S. Grindley. 1993. The panel evaluation method: an approach to evaluating controversial resource allocation proposals. *Environmental Impact Assessment Review.* 13.1. 13-35.

Stefanovic, I.L. 1996. Interdisciplinarity and wholeness: lessons from eco-research on the Hamilton harbour ecosystem. *Environments.* 23.3. 74-94.

Stern, A.J. 1991. Using environmental impact assessments for dispute management. *Environmental Impact Assessment Review.* 11.1. 81-87.

Stokey, E. and R. Zeckhauser. 1978. *A Primer for Policy Analysis.* New York: W.W. Norton.

Street, J. and B. Barker. 1995. Promoting good environmental management: lessons from BS 5750. *Journal of Environmental Planning and Management.* 38.4. 483-504.

Stinchcombe, A.L. 1968. *Constructing Social Theories.* Chicago: University of Chicago Press.

Stuart, D. 1978. *Evaluating Alternative Plans.* Planning Advisory Service Report # 336. Chicago: American Planning Association.

Sullivan, W.C., F.E. Kuo and M. Prabhu. 1996. Assessing the impact of environmental impact statement on citizens. *Environmental Impact Assessment Review.* 16. 3. 171-182.

Sunderlin, W.D. 1995. Managerialism and the conceptual limits of sustainable development. *Society and Natural Resources.* 8.4. 481-492.

Susskind, L.E., J.R. Richardson and K.J. Hildebrand. 1978. *Resolving Environmental Disputes.* Cambridge, Massachusetts: Massachusetts Institute of Technology.

Susskind, L. E. and D. Madigan. 1984. New approaches to resolving disputes in the public sector. *The Justice System Journal.* 9.2. 179-190.

Suter II, Glen W. 1990. Endpoints for regional risk assessment. *Environmental Management.* 14.1. 9-23.

Talen, E. 1996. Do plans get implemented? A Review of evaluation in planning. *Journal of Planning Literature* 10.3. 248-259.

Tamminga, K. 1995. Is the living filter "sustainable?" : assessing the local application of municipal effluent. *The Environmental Professional.* 17.4. 290-300.

__________, 1996. Restoring biodiversity in the urbanizing region: toward pre-emptive ecosystems planning. *Plan Canada.* July. 10-15.

Tauxe, C.S. 1995. Marginalizing public participation in local planning: an ethnographic account. *Journal of American*

Planning Association. 61.4. 471-481.

Taylor, D. and J. Wilson. 1994. Entering the watershed battles: forest communities seek peace through local control. *Environments.* 22.3. 93-102.

Taylor, N. 1980. Planning theory and the philosophy of planning. *Urban Studies.* 17. 159-172.

Therivel, R., E. Wilson, S. Thompson, D. Healey and D. Prichard. 1992. *Strategic Environmental Assessment.* London: Earthscape Publications Ltd.

Therivel, R. 1993. Systems of strategic environmental impact assessment. *Environmental Impact Assessment Review.* 13.3.145-168.

Therivel, R. and P. Morris.1995. Interactions between impacts. In *Methods of Environmental Impact Assessment.* eds. P. Morris and R. Therivel. 297-306. Vancouver: UBC Press.

Thomas, D. 1979. *Naturalism and Social Science.* Cambridge: Cambridge University Press.

Thomas, M.J. 1982. The procedural planning theory of A. Faludi. In *Critical Readings in Planning Theory.* ed. C. Paris. 3-12. Oxford: Pergamon Press.

Thompson, D. 1995. Curing institutional Alzheimer's: tools for more effective and efficient environmental planning. *Plan Canada.*35.6. 14-17.

Thompson, J.G. and G. Williams. 1990. Social assessment: roles for practitioners and the need for stronger mandates. *Impact Assessment Bulletin.* 10.3. 43-56.

Thompson, M.A. 1990. Determining impact significance in EIA: a review of 24 methodologies. *Journal of Environmental Management.* 30.3. 235-250.

Tomlinson, P. and S.F. Atkinson. 1987. Environmental audits: proposed terminology. *Environmental Monitoring and Assessment.* 8. 187-198.

Tongcumpou, C. and N. Harvey. 1994. Implications of recent EIA changes in Thailand. *Environmental Impact Assessment Review.* 14.4. 271-295.

Torgerson, D. 1980. *Industrialization and Assessment.* Toronto: York University Publications in Northern Studies.

_____________. 1981. SIA as a social phenomenon: the problem of contextuality. In *Social Impact Assessment - Theory, Method and Practice.* eds. F.J. Tester and W. Mykes. 68-92. Calgary: Kananskis Centre for Environmental Research.

Treweek, J. 1995. Ecological impact assessment. *Impact Assessment.* 13.3. 289-316.

Tywoniuk, N. 1990. Integrating environmental factors into both planning and impact assessment functions. *Impact Assessment Bulletin.* 8.1.2. 275-288.

Twiss, R.H. 1974. Linking the EIS to the planning process. In *Environmental Impact Assessment: Guidelines and*

Commentary. eds. T. G. Dickert and K.R. Domeny . Berkeley: University of California. 5-16.

Udy, J. 1980. Why plan? Planning and the eternal values. *Plan Canada.* 20: 3,4. 176-183.

(UN) United Nations, 1992. *AGENDA 21: Program for Action for Sustainable Development.* New York: United Nations.

________, 1994. *Trends in Environmental Impact Assessment of Energy Projects.* New York: United Nations.

United Nations Environment Programme. 1988. *Environmental Impact Assessment: Basic Procedures for Developing Countries.* UNEP. Bangkok: Regional Office for Asia and the Pacific.

U.S. Army Corps of Engineers. 1983. *Public Involvement Techniques: A Reader of Ten Years Experience at the Institute for Water Resources.* IWR Research Report 82-R1. Washington, D.C. : U.S. Government Printing Office.

Valiela, D. 1984. Improving predictive performance and usefulness of biological environmental impact assessment: experimental impact studies and adaptive impact assessment. In *Improving Impact Assessment.* eds. S.L. Hart, G.A. Enk and W.F. Hornick. 143-158. Boulder, Colorado: Westview Press.

VanGundy, A.B. 1988. *Techniques of Structured Problem Solving.* New York: Van Nostrand Reinhold Company.

Van Horn, C.E., D. C. Baumer and W.T. Gormley. 1989. *Politics and Public Policy.* Washington, D.C.: CQ Press.

Van Houton, D. 1989. Planning rationality and relativism. *Environment and Planning B: Planning and Design.* 201-214.

Verma, N. 1996. Pragmatic rationality and planning theory. *Journal of Planning Education and Research.* 16.1. 5-14.

VHB Research and Consulting Inc. Loc Plan and Lawrence MacDonald and Associates. 1990. *Evaluation Methods in Environmental Assessment,* Toronto: Queen's Printer for Ontario.

Vickers, G. 1985. *The Art of Judgment: A Study of Policy Making.* New York: Basic Books Inc.

Vig, N.J. 1992. Parliamentary technology assessment in Europe: comparative evaluation. *Impact Assessment Bulletin.* 10.4. 3-24.

Vizayakumar, K. and P.K.J. Mohaptra. 1991. Framework for environmental impact analysis - with special reference to India. *Environmental Management.* 15.3. 357-368.

Vlachos, E. 1977. The use of scenarios for social impact assessment. In *Methodology of Social Impact Assessment.* eds. K. Finsterbusch and C.P. Wolf. 211-223. Stroudburg, Pennsylvania: Dowden, Hutchinson and Ross, Inc.
Wachs, M. ed. 1985. In *Ethics and Planning.* ed. M. Wachs. 291-298. New Brunswick, New Jersey: Rutgers, State University of New Jersey.

Voogd, H. 1983. *Multicriteria Evaluation for Urban and Regional Planning.* London: Pion Limited.

Voogd, H. and A. Faludi. 1985. Evaluation of complex policy problems: some concluding comments. In *Evaluation of Complex Policy Problems.* eds. A. Faludi and H. Voogd. 201-206. Delft, Netherlands: Delftsche Uitgevers

Maatschappi.

Walker, G. and D. Bayliss. 1995. Environmental monitoring in urban areas: political contexts and policy problems. *Journal of Environmental Planning and Management*. 38.4. 469-482.

Wallenius, J. 1975. Comparative evaluation of some interactive approaches in multicriterion optimization. *Management Science*. 21. 1387-1396.

Waller, T. 1995. Knowledge, power and environmental policy: expertise, the lay public, and water management in the western United States. *The Environmental Professional*. 17.3. 153-166.

Walter, S. and P. Choate. 1984. *Thinking Strategically*. Washington, D.C.: The Council of State Planning Agencies.

Warner, M. 1996. Integration of regional land use planning with environmental impact assessment: practical land suitability approach. *Impact Assessment*. 14.2. 155-190.

(WCED) World Commission on Environment and Development. 1987. *Our Common Future*. Oxford: Oxford University Press.

Weaver, A.V.B., T. Greyling, B.Q. Van Wilgen and F.J. Kruger. 1996. Logistics and team management of a large environmental impact assessment: proposed dune mining at St. Lucia, South Africa. *Environmental Impact Assessment Review*. 16.2. 103-113.

Weaver, C. *et.al.* 1985. Rationality in the public interest: notes toward a new synthesis. In *Rationality in Planning*. eds. M. Breheny and A. Hooper. London: Pion Ltd. 145-165.

Webber, M.M., 1968/69. Planning in an environment of change: beyond the industrial age - permissive planning. *The Town Planning Review*. 39. 179-195, 277-295.

________, 1978. A difference paradigm for planning. In *Planning Theory in the 1980's*. eds. R.W. Burchell and G. Sternlieb. New Brunswick, New Jersey: Center for Urban Policy Research.

Webler, T., H. Kastenholz and O. Renn. 1995. Public participation in impact assessment: a social learning process. *Environmental Impact Assessment Review*. 15.5. 443-463.

Weinberg, A.M. 1972. Science and trans-science. *Minerva*. 10.2. 209-211.

Wenz, P.S. 1988. *Environmental Justice*. Albany: State University of New York Press.

Westman, W.E. 1985. *Ecology, Impact Assessment and Environmental Planning*. New York: John Wiley and Sons.

Westhues, A. 1985. Toward a positive theory of planning. *Plan Canada*. 25.3. 97-103.

White, A., P.D. Raskin, P. Merges and R.S. Harvey. 1988. Reconciling state wide needs and local impacts: New York State's recommended offsets package for community hosting a LLRW management facility. *Waste Management '88*. ed. R.G. Post. 117-122. Tucson, Arizona: Symposium on Waste 'Management.

Whitney, J.B.R. and V.W. Maclaren. 1985. A framework for the assessment of EIA methodologies. In *Environmental*

Impact Assessment: The Canadian Experience. Eds. J.B.R. Whitney and V.W. Maclaren. 1-31. Institute for Environmental Studies. Toronto: University of Toronto.

Whyte, A.V. and I. Burton eds. 1980. *Environmental Risk Assessment*. SCOPE 15. New York: John Wiley and Co.

______________. 1982. Perception of risks in Canada. In *Living with Risk: Environmental Risk Management in Canada*. eds. I. Burton, C.D. Fowle. 39-70. Environmental Monograph No.3 , Toronto: Institute for Environmental Studies, University of Toronto.

Widditsch, A. 1983. Recommendations for effective public participation. In *Public Involvement Techniques: A Reader of Ten Years Experience at the Institute for Water Resources*. 71-80. Virginia: US Army Corps of Engineers.

Wiesner, D. 1995. *E.I.A. The Environmental Impact Assessment Process - What It Is and How to do One*. Dorset, Great Britain: Prism Press.

Wilbanks, T.J. 1994. 'Sustainable development' in geographical perspective. *Annals of the Association of American Geographers*. 84.4. 541-556.

Wildman, P. 1990. Methodological and social policy issues in social impact assessment. *Environmental Impact Assessment Review*. 10.1. 69-79.

Williams, D.C. 1990. Integrating impact assessment into resource management planning: the US Bureau of Land Management. *Impact Assessment*. 8.1.2. 161-178.

Williamson, S.C. 1992. Cumulative impacts assessment and management planning: lessons learned to date. In *Environmental Analysis: The NEPA Experience*. eds. S. G. Hidebrand and J.B. Cannon. 394-411. Lewis Publications, CRC Press Inc. : Boco Raton, Florida: Lewis Publishers, CRC Press Inc. Chapter 5.

Wilson, A. M. Roseland and J.C. Day. 1996. Shared decision-making and public land planning: an evaluation ofthe Vancouver Island, regional CORE process. *Environments*. 23.2. 69-86.

Wilson, J. 1981. Introduction. In *Social Impact Assessment - Theory, Method and Practice*. eds. F. J. Tester and W. Mykes. xi-xvii. Calgary, Alberta: Kananaskis Centre for Environmental Research.

Winder, Jr. J.S. and R. H. Allen. 1975. *The Environmental Impact Assessment Project: A Critical Assessment*. Washington, D.C.: The Institute of Ecology.

Wismer, S. 1996a. Across the great divide: monitoring, assessing and reporting upon ecological change. *Environments*. 24.1. 69-71.

________, 1996b. The nasty game. *Alternatives Journal*. 22.4. 10-17.

Witty, D. 1994. The practice behind the theory - co-management as a community development tool. *Plan Canada*. January. 22-27.

Wlodarczyk, T.L. 1990. Mitigation and waste management facility siting. *Impact Assessment Bulletin*. 8.4. 45-62.

Wolf, C. P. 1983. *Social Impact Assessment*. Boulder, Colerado: Westview Press.

Wolfe, A.K. 1993. Risk communications in social context: improving effective communications. *The Environmental Professional.* 14.3. 248-255.

Wolfe, L.D.S. 1987. *Methods for Scoping Environmental Impact Assessments - A Review of Literature and Experience.* Vancouver, B.C.: Federal Environmental Assessment Review Office.

Won, J. 1990. Multicriteria evaluation approaches to urban transportation projects. *Urban Studies.* 27.1. 119- 138.

Wood, C. and M. Dejeddour. 1990. Strategic environmental assessment: EA of policies, plans and programmes. *Impact Assessment Bulletin.* 10.1 3-22.

Wood, C. 1995. *Environmental Impact Assessment - A Comparative Review.* Essex, England: Longman Scientific and Technical.

Woodley, S. 1996a. A scheme for ecological monitoring in national parks and protected areas. *Environments.* 23.3. 50-73.

__________, 1996b. Monitoring, assessing and reporting upon ecological change: implications for planning and management. *Environments.* 24.1. 60-71.

Wright, P.A. 1994. Limits of acceptable change: a recreational tool for cumulative effects assessment. In *Cumulative Effects Assessment in Canada: From Concept to Practice.* ed. A.J. Kennedy. 159-178. Edmonton, Alberta: Alberta Society of Environmental Biologists.

Wyant, J.G., R.A. Meganeck and S.H. Horn. 1995. A planning and decision-making framework for ecological restoration. *Environmental Management.* 19.6. 789-796.

Yap, N.T. 1990. Round the peg or square the hole? populists, technocrats and environmental assessment in third world countries. *Impact Assessment Bulletin.* 8.1/2. 69-84.

Yewlett, C.J.L. 1985. Rationality and plan making: a professional perspective. In *Rationality in* Planning. eds. M. Breheny and A. Hooper. 209-228. London: Pion.

Yewlett, C.J. L. 1984. Polishing practice - the reconcilation of scientists and practitioners. *Journal of the OperationalResearch Society.* 36.6. 487-498.

Yiftachel, O. 1989. Towards a new typology of urban planning theories. *Environment and Plannng B: Planning and Design.* 16. 23-39.

Zeiss, C. 1991. Community decision-making and impact management priorities for siting waste facilities. *Environmental Impact Assessment Review.* 11.3. 231-255.

________, 1992. Priorities for impact management waste facilities responding to residents's preferences through a planning / engineering approach. *Hazardous Materials / Waste: Social Aspects of Facility Planning and Management Conference Proceedings.* 195-213. September 30 to October 3, 1990. The Institute for Social Impact Assessment.

Zeiss, C. and L. Lefsrund. 1995. Developing host community siting packages for waste facilities. *Environmental Impact*

Assessment Review. 15.2. 157-178.

________________________, 1996. Making or breaking waste facility siting processes with a siting framework. *Environmental Management*. 20.1. 53-64.

Ziemar, R.R. 1994. Screening cumulative effects: triggers and responsibilities. In *Cumulative Effects Assessment in Canada: From Concept to Practice*. ed. A.J. Kennedy. 319-326. Edmonton, Alberta: Alberta Society of Environmental Biologists.

EIA Legislation, Regulations and Guidelines

<u>*General*</u>

Doyle, D. and B. Sadler, 1996. *Environmental Assessment In Canada*. Canadian Environmental Assessment Agency. Ottawa: Ministry of Supply and Services Canada.

Gibson, R.B. 1993. Environmental assessment design: lessons from the Canadian experience. *The Environmental Professional*, 15. 12-24.

<u>*Alberta*</u>

Alberta. *Environmental Protection and Enhancement Act*. S.A. 1992. c. E-13.3.

Alberta Environmental Protection, November 17, 1995. *Final Terms of Reference Environmental Impact Assessment (EIA) Report for the Syncrude Canada Ltd. Aurora Mine Project*.

________________________, August 9, 1995. *Final Terms of Reference Environmental Impact Assessment (EIA) Report for the Suncor Inc. Steepbank Mine Project*.

________________________, January 23, 1995, *Cardinal River Coals Ltd. Terms of Reference for the Proposed Cheviot Mine Development Environmental Impact Assessment*.

________________________, April 14, 1992. *Vacation Alberta Corporation Terms of Reference for the Proposed Westcastle Four Seasons Resort Environmental Impact Assessment*.

________________________, December 1993. *Grande Alberta Paper Ltd. Proposed Terms of Reference for the Environmental Impact Assessment*.

________________________, October 18, 1994. *Screening Report - Ainsworth Lumber Co. Ltd. Oriented Strand Board and Value-added Wood Processing Facility*.

________________________, June 3, 1994. *Screening Report. Tolko Industries Ltd. Oriented Strand Board (OSB) Manufacturing Plant*.

Energy Resources Conservation Board and Alberta Environmental Protection. 1993. *Administrative Procedures for Preparing An Environmental Impact Assessment*.

Hegmann, G.L. and G.A. Yarranton. July 1995. *Cumulative Effects and the Energy Resources Conservation Board's Review Process.* Macleod Institute for Environmental Analysis. Calgary: University of Calgary.

British Columbia

British Columbia. *Bill 29 - Environmental Assessment Act.* S.B.C. 1995. C.35, *Reviewable Projects Regulation* (B.C. Reg. 276/95), *Prescribed Time Limits Regulations* (B.C. Reg. 278/95), *Transition Regulation* (Reg. 277/95).

____________, *Guide to the British Columbia Environmental Assessment Process*, 1995. Victoria, B.C.: Crown Publications.

____________, *Environment and Land Use Act,* R.S.B.C. 1979, c. 110, *Cowichan River Estuary Environmental Assessment Procedures* (B.C. Reg. 486/77) and *Fraser River Estuary Environmental Assessment Procedures* (B.C. Reg. 202/77).

____________, *Ministry of Environment Act.* S.B.C. 1980, c.30.

Province of British Columbia. 1980. *Environmental and Social Impact Compensation / Mitigation Guidelines.* Environmental and Land Use Committee Secretariat.

____________, February 1996. *Final Project Report Specifications - Tulsequah Chief Copper / Lead / Zinc / Gold / Silver / Project.* Victoria, B.C.: Environmental Assessment Office.

____________, June 1996. *Final Report Project Specifications - Red Chris Copper / Gold Mine Project.* Victoria, B.C.: Environmental Assessment Office.

____________, October 1996. *Final Project Report Specifications - Proposed Bamberton Report Specifications.* Victoria, B.C.: Environmental Assessment Office.

Canada

Canada. *Canadian Environmental Assessment Act - Bill C-13.* S.C. 1992, c. 37., *Comprehensive Study List Regulations* (SOR/94-638), *Exclusion List Regulations* (SOR/94-639), *Inclusion List Regulation* (SOR/94-637), *Law List Regulation* (SOR/94-636).

Canadian Environmental Assessment Agency. 1994 (with updates in 1995 and 1996). *The Canadian Environmental Assessment Act Training Compendium.*

Environment Canada. February 1995. *Departmental Guidance for the Canadian Environmental Assessment Act.*

Environmental Assessment Panel. Undated. *Guidelines for the Preparation of Environmental Impact Statements for theCigar Lake and McArthur River Project.*

____________, March 1992. *Final Guidelines for the Preparation of an Environmental Impact Statement on the Nuclear Fuel Waste Management and Disposal Concept.*

____________, 1989. *Goose Bay EIS Appendix II Guidelines for the Preparation of an*

Environmental Impact Statement on Military Flying Activities in Labrador and Quebec.

Manitoba

Manitoba. *Environment Act.* S.M. 1987-88, c.26, *Classes of Development Regulation* (Man. Reg. 164/88), *Environmental Assessment Hearing Costs Recovery Regulation* (Man. Reg. 210/92), *Joint Environmental Assessment Regulation* (Man. Reg. 126/91), *Participant Assistance Regulation* (Man. Reg. 125/91.)

__________, *Guide to the Manitoba Environment Act.* Winnipeg, Manitoba: Manitoba Environment.

____________, 1995. *Toward Institutional Change in the Manitoba Public Sector.* Manitoba Round Table on Environment and Economy.

_______________, 1995. *A Discussion Paper for a Sustainable Development Act.* Manitoba Round Table on Environment and Economy.

___________, 1995. *"What You Told Us" - Sustainable Development Act.* Manitoba Round Table on Environment and Economy.

__________, 1996. *White Paper on the Sustainable Development Act.* Sustainability Manitoba.

Manitoba Environment. undated. *Guide to the Manitoba Environment Act.*

__________________, undated. *Guidelines for the Preparation of the Environmental Impact Statement for the Repap Manitoba Inc. 1997-2009 Forest Management Plan.*

_________________, undated. *General Guidelines for the Preparation of an Environmental Impact Assessment for Hazardous Waste Management Facilities Regulated Under the Manitoba Dangerous Goods Handling and Transportation Act.*

_________________, undated. *General Guidelines for the Preparation of an Environmental Impact Assessment for Water Developments Regulated Under the Environment Act of Manitoba.*

New Brunswick

New Brunswick. *Clean Environment Act.* R.S.N.B. 1973, c.C-6, *Environmental Impact Assessment Regulation* (N.B. Reg. 87-83).

__________________, *Environmental Impact Assessment in New Brunswick.* Fredericton, N.B.: Department of Municipal Affairs and Environment.

______________, 1993. *Environmental Impact Assessment Reform - Directions for Change - A Position Paper.* Fredericton, N.B.: New Brunswick Environment.

Department of Municipal Affairs and Environment. Undated. *Environmental Impact Assessment in New Brunswick.*

Minister of the Environment. May 17, 1991. *Guidelines for an Environmental Impact Assessment Acadian Peninsula Regional Waste Treatment Facility.* Issued to the Acadian Peninsula Solid Waste Provisional Committee.

________________________, August 2, 1991. *Guidelines for an Environmental Impact Assessment Fundy Trail.* Issued to the Fundy Trail Development Authority Inc.

____________________, September 9, 1992. *Guidelines for an Environmental Impact Assessment Proposed Kraft Pulp and Paper Mill Landfill Site.* Issued to Miramichi Pulp and Paper Inc.

_________________________, March 12, 1993. *Guidelines for an Environmental Impact Assessment Proposed Industrial Landfill and Secondary Treatment Facility.* Issued to J.D. Irving Limited.

__________________________, December 8, 1993. *Guidelines for an Environmental Impact Assessment - Trans Canada Highway - Fredericton to Salisbury.* Issued to N.B. Department of Transportation.

Newfoundland

Newfoundland. *Environmental Assessment Act.* R.S.N. 1990, c. E-14, *Environmental Assessment Regulation* (225/84).

_________________, *Environmental Assessment - A Guide to the Process.* St. John's, Newfoundland: Department of Environment and Lands.

_________________, 1995. *A White Paper on Proposed Reforms to The Environmental Assessment Process.* St. John's, Newfoundland: Department of Environment.

Department of Environment and Lands. Undated. *Environmental Assessment - A Guide to the Process.* Harris and Associates Ltd. and Jacques Whitford Environment. 1993. *Terms of Reference for the Town of Salmon Cove Water and Sewer Project.* Prepared for the Department of Environment and Lands.

Emery Construction Co. Ltd. 1993. *Northwest Arm Brook Small Hydroelectric Project - Terms of Reference for Preparation of EIS and Component Studies.* Prepared for Department of Environment and Lands.

Environmental Design Consultants, 1993. *Thorburn Road Golf Course Environmental Impact Statement Terms of Reference - Diana Investment Ltd.* Submitted to Department of Environment and Lands.

Genergy Inc. on Behalf of Belle Island Power Corp. 1993. *Guidelines for Terms of Reference for the Northwest River Power Development (Port Blandford - Terra Nova National Park) - Environmental Impact Statement* Prepared by the Environmental Assessment Committee Northwest River Power Development.

Nova Scotia

Nova Scotia. *Environment Act,* S.N.S. 1995, c.*1. Environmental Assessment Regulations* (N.S. Reg. 27/95). *Draft Environmental Assessment Board Regulations.*

Nova Scotia. *Environment Act,* S.N.S. 1995, c.*1. Environmental Assessment Regulations* (N.S. Reg. 27/95). *Draft Environmental Assessment Board Regulations.*

Department of the Environment. Undated. *A Citizen's Guide to Environmental Assessment.*

______________________, April 10, 1992. *Environmental Assessment Act Final Guidelines for the Preparation of Terms of Reference - Nova Mona Peat Products Limited Fuel Peat Harvesting Operation.*

________________________, April 15, 1992. *Environmental Assessment Act Final Guidelines for Preparation of Terms of Reference -156993 Canada Incorporated West River Sheet Harbour Hydroelectric Project.*

___________________________, February 11, 1993. *Environmental Assessment Act Final Guidelines for the Preparation of the Terms of Reference. Nova Scotia Department of Transportation and Communications - Highway # 107 Construction Project.*

__________________________, 1994. May 30, 1994. *Environmental Assessment Act. Final Guidelines for the Preparation of Terms of Reference - Scotia Synfuels Limited Coal / Oil Upgrader Project.*

<u>*Ontario*</u>

Ontario. *Environmental Assessment Act.* R.S.O. 1990, c. E.18. *Private Sector Developers Regulation* (O. Reg. 345/93), *General Regulation* (R.S.O. Reg. 334), *Rules of Practice - Environmental Assessment Board* (R.S.O. 1990, Reg. 335).

______, R.S.O. 1996, c.27.. *Bill 76 - An Act to Improve Environmental Protection, Increase Accountability and Enshrine Public Consultation in the Environmental Assessment Act (Environmental Assessment and Consultation Improvement Act).*

______, *Environmental Bill of Rights*. R.S.O. 1990, c.E. 18. and S.O. 1993, c.27, *Classification of Proposals for Instruments* (O. Reg. 681/94), *General Regulation* (O. Reg. 73/94).

_________________, 1983. *Project Screening and Application for Exemption Order Under Section 29 of the Environmental Assessment Act.* Environmental Assessment Branch, Toronto: Ministry of the Environment.

_________________, 1987. *The Role of the Review and the Review Participants in the EA Process.* Environmental Assessment Branch. Toronto: Ministry of the Environment.

___________, 1989. *Interim Guidelines on Environmental Assessment Planning and Approvals.* Environmental Assessment Branch, Ministry of Environment. Toronto: Queen's Printer.

_____________, 1990. *Evaluation Methods in Environmental Assessment.* VHB Research and Consulting Inc., LocPlan, Lawrence MacDonald and Associates. Environmental Assessment Branch, Ontario Ministry of the Environment. Queen's Printer.

___________, 1992. *Guideline for Preparing Environmental Assessment Proposals.* Environmental Assessment Branch, Ministry of Environment. Toronto: Queen's Printer.

_____________, 1992. *Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments.* Ministry of Culture and Communications and Ministry of the Environment. Toronto: Queen's Printer.

______________, 1993. *Guideline for Preparing Environmental Assessments - Land Use Planning Component.* Ministry of Environment and Energy and Ministry of Municipal Affairs. Toronto: Queen's Printer.

______________, *Pre-Submission Consultation in the EA Process.* Environmental Assessment Branch. Ministry of the Environment. Toronto: Queen's Printer.

______________, 1994. *Waste Management Planning - Sectoral Environmental Assessment Proposal for Waste Management Planning.* Toronto: Ministry of Environment and Energy.

Municipal Engineers Association. June 1993. *Class Environmental Assessment for Municipal Road Projects.*

______________________. June 1993. *Class Environmental Assessment for Municipal Water and Wastewater Projects.*

Prince Edward Island

Prince Edward Island. *Environmental Protection Act.* R.S.P.E.I. 1988, c.E-9.

_________________, 1989. *Environmental Impact Assessment in Prince Edward Island - Interim* Guidelines. Charlottetown: P.E.I.: Department of the Environment.

__________________, undated. *Terms of Reference - Environmental Impact Assessment - Charlottetown Area Cogeneration Project.*

Quebec

Quebec. *Environmental Quality Act.* R.S. Q. 1977, c. Q-2. *Environmental Impact Assessment and Review Regulation* (R.R.Q. 1981, c. Q-2, r.11), *Environmental Impact Assessment and Review Applicable to a Part of the Northeastern Quebec Region Regulation* (R.R.Q. 1981, c. Q-2, r. 10), *Environmental and Social Impact Assessment and Review Procedure Applicable to the Territory of James Bay and Northern Quebec Regulation* (R.R. Q. 1981, c. Q-2, r.11; *Regulation to amend the Regulation Respecting Environmental Impact Assessment and Review* (R.S.Q. c.Q-2, s.31.9).

___________, Boudreault, F. R. and A. Rodrigue. April 1982. *General Guide for Environmental Impact Studies.* Government of Quebec.

___________, July 1982. *Environmental Impact Assessment and Review Procedure.* Government of Quebec.

____________, 1994. *Environmental Assessment of Northern Projects.* Government of Quebec.

______________________, 1996. *Environmental Assessment in Quebec: The Procedure for Southern Quebec.*

______________________, August 1991. *Impact Assessment Guidelines Great Whale Hydroelectric Complex.*

______________________, undated. *Impact Study Guidelines for the Planned Extension of Forest Road N-822-Proponent: Domtar Inc.*

<u>*Saskatchewan*</u>

Saskatchewan. *Environmental Assessment Act.* S.S. 1979-80, c.E-10.1, as amended by C.77 of *The Revised Statutes of Saskatchewan, 1983, C.42 of the Revised Statutes of Saskatchewan 1988-89 and C.42 (rep.) of The Revised Statutes of Saskatchewan, 1988-89.*

Saskatchewan Environment and Public Safety. 1987. *Saskatchewan Environmental Assessment and Review Process.*

____________________, December 1992. *Final Project Specific Guidelines for the Preparation of an Environmental Impact Statement - Saskpower Proposed Condie-Queen Elizabeth 230 KV Transmission Line.*

________. 1994. *Environmental Assessment Reform Summary Reform.* Saskatchewan Environment and Resource Management.

____________________, October 1992. *East Prince Waste Management Committee Final Terms of Reference for Environmental Impact Assessment Study.*

Saskatchewan Environment and Resource Management , April 9, 1996. *Project Specific Guidelines for the Preparation of an Environmental Impact Statement for Weyerhaeuser Saskatchewan Ltd. Proposed Twenty Year Forest Management Plan.*

____________________, July 1995. *Final Project-Specific Guidelines for the Preparation of an Environmental Impact Statement. Saskfor Products Limited Proposed Oriented Strand Board Manufacturing Facility at Hudson Bay, Saskatchewan.*

Environmental Impact Assessments

ADI Limited for East Prince Waste Management Committee. 1993. *Environmental Impact Assessment for the East Prince Sanitary Landfill Facility.*

Harris and Associates and Jacques Whitford Environment. August 1994. *Town of Salmon Cove Water and Sewer Project Environmental Impact Statement.* Project No. 488.

Laidlaw Environmental Services Ltd. April 1996. *Environmental Assessment - Landfill Service Continuation.*

Manitoba Hydro. March 1995. *Environmental Impact Statement - Churchill - SpacePort 138 kV Transmission Line.*

McArthur River Joint Project. October 1995. *Environmental Impact Statement - McArthur River Project.*

National Defence. July 1989. *Goose Bay EIS - An Environmental Impact Statement on Military Flying Activities in Labrador and Quebec.*

P. Lane and Associates Ltd. and Washburn and Gillis Associates. 1988. *Generic Initial Environmental Evaluation of the Northumberland Strait Crossing Project.* Public Works Canada.

Saskatchewan Power Corporation. June 1995. *Condie to Queen Elizabeth 230 KV Transmission Line Environmental*

Impact Assessment.

Saskfor MacMillan Products Limited Partnership. September 29, 1995. ***Environmental Impact Statement - Oriented Strand Board Plant, Hudson Bay, Saskatchewan.***

Strait Crossing Inc. April 22, 1993. ***Environmental Evaluation of SCI's Northumberland Strait Crossing Project.***

Suncor Inc. Oil Sands Group. April 1996. ***Steepbank Mine Project Application.***

Contacts

Alberta

Klym, D. Manager, Project Approvals, Suncor Inc.

Sommel, B. Registrar of Environmental Information, Alberta Environmental Protection.

Stone, B. Director, Environmental Assessment Branch.

British Columbia

Giesbrecht, S. Office Assistant, Environmental Assessment Office Project Registry.

Yanulik, T. Assistant Registrar. Environmental Assessment Office Project Registry.

Canada

Hazell, S. Director, Affaires legislatives and reglementaires

Manitoba

Barto, W., Senior Policy Analyst, Executive Council, Sustainable Development Coordination Unit, Manitoba Round Table on Environment and Economy

Strachan, L. Director, Environmental Management.

New Brunswick

Drescher, G.G. Planner, Department of the Environment

Gordon, K. Manager, Environmental Assessment Section

Newfoundland

Graham, P., Director, EA Division

Kaufhold, E., Socio-economic analyst / environmental biologist

Nova Scotia

Porter, G.K., Environmental Assessment Officer.

Ontario

Bullen, J. Environmental Planner, Environmental Assessment Branch

Harrison, M.A. Environmental Planner, Environmental Assessment Branch

Oman, C.D. Environmental Planner, Environmental Assessment Branch

Pella, L.G., Senior Environmental Planner, Environmental Assessment Branch

Prince Edward Island

Godfrey, A. Environmental Impact Assessment Coordinator.

Quebec

Crowley, M. Agent de recherge, Direction de l'evaluation environmentale des projets industriels

Saskatchewan

Lechner, L. Manager, Assessment Review.

GLOSSARY OF ACRONYMS

Glossary of Acronyms

AEA	-	adaptive environmental assessment
ALB	-	Alberta
BC	-	British Columbia
CAN	-	Canada
CCA	-	community control approach
CCEM	-	Canadian Council of Environment Ministers
CEA	-	cumulative effects assessment
CEAA	-	Canadian Environmental Assessment Agency
CEARC	-	Canadian Environmental Assessment Research Council
CEE	-	cumulative environmental effects
CEQ	-	Council on Environmental Quality
DOE	-	Department of Environment
EA	-	environmental assessment
EAA	-	Environmental Assessment Act
ECE	-	Economic Commission for Europe
EIA	-	environmental impact assessment
EIS	-	environmental impact statement
ELUS	-	Environment and Land Use Secretariat
EMF	-	electro-magnetic field
EPA	-	Environmental Protection Agency
EPP	-	environmental protection plan
ESA	-	environmental sustainability assessment
ESA	-	environmental suitability approach (Chapter 8 only)

FEARO - Federal Environmental Assessment Review Office

FONSI - finding of no significant action

GIS - geographic information system

HAZOP- hazards operability study

IA - impact assessment

IAIA - International Association of Impact Assessment

IEM - integrated environmental management

IISD - International Institute for Sustainable Development

IJC - International Joint Commission

IRP - Integrated Resource Plan

LULU - locally unwanted land use

MAN - Manitoba

NATO - North Atlantic Treaty Organization

NB - New Brunswick

NEC - Niagara Escarpment Commission

NEPA - National Environmental Policy Act

NFLD - Newfoundland

NS - Nova Scotia

ONT - Ontario

OSB - oriented strand board

PEI- - Prince Edward Island

PEM - political-economic mobilization

RA - risk assessment

RIAS - regulatory impact analysis statement

SASK - Saskatchewan

SEA	-	strategic environmental assessment
SEA	-	social equity approach (chapter 8 only)
SEI	-	socio-ecological idealism
SIA	-	social impact assessment
SOE	-	state of the environment
TA	-	technology assessment
UN	-	United Nations
UNCEP	-	United Nations Conference on Environment and Development
US	-	United States
VEC	-	valued ecosystem component
VSC	-	valued socio-economic component
WCED	-	World Commission on Environment and Development