

Expanding the adaptation toolbox: exploring managed retreat in Grand Forks, BC

by

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## **Author's Declaration**

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

## Abstract

Climate change is likely to continue to increase the frequency and severity of floods in Canada, resulting in increased risk to physical, psychological, social, and economic systems. To effectively reduce flood risk in Canadian communities, managed retreat measures – the removal of people and property from high-risk areas – may need to be employed. Situated within resilience theory, this thesis aimed to increase understanding of property buyout programs as a form of managed retreat in Canada and as an element of future successful flood risk reduction measures. A systematic literature review (n=127) was first used to map the current understanding of property buyout programs as managed retreat in the Canadian context. A case study then critically documented and explored a property buyout program developed following the 2018 flood in Grand Forks, BC. Observational research and semi-structured interviews (n=27) with actors related to the Grand Forks flood recovery efforts and/or managed retreat program were used to identify thematic constraints and enablers of the development and implementation of managed retreat programs, along with elements for successful flood risk reduction measures in similar communities. The systematic review identified interconnected themes relating broadly to finance, social equity, emotional dimensions, timing, and participating agents. The case study research revealed that BC communities wishing to develop a property buyout program face a range of constraints, many of which may only be overcome during the window of opportunity that opens following a large-scale natural hazard event. In such situations, funding may be more accessible to pay for these expensive programs, and community members and politicians more amenable to such measures. Though interviewees broadly supported a managed retreat approach to hazard risk reduction, they stressed the importance of transparent, human-centric implementation that is guided by high-quality data and public input. As climate change increases and highlights hazard risk in communities across BC, public investments at all levels of government are needed to make managed retreat and resilience practices viable tools in the adaptation toolbox. These findings are relevant for communities across Canada, and offer important insights for those interested in undertaking or supporting managed retreat programs. The unique elements of the Grand Forks buyout program make it a valuable case study across many jurisdictions, and the thesis extends academic understandings of resilience theory, managed retreat, climate change adaptation, planning practice, and flood planning.

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## **Dedication**

This thesis is dedicated to the people of Grand Forks.

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# Chapter 1

## Introduction

### 1.1 Research problem

The changing climate has resulted in an increase in the rate and severity of natural hazard and extreme weather events in Canada, including heavy rains and flooding. According to contributions to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), global changes in temperature, rainfall, and extreme weather will result in widespread loss and damage to human and natural systems by mid-century (IPCC, 2022). In many North American settlements, flooding is projected to become a dominant risk, displacing people, damaging infrastructure and heritage resources, interrupting economic activities and livelihoods, and increasing safety concerns (IPCC, 2022). Climate change impacts are expected to intensify in unexpected and unpredictable ways, and often with little to no warning, especially as they interact with other societal and environmental challenges.

In Canada, the severity and frequency of flooding will likely increase under climate change. Due to warmer winter and spring temperatures, the spring melt and subsequent flooding is expected to come earlier and be less predictable (Bonsal et al., 2019; Derksen et al., 2019). Changes in precipitation patterns are anticipated to increase rainfall-related flooding, resulting in a higher risks of water overflow and flash flooding (Gosselin et al., 2022). In the Province of British Columbia, the increased flood risk has been demonstrated by record-breaking floods in multiple communities in 2018 and 2021 (City News, 2018; McSheffrey, 2021).

Due to historical patterns of settlement across Canada, many communities are located close to water and have residential areas in or beside flood zones. This is especially the case in mountainous BC, where flat land is relatively uncommon, and the establishment of many interior communities predates floodplain mapping or awareness around flood risk. In 2019, the Insurance Bureau of Canada estimated that around 10% of private Canadian residences are at high risk of flooding. However, since the early 2000s, floodplain mapping in BC has not been comprehensively updated, resulting in mixed awareness of specific flood risk at both institutional and personal levels (British Columbia Real Estate Association & University of British Columbia Okanagan, 2021;

Northwest Hydraulic Consultants Ltd, 2021a). Indeed, in a national survey on flooding conducted in 2020, only 6% of respondents were aware that they live in a designated flood risk area (Ziolecki et al., 2020).

Floods result in range of impacts, including physical, psychological, social, and economic. Exposure to flooding can increase risk of physical injury, disease, and death, and can cause or exacerbate symptoms of anxiety, post-traumatic stress, and depression. These impacts are linked to both the trauma of the event itself, as well as social and economic disruptions which can last for many months. According to some research, 9% to 53% of populations exposed to flooding experienced post-traumatic stress two years on (Alderman et al., 2012). In addition to increased risks to personal health, flooding has become Canada's most frequent and expensive natural hazard in terms of property damage (Public Safety Canada, 2018b). Following the BC flooding in fall of 2021, insured damages were estimated at \$450 million, making it the most costly severe weather event in the province's history (Charlebois, 2021). For all of these reasons, there is now a significant push to attempt to avoid the negative impacts of flooding through a wide range of Disaster Risk Reduction approaches. Options to address flood risk include structural protections such as dikes and levees, raising structures or making them flood-resilient to reduce exposure to flood risk, and retreat actions that move people or property out of high-risk areas (Alexander & Ryan, 2012; Doberstein et al., 2019; Melius & Caldwell, 2015).

While Canadian communities have historically used traditional structural solutions to reduce the risk of flooding, in recent years interest in managed retreat has grown. Managed retreat refers to measures that intentionally withdraw, relocate or abandon buildings, infrastructure, and people away from risky areas (Doberstein et al., 2019; Harker, 2016; Healy & Soomere, 2008; Hino et al., 2017; Vandenbeld & MacDonald, 2013). This is often done through use of a property buyout program, which sees a government entity purchase and remove flooded or at-risk property (Salvesen et al., 2018). As climate change deepens, repeated flooding increases the cost of disaster rebuilding and magnifies the risk to human life, and retreat seems an inevitable consideration in some areas (Bronen & Chapin, 2013; Freudenberg et al., 2016; Mach et al., 2019). However, managed retreat programs remain highly controversial due to related financial, social, and political costs. Some communities in Canada have undertaken property buyout programs following large-

scale flood events, including Alberta in 2013 and Quebec in 2019 (Kovacs & Sandink, 2013; Sudha & Montpetit, 2019). The programs varied widely in program parameters, including timing, funding, buyout offers, and governance. Accordingly, with managed retreat programs such as buyouts becoming more common in Canada and other countries, there is a need to examine how these programs have been developed and implemented in order to identify key elements and elements for future successful programs.

## **1.2 Research gap and rationale**

While there are nearly two decades of research on managed retreat programs implemented around the world, and researchers are beginning to understand elements of best practice which might lead to program success, recently implemented programs still vary widely and experience context-specific enablers and constraints. Significant flood events in Canada in 2013, 2018, 2019, and 2021 have increased attention on the adaptation options available to Canadian communities, as well as related government policies and programs. In order to better understand and plan property buyout programs for the Canadian context, further research is needed on programs that have been implemented within in the Canadian risk reduction policy and funding landscape. This research aims to address some of these gaps in knowledge by systematically reviewing property buyout programs as managed retreat in the Canadian context, and then critically exploring and documenting the implementation of a recent managed retreat program in Grand Forks, BC.

In September of 2018, the City Council in Grand Forks, BC, voted to move people and property out of high-risk flood zones in the community. Earlier in the year, the area had experienced a 1-in-200-year flood that forced 1,471 households to evacuate and caused nearly \$50 million in damage (City of Grand Forks, 2018a; NOR-EX Engineering Ltd., 2019). Located at the junction of the Granby and Kettle Rivers, Grand Forks commonly experienced seasonal flooding from the spring thaw, including seven major flood events from 1894 to 2020 (Ebbwater Consulting Inc., 2021a). The floods in 2018, however, brought into sharp focus the high level of flood risk that has become a new normal in many parts of the Province. In the face of this reality, Grand Forks embarked on a multi-million dollar, multi-year program to purchase close to 100 properties from property owners and return the areas to floodable open space.

The case of Grand Forks is significant for many reasons. The decision made by the Grand Forks City Council in 2018 represented the first time a managed retreat strategy was employed in the Province of BC in response to flood risk, and one of only a handful of instances across Canada. As with many managed retreat case studies, the Grand Forks case showcases the complex and context-specific nature of managed retreat, and highlights many of the considerations that come with moving residents out of flood-zones – from financial and economic, to social and mental. Additionally, the property buyout program was unique in that it based buyout offers on post-flood value – an approach recommended against in literature – and required retreat within a particular timeframe. In addition to the lessons this case study provides, primarily for Canadian communities considering managed retreat to address their own flood risk, the unique elements of the Grand Forks program make it a valuable case study for many jurisdictions, and extends academic understandings of managed retreat.

### **1.3 Research purpose, questions, and objectives**

The purpose of this research is to increase understanding of managed retreat programs in Canada, including elements for future successful flood risk reduction measures. This was done by first developing an understanding of property buyout programs as managed retreat with a systematic literature review, followed by a case study of recent property buyout program. By using the case study of the Grand Forks program, I have provided a critical lens through which Canadian and BC policies, funding mechanisms, governance, and the buyout program itself have been explored. Qualitative approaches were used to address the following questions and objectives:

1. What is the current understanding of property buyout programs as managed retreat in the Canadian context?
  - Objective #1: To explore considerations for designing and implementing effective property buyout programs to reduce flood risk.
  - Objective #2: To document experiences and program details of previously implemented property buyout programs in Canada and other comparable jurisdictions.
  - Objective #3: To identify gaps in research related to the design and implementation of more effective property buyout programs in Canada.
2. How has the City of Grand Forks used a government-sponsored managed retreat (property buyout) program to reduce flood risk, and what were the related constraints and enablers?

- Objective #4: To understand the decision-making process that led to the Grand Forks property buyout program and document its details.
- Objective #5: To explore constraints and enablers of the buyout program.
- Objective #6: To map relevant policy and planning tools.
- Objective #7: To identify elements for future successful risk reduction measures in similar communities.

## **1.4 Thesis structure**

This thesis is divided into five chapters, and is organized as follows: Chapter 1 introduces the research problem, purposes and chosen case study, and outlines the research questions and objectives. Chapter 2 explains the research design and methods used in this research. Chapter 3 presents an in-depth, systematic literature review on key concepts and theory, including key considerations for property buyout programs to reduce flood risk in the Canadian context. Chapter 4 presents the results of the case study research, including an overview of the case study site and context, the flooding and climate change context in BC, a narrative description of the flood event and subsequent decision-making process, and a thematic analysis of the key informant (KI) interviews. Finally, the thesis ends with an overview of the research findings, discussion, implications, recommendations, avenues for future research, and concluding remarks.

# Chapter 2

## Research Methods

### 2.1 Research Design

This study used qualitative approaches to increase understanding of property buyout programs as managed retreat, and explore constraints and enablers of the Grand Forks managed retreat program. Two phases of qualitative research were used:

1. Systematic scoping literature review (n=127) of academic and grey literature on managed retreat and property buyout programs, and;
2. Case study research involving observational research and semi-structured interviews (n=27) with local actors related to the Grand Forks flood recovery efforts and/or managed retreat program.

The table below summarizes my research objectives, research questions, and the method used.

**Table 1: Overview of Research Design**

Research Question	Research Objectives	Methods
What is the current understanding of property buyout programs as managed retreat in the Canadian context?	<ul style="list-style-type: none"> <li>• Objective #1: To explore considerations for designing and implementing effective property buyout programs to reduce flood risk.</li> <li>• Objective #2: To document experiences and program details of previously implemented property buyout programs in Canada and other comparable jurisdictions.</li> <li>• Objective #3: To identify gaps in research related to the design and implementation of more effective property buyout programs in Canada.</li> </ul>	Systematic literature review
How has the City of Grand Forks used a government-sponsored managed retreat (property buyout) program to reduce flood risk, and what were the related constraints and enablers?	<ul style="list-style-type: none"> <li>• Objective #4: To understand the decision-making process that led to the Grand Forks property buyout program and document its details.</li> <li>• Objective #5: To explore constraints and enablers of the buyout program.</li> <li>• Objective #6: To map relevant policy and planning tools.</li> <li>• Objective #7: To identify elements for future successful risk reduction measures in similar communities.</li> </ul>	Case study research

### 2.2 Literature Review

The first approach involved a systematic scoping review of relevant academic and grey literature. Scoping reviews or studies typically aim to map relevant literature in the field of interest in a valid, reliable, and repeatable way (Arksey & O'Malley, 2005; Xiao & Watson, 2019). Specifically,

this systematic scoping review aimed to provide a map of the field, overview relevant research findings, and identify research gaps in existing literature. It was guided by the following research questions and objectives:

1. What is the current understanding of property buyout programs as managed retreat in the Canadian context?
  - Objective #1: To explore considerations for designing and implementing effective property buyout programs to reduce flood risk.
  - Objective #2: To document experiences and program details of previously implemented property buyout programs in Canada and other comparable jurisdictions.
  - Objective #3: To identify gaps in research related to the design and implementation of more effective property buyout programs in Canada.

### **2.2.1 Searches**

Two document searches were completed. The first search collected documents published up until July 2020, and a later search added documents published until May 2021. The documents were sourced primarily from four databases: Scopus, ScienceDirect, Web of Science, and Pro Quest. These databases were selected to capture multiple disciplines and document types, as Pro Quest includes databases for government documents. A small number of documents were also added through snowball sampling based on references in reviewed papers.

The activities involved in property buyout programs are known by a range of terms in different contexts and countries. In order to capture all relevant literature several phrases were used in the search, including: 'strategic relocation', 'household relocation', 'planned relocation', 'managed retreat', 'strategic retreat', and 'planned resettlement'. Targeted searches were conducted using the following search string to produce a preliminary list of articles. Where not applicable, full versions of the search terms were used:

[buyout\* OR "strategic relocation" OR "household relocation" OR "planned relocation" OR "planned resettlement"]

AND

[climat\* OR hazard\* OR disaster\* OR adapt\* OR "managed retreat" OR "strategic retreat"]



### **2.2.2 Article screening and study**

Articles needed to meet the following criteria in order to be considered in the review:

- English language literature from reliable sources (peer-reviewed literature or published by a government or other credible organization);
- Focused on the geographic scope of US, Canada, New Zealand, and Australia, plus limited other jurisdictions (specific papers that were informative for case studies);
- Needed to reference 'property' or 'buyout' in the text;
- Included activities that met the chosen definition of 'property buyout';
- Offered insight on such programs (whether through case studies or theoretical analysis); and the buyout actions needed to be motivated primarily by natural hazard risk. This last criterion eliminated documents that were about property acquisitions due to infrastructure developed for other reasons (e.g., highways).

One related term was excluded from the explicit search. The term 'managed realignment' is used somewhat interchangeably in the UK with managed retreat and is understood as measures which allow shorelines to evolve and move naturally (Doody, 2013; Esteves, 2014). While realignment can include moving people and property, the focus is on allowing the coast to adapt, and therefore more often includes methods such as removing flood defenses, intentionally breaching coast defenses, altering water flow, and moving infrastructure (Doody, 2013; Esteves, 2014). Due to this distinction, this review separates property buyouts as managed retreat from 'managed realignment' and did not include the latter in the document search.

An initial scan was performed of titles, key words, and abstracts. Documents that met the eligibility criteria were saved in Zotero, a citation and document management software. Zotero was used to sort, review, store, and cite the articles, as well as providing an Excel framework for analysing and coding the documents. The documents were obtained through institutional library access and then read in full, doing further eliminations and identifying additional documents to include. A small number of papers were eliminated due to limited journal access.

### **2.2.3 Data extraction, synthesis, and presentation**

Bibliographic information for the documents was exported from Zotero as an Excel spreadsheet, which provided the framework for note taking and document analysis. All the documents were then reviewed, noting main topics, methods, findings, and frameworks used or

developed. Common themes were identified and a qualitative synthesis provided. A shortlist of common property buyout program details was made, including trigger event, timeline, financial compensation, level of coercion<sup>1</sup>, funding source(s), and organization(s) involved. A separate spreadsheet was used to create comparison tables of implemented property buyout programs. Programs included in these tables were a sample of convenience as opposed to a comprehensive survey, as some program details were not included in relevant literature.

## **2.3 Case Study**

### **2.3.1 Case study selection**

This thesis used inductive strategies of inquiry to explore a single case study of the managed retreat program implemented by the City of Grand Forks, British Columbia. The instrumental, single case-study methodology allows for in-depth understanding of a specific phenomenon via one bounded case (Stake, 2005). This specific case was selected as the municipality is currently implementing a managed retreat program to reduce flood risk, including property buyouts. The program was initiated following an historic flood in 2018 (City of Grand Forks, 2021c). Property buyouts were projected to be settled by the end of 2021, with the rest of the Flood Mitigation Program completed in 2023 (City of Grand Forks, 2021j). As the program and trigger event are fairly recent, the case presents an opportunity to gather “accurate information not lost in time” (Creswell, 2013, p. 98). Additionally, the Grand Forks case is one of only a handful of instances that managed retreat has been used following a natural hazard event in Canada, and the first time a managed retreat program has been implemented in British Columbia, offering empirical experience and lessons to guide future flood risk reduction plans and programs. Lastly, when the case study was selected in 2020, the Grand Forks buyout program was anticipating nearly 100% voluntary

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<sup>1</sup> For the purposes of this thesis, the level of coercion refers to either voluntary or mandatory buyout programs. In a voluntary program, a homeowner must agree to sell their property, without the use of eminent domain or other condemnation powers (Mach et al., 2019). This is in contrast to a mandatory program, which expropriates property as per expropriation law or eminent domain, depending on the jurisdiction. Though this black and white distinction has been used, I acknowledge that programs are rarely so clear cut. Further research is required to understand coerciveness in voluntary programs.

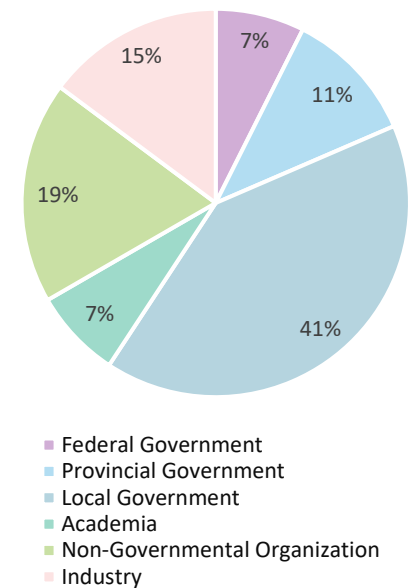
acceptance of buyout offers based on post-flood fair market property values – an unlikely combination, according to literature.

## 2.3.2 Semi-structured interviews

### 2.3.2.1 Key Informant Selection

Semi-structured interviews were used to collect data as they allow for both set questions and variation from participant to participant (Berg & Lune, 2017; Fylan, 2005). Key informants (KI) were identified using purposive and snowball sampling methods. They were selected for their proximity to the Grand Forks managed retreat program and understanding of disaster risk reduction and flood management policy and practice in British Columbia. Selected KI's came from a range of backgrounds, including municipal government, provincial government, federal government, academia, consulting firms, non-governmental organizations and insurance, and had expertise in land use planning, engineering, government, insurance, risk management, flood and hazard planning, climate change, real estate, and social supports (see Figure 1). Property owners were excluded from participation due to ethical considerations related to repeat trauma and the practical considerations including access during a global pandemic. An initial list of potential participants was compiled, and publicly available email address recorded. I then sent out initial contact emails inviting prospective informants to participate in interviews as part of the research project (see Appendix A). If they expressed interest, a second email was sent with more information on the project and a consent form (see Appendix B and C), and interview arrangements were made. Some informants recommended names of other possible informants during the interviews or in email correspondence. These individuals or organizations were then contacted through the same email process. In total, 34 informants were contacted, and 27 interviews conducted.

**Figure 1: Key informant distribution**



As per the Tri-Council Policy Statement for research involving humans, ethics approval was required for this research project. Ethics clearance for this research program was granted through the University of Waterloo Research Ethics Committee (ORE #41934). A signed consent form authorizing the use of data for research purposes was obtained from each research participant before an interview began.

### **2.3.2.2 Interview Design and Procedure**

This research conducted semi-structured interviews with key informants, which allowed for both focused questions and additional, individual details and experiences to emerge on the topics of interest (Fylan, 2005). An interview guide was developed to include themes and questions relevant for both key informants with knowledge of the Grand Forks managed retreat program and broader expertise from subject matter experts (see Appendix D). As per the semi-structured approach, questions were tailored to the background of the key informant and interview probes used (Berg & Lune, 2017; Fylan, 2005).

Due to travel restrictions related to the COVID-19 pandemic, all interviews were conducted over the telephone or video call using institutional Microsoft Teams access. Interviews lasted from 38 to 103 minutes long, for a total of 28 interview hours. The interviews were audio-recorded after receiving participant consent and transcribed to facilitate further analysis. The online transcription program Otter.ai was used to auto-generate initial transcripts, which were then downloaded and cleaned in MS Word to match the recording exactly. All identifiers were removed to maintain confidentiality. The audio recordings and transcripts were saved to a secure device as per research ethics protocol.

### **2.3.3 Field Visit**

Field research was originally planned for the summer of 2020 but postponed due to the COVID-19 pandemic. Once field research was again permitted by the Office of Research Ethics, I applied for permission to visit the City of Grand Forks to complete observational research of the community. Upon completion of the health and safety protocol documents, permission was granted for a three-day trip in August 2021 (a day and a half each of travel and research). Once in the community, I walked previously flooded areas to visually assess the recovery process and detail

progress of the managed retreat program. I also attended an outdoor walking tour run by City of Grand Forks administration, who shared updates of the Flood Mitigation Program and walked the alignment of the structural flood mitigation works proposed for the downtown area. Field notes and photographs were used to supplement interview data and help with reflectivity (Creswell, 2013).

#### **2.3.4 Data Analysis**

Data analysis followed the general order of qualitative content analysis activities outlined in Berg and Lune (2017, p. 184). Interview data was uploaded to NVIVO 12, a qualitative data analysis software, which was used to support the coding process. I familiarized myself with the interview data, and then conducted an initial pass to open code common themes found in key informant responses (Saldaña, 2013). Subsequent passes of the data were done to add focused themes, code data, and identify key quotes (Braun & Clarke, 2006; Saldaña, 2013).

Researcher reflexivity was supported by a research journal recording experiences, observations, and ideas, a field notebook, and analytic memos (Creswell, 2013; Saldaña, 2013). Triangulation verifies data and establishes credibility through the use of multiple data sources, methods, or theoretical schemes (Creswell, 2013, p. 247). Where possible, data was verified with observational research and secondary data including news articles, council minutes, and government reports.

Due to the emerging nature of the chosen case study, a cut-off date had to be chosen after which data and updates were not included. For the purposes of this thesis, data is comprehensive until September 2021.

## Chapter 3

### Literature Review

#### 3.1 Introduction

Climate-related hazards are increasing flood risk around the world, displacing people and costing billions in disaster assistance (Hino et al., 2017). Flood damages make up around one third of total economic losses caused by natural hazards globally (Bosello et al., 2018). In Canada, 2013 flood events in Alberta and Ontario alone totaled losses close to \$3 billion CAD (IBC, 2020). Patterns of spatial risk were highlighted as recently as the 2020 Fort McMurray flood, where structures that had been recently rebuilt were again damaged in a 1-in-100-year flood event (Keller & McClearn, 2020). As “hazardousness of place” (Black et al., 2011, p. 53) increases, contemporary urban planning practice continues to explore ways to address vulnerabilities and create a harmonious relationship between natural and built environments (Bertilsson et al., 2019).

There are multiple responses available to decision-makers to reduce risk to people and property in flood zones. Potential responses often include protection, accommodation, and retreat (Abel et al., 2011; Doberstein et al., 2019; Hino et al., 2017; Koslov, 2016; Melius & Caldwell, 2015; Niven & Bardsley, 2013; Young, 2018). Protection includes structural works such as levees and dikes, which keep flood waters away from buildings and infrastructure (Doberstein et al., 2019; Melius & Caldwell, 2015). Accommodation measures involve reducing exposure or vulnerability to flooding, for example raising structures above flood levels or building them to be flood-resilient (Alexander & Ryan, 2012). Retreat includes actions that specifically move flood-prone infrastructure out of flood-zones to safer areas (Doberstein et al., 2019; Melius & Caldwell, 2015). In addition to these three responses, other adaptations could include avoid, i.e. keep infrastructure from being build in a flood-zone in the first place (Doberstein et al., 2019), do nothing (Harker, 2016; Niven & Bardsley, 2013; Savard et al., 2016), or a combination of all strategies (Savard et al., 2016; Young, 2018). Historically, protection has been a popular measure in North America as it allows communities to remain in place (Perry & Lindell, 1997). Unfortunately, hard infrastructure such as flood walls or dykes have limits on the protection they offer and can be costly to implement, maintain, and adjust

(Koslov, 2016). There is also evidence that they can cause environmental damage and lead to loss of biodiversity (Gordon & Little, 2009; Hino et al., 2017; Savard et al., 2016).

Interest in 'retreat' measures have grown recently, including managed retreat<sup>2</sup>. Managed retreat refers to management and mitigation measures that intentionally withdraw, relocate or abandon buildings, infrastructure, and people away from hazardous areas to manage hazard risk (Doberstein et al., 2019; Harker, 2016; Healy & Soomere, 2008; Hino et al., 2017; Vandenbeld & MacDonald, 2013). Managed retreat is grounded in concepts of resilience, which can refer to the ability of an urban system to persist in the face of disturbance or shock, adapt to change and adversity, and transform to support future adaptive capacity in a timely and efficient way (Meerow et al., 2016; Sayers et al., 2013). In the context of flooding, resilience can be understood as an urbanized area's ability to flood without disaster, or in instances where economic and social orders are disrupted by a flood event, to reorganize quickly (Liao, 2012). The planning process is an important part of increasing flood resilience, as in most cases appropriate control of land use and development can proactively reduce risk (Scott et al., 2013).

Unlike other risk-reduction strategies, managed retreat eliminates risk to residents and infrastructure (Cigler, 2009), and supports the creation of space and amenities that can act as natural floodplain management (Freudenberg et al., 2016). As a one-time cost, the financial argument for retreat is strong, and some literature has aimed to quantify this (Nelson & Molloy, 2021; Noy, 2020; Pinter & Rees, 2021; Remo et al., 2012; Salvesen et al., 2018; Tate et al., 2016; Yildirim & Demir, 2021; Zheng et al., 2014). As repeated flood hazards increase spending on disaster rebuilding (Freudenberg et al., 2016) and risk to human life and property (Bronen & Chapin, 2013), retreat seems an inevitable consideration in some areas (Mach et al., 2019). As many scholars note, it is near impossible to eliminate all risk through non-retreat based infrastructure adaptation (Bier et al., 2019; Cigler, 2009; Freudenberg et al., 2016).

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<sup>2</sup> Due to the negative perception of the concept of 'retreating' in the US (Koslov, 2016), property buyouts and managed retreat are also referred to as 'strategic relocation', 'community relocation', 'climate displacement', or planned resettlement' (Hino et al., 2017). In other jurisdictions, property buyouts may also be referred to as 'household relocation', 'planned relocation', and 'strategic retreat' (Seebauer & Winkler, 2020b).

Property buyout programs are one form of managed retreat. As this mechanism can vary widely, for the purposes of this review buyouts are understood as programs through which a government acquires and subsequently removes property that has been damaged or destroyed by a natural hazard (Salvesen et al., 2018). Such buyout programs allow government to strategically move people and infrastructure out of high-risk areas (Craig, 2019) and protect against future damage and risk by re-zoning the land to limit certain kinds of use and development (Koslov, 2016). Buyout programs have been conducted around the world with varying success. In the US, they are commonly a post-disaster response funded by the federal government and implemented on the community scale (Siders, 2013b). In other jurisdictions they have been successfully used to move communities out of harm's way from sea-level rise (Australia) (Sipe & Vella, 2014) and earthquakes (New Zealand) (Mitchell, 2015; Noy, 2020).

As property buyout programs become more popular as a flood-risk reduction tool, there is a need to further understand their varied aspects, including program planning, implementation, and long-term affects. In particular, there are gaps in scholarship related to documenting and critically exploring aspects of these programs in the Canadian context, as Canadian buyout programs have been limited and mainly reactive (Thistlethwaite et al., 2020).

In order to develop a comprehensive understanding of property buyouts for flood risk reduction in Canada, this chapter synthesizes literature on property buyout programs within the larger context of managed retreat. It provides an overview of key messages and themes found in literature, with the aim of identifying considerations and issues to explore in semi-structured interviews. It also highlights research gaps that can be probed through the empirical stages of my research. In order to identify themes relevant for property buyout programs in the Canadian context, this review looked at literature focused on other countries with similar policy contexts and incomes. These included the US, New Zealand, Australia, and select jurisdictions in Europe.

The review determined that while property buyout programs are varied, they share key challenges related to funding, equity, timing, and capacity. Literature also highlights common factors for success, namely public participation, homeowner supports and financial compensation, a planned approach, and organizational capacity. Few documents were focused on Canada, highlighting this continued gap in the literature, with no research exploring property buyout



programs implemented in BC, Canada. Much of the existing research focused on property buyout programs that were entirely voluntary, whereas the Grand Forks program was essentially mandatory as it required retreat within a designated timeframe.

## **3.2 Background**

### **3.2.1 Approaches to addressing flood risk**

The wicked problem of climate change has shone a light on the hazard risk that exists in urbanized areas. Much of this risk has been perpetuated by urban planning and engineering practices that have enabled and prioritized urbanization and subsequent economic development in areas to flooding. The rational comprehensive model of planning – which provides the basis for many contemporary planning practices – assumes complete knowledge of all current and future factors, and a planning process separate from politics (Abs, 1988; Howe, 1992). As noted by Abs (1988), not only are these assumptions often false, planning is often reactive due to limited public sector resources, resulting in a planning process that is heavily influenced by the trends and whims of the private sector. When applying such a process to the uncertainties of flood risk reduction in the context of climate change, it is no wonder that past approaches, including a heavy focus on structural options, are now falling short (Burby et al., 2000; Gleeson, 2016; Liao et al., 2016; Scott et al., 2013; Yumagulova & Vertinsky, 2019). Flood risk reduction not only often involves managing complex governance systems and competing interests for land and water resources, but also wide temporal and spatial scales, and uncertain future risks (Liao, 2012; Scott et al., 2013; Yumagulova & Vertinsky, 2019). Faced with such a challenge, it is no surprise that concepts of resilience offer promising approaches to risk reduction planning.

### **3.2.2 The role of resilience**

Resilience began to emerge in disaster literature around the late 1970s. Holling introduced two definitions of the term, first from ecology (1973) and later from engineering (1996). The engineering definition of resilience refers to a system's ability to maintain and return to stability near a state of equilibrium, including the speed with which the system recovers back to the original condition (Bertilsson et al., 2019; Davoudi et al., 2012; C. Holling, 1996; Liao, 2012). In contrast, the

ecological definition focuses on ecosystem dynamics, and posits that there are many equilibrium possibilities into which an ecosystem can stabilize following a disturbance. Resilience in this case is therefore determined by a system's ability to absorb disturbances or shocks and still maintain critical characteristics, or persist (W. N. Adger, 2000; Bertilsson et al., 2019; Davoudi et al., 2012; C. Holling, 1996; C. S. Holling, 1973; Liao, 2012). Many other definitions of resilience exist from a range of subject areas, including agriculture, engineering, environmental science, social sciences, business management, accounting, and psychology (Meerow et al., 2016). A 2016 review of resilience definitions developed the following definition:

*“Urban resilience refers to the ability of an urban system and all its constituent socioecological and socio-technical networks across temporal and spatial scales to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit future adaptive capacity.”* (Meerow et al., 2016, p. 39).

Liao (2012) uses Holland's ecological concepts of resilience to define flood resilience as an urbanized area's ability to flood without causing a disaster, or in instances where economic and social orders are disrupted by a flood event, to reorganize and recover quickly. Inherent in this definition is the idea of agile communities as hazard-resilient communities (W. Adger et al., 2004), moving away from managing specific known risks to developing a system that can flexibly adapt to future, uncertain risks (Scolobig et al., 2017; Yumagulova & Vertinsky, 2019). Resilience thinking encourages adaptability and a systems approach in the face of levels of uncertainty, making it a key framework for addressing increased exposure to risk and the uncertainties that communities face with a changing climate (Doberstein et al., 2019; Gleeson, 2016; Scott et al., 2013; Tyler & Moench, 2012).

Attempts to operationalize flood resilience point to a range of planning and policy tools and measures that serve to widen notions of risk assessment, options for implementation and even embracing some flooding in urban spaces (Bertilsson et al., 2019; Liao et al., 2016; Scott et al., 2013; Scott & Lennon, 2020). In this context, managed retreat can serve as a tool for urban resilience both by reducing direct exposure to flood risk and allowing some flooding as needed.

### 3.2.3 Property buyout programs in context

In Canada, property buyout programs as a form of managed retreat have been limited and documentation of them even more so. Understanding of property buyouts has been heavily influenced by the American experience, where many programs have taken place and subsequently researched. The US Department of Housing and Urban Development (HUD) defines buyouts as the “acquisition of properties located in a floodway or floodplain that is intended to reduce risk from future flooding” (US Department of Housing and Urban Development, 2019, p. 33). In the US, buyouts have been used since the late-1970s, when Soldiers Grove, Wisconsin moved their downtown out of the flood zone (Greer & Binder, 2017). At this time non-structural approaches were uncommon, and literature has noted the 1993 record-breaking flooding in the Midwest as a turning point for US federal policy, following which property buyouts became a viable post-disaster response (Koslov, 2016). In this context, a typical property buyout program involves purchasing properties located in a floodplain, removing the buildings, and restricting future land use through rezoning and other regulations (McGhee et al., 2020; Salvesen et al., 2018; Siders, 2013b). Property buyouts can be distinguished from other land acquisitions based on program goals, including future land use (Siders, 2013b). Other acquisitions may be for infrastructure projects such as dam expansion or due to community economic failure (Dannenberg et al., 2019). Because of the negative perception of the concept of ‘retreating’ in the US (Koslov, 2016), property buyouts and managed retreat are often referred to as ‘strategic relocation’, ‘community relocation’, ‘climate displacement’, or ‘planned resettlement’ (Hino et al., 2017). In other jurisdictions, property buyouts may also be referred to as ‘household relocation’, ‘planned relocation’, and ‘strategic retreat’ (Seebauer & Winkler, 2020b).

Rarely are property buyout a stand-alone measure, and the extent of their use varies by jurisdiction and circumstance. In countries such as the Netherlands and the UK, property buyouts are often a small piece of larger managed retreat programs. In the Dutch Room for the River approach, the focus is on making room for water for the sake of human safety (Bogdan et al., 2020). In order to facilitate this, private properties sometimes need to be moved or removed, as was the case in Nijmegen, the Netherlands, where a project to relocate a dyke required shifting houses to elevated land (Nijssen & Schouten, 2012).

### 3.2.4 Trigger events for buyout programs

Many property buyout programs have taken place following a natural hazard event such as a major flood, hurricane, or earthquake, establishing a major link with disasters as a trigger for buyouts (Siders, 2013a). This approach takes advantage of a post-hazard policy window of opportunity (see more in section 4.4.1) which often creates a secondary buyout trigger, available funding, in a post-disaster environment. In Canada some funding for buyouts has come from federal and provincial governmental Disaster Financial Assistance, which can be triggered following a hazard event – for example following 2019 floods in Quebec and New Brunswick (Davies, 2020). In the US buyouts are typically funded by the Federal Emergency Management Agency (FEMA), the Department of Housing and Urban Development (HUD), and some state governments (BenDor et al., 2020; Mach et al., 2019; McGhee et al., 2020), though the program is managed by a state or local government (Siders, 2019b). Since 1993, FEMA has funded the purchase of more than 55,000 flood-damaged properties (Federal Emergency Management Agency, 2020), closely linking buyouts to FEMA, HUD, and their respective program rules and requirements. In a typical FEMA floodplain acquisition the program is voluntary, property owners are offered a percentage of pre-flood property value, and the purchased area maintained as floodable open space in perpetuity (McGhee et al., 2020; Salvesen et al., 2018; Siders, 2013a).

Beyond flooding, property buyouts programs have been used as part of post-disaster urban planning revisions and rezoning in Toronto following Hurricane Hazel in 1954 (Davies, 2020), and in New Zealand after the 2011 Canterbury earthquake. Affecting Christchurch and the surrounding area, the earthquake series caused hundreds of deaths and damage on the scale of 20% of the country's GDP (Mitchell, 2015, p. 3). Following the event, the New Zealand government ran a program to purchase property from insured owners and rezone the area, especially in areas of the city physically prone to liquefaction (Mitchell, 2015).

Property buyout programs have also taken place both reactively and proactively in response to longer-term hazards such as sea level rise. This is especially common in countries such as Australia and New Zealand, where coastlines are both heavily developed and vulnerable to flooding (Niven & Bardsley, 2013). In 2011, 85% of Australia growing population lived near the coast (Abel et al., 2011, p. 281). With increases in coastal flooding and storm events putting private and public

assets at risk (Harker, 2016; Hayward, 2008), retreat from the coast is becoming a common consideration by governments, and planned retreat in some form has been used in Australia since 1988 (Niven & Bardsley, 2013). One challenge to using property buyouts as a planning tool for sea water inundation is that owners must often give up their property before the land is permanently taken over by water (Alexander & Ryan, 2012).

### **3.3 Results**

The review resulted in 127 academic and grey documents related to property buyout programs as a form of managed retreat. Authorship came from a wide range of disciplines, including economics, psychology, geography, law, public health, anthropology, and urban planning. Article types included reviews, qualitative, quantitative, and mixed method studies. A selection of completed property buyout programs found in the review are summarized in Tables 2 and 3.

#### **3.3.1 Financial considerations of buyout programs**

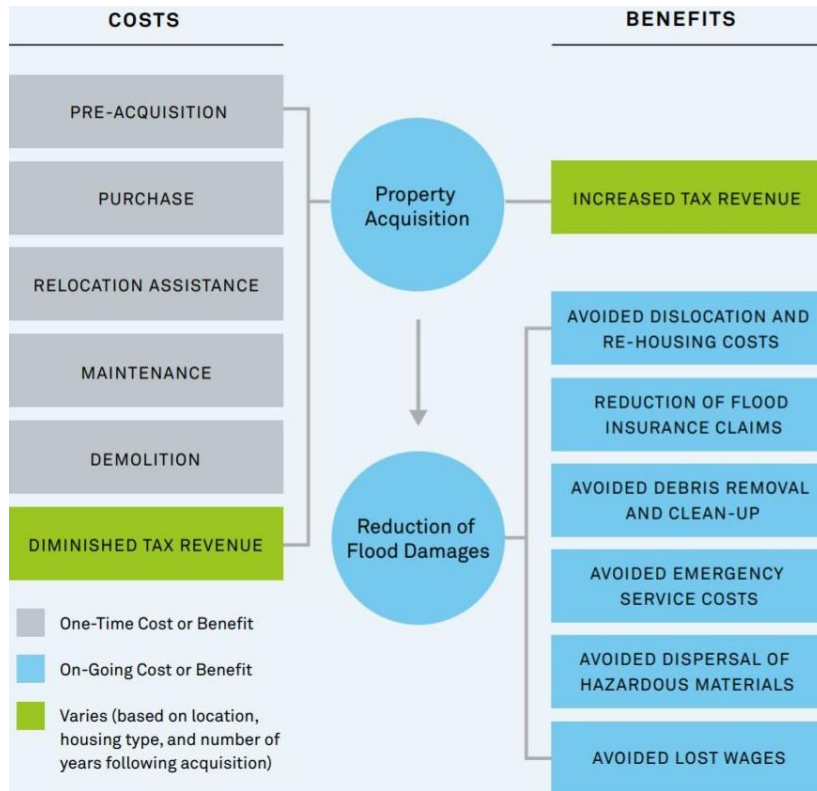
All of the reviewed articles mentioned financial considerations of property buyout programs, suggesting this is an element of critical concern for buyouts. They included economic analyses of programs, funding sources for buyouts, financial compensation for property owners, and the role of insurance. A comparison of financial details from past programs can be found in Table 2.

##### **3.3.1.1 The economic case for property buyouts**

A key justification for retreat as a flood-risk reduction measure is the long-term financial benefit, as emergency response and repeat rebuilding costs are often higher than moving people and property out of high-risk areas (Olsen et al., 2000; Salvesen et al., 2018; Zheng et al., 2014). Many funding programs are contingent on a cost-benefit analysis (CBA) proving that the financial cost of staying long-term is indeed higher than retreat, and involve assessing costs of acquiring and maintaining property against possible losses and repairs should people and property remain in place (Freudenberg et al., 2016; Tate et al., 2016). Common costs and benefits of buyouts are summarized in Figure 2. In the US, FEMA has an approved CBA process (Environmental Law Institute, 2017; Siders, 2019a), used by many of the implemented programs included in this review – though

properties located in a 100-year floodplain and considered ‘substantially damaged’ are declared cost effective and the CBA is waived (Tate et al., 2016).

**Figure 2: Fiscal Impacts of Buyouts: Costs and Benefits**



(Freudenberg et al., 2016)

To provide insight and data regarding the economic case for property buyout programs, some literature aimed to quantify their long-term financial benefits. Olsen et al. (2000), took a first step towards dynamic modelling of floodplain management, and found that buyouts can be beneficial when the expected benefits of structural measures are limited by the likelihood of future flooding. Along the same line, Remo et al. (2012) used hydraulic analysis, hydrologic analysis, and Hazus-MH modeling to quantify levee benefits. The authors modelled an area on the Mississippi River and found that buying out all the properties in the 500-year floodplain would cost 40% less than repairing the buildings damaged by the 500-year flood alone. Salvensen et al. (2018) compared avoided losses across multiple communities following Hurricanes Fran, Floyd or Matthew and found that buyouts saved close to \$95 million USD in flood damages. Nelson & Molloy (2021) calculated

**Table 2: A non-comprehensive overview of completed property buyout programs found in the systematic review**

Case	Trigger Event	Main Funding Sources	Financial Incentives	Land use post-buyout	Lit Reference
Ames, Iowa, USA	1993 Great Flood	US FEMA HMGP; US HUD CDBG; State sources	110% appraised value pre-event; incentives to relocate within City; \$8500 for moving expenses and down payment.	Extension of existing park; floodwater retention land.	Siders, 2019b; Siders, 2013a
Breezy Point & St Peters Road, Manitoba, Canada	2009 ice jams flood	Government of Manitoba	100% appraised value pre-event	Natural state; Flood buffer zone; unoccupied crown land.	IBI, 2017
Cedar Rapids, Iowa, USA	2008 Midwest Floods	US FEMA HMGP; Iowa Flood Mitigation Board (interim funding); US HUD CDBG	100% appraised value pre-event, minus FEMA payments and other federal assistance; 107% pre-flood value.	(1) Greenway (2) Construction & Study Area; (3) Neighborhood Reinvestment Area	Lovett, 2016; Siders, 2019a; Munoz and Tate, 2016; Tate et al., 2016
Cherokee City, Iowa, USA	1993 Midwest Floods	FEMA HMGP (75%); City of Cherokee and State of Iowa (25%)	100% appraised value pre-event; relocation assistance; up to \$22,000 in down payment support; new subdivisions for relocation	Green space and open space recreation.	Siders, 2013b
Christchurch, New Zealand	2011 earthquake	Government of New Zealand	1) 100% appraised value pre-event of land/ buildings, minus insurance payments. 2) 100% pre-event value of land only, plus insurance.	Recreational activities; green space	Mitchell, 2015; Noy, 2020
Colorado, USA	2013 flood	US FEMA HMGP	100% appraised value post-event of land only.	Parks or recreational purposes.	Rumbach et al., 2020
Eferding Basin, Austria	2013 river flood	Austrian Federal Government (50%); Upper Austrian State Government (30%)	80% appraised value pre-event of buildings only; 80% of demolition costs (within 5 years after signing relocation agreement).	Grassland. Strict rezoning including no new building.	Seebauer & Winkler, 2020
Grantham, Queensland, Australia	2011 flood	Australian Government (47.5%); Queensland Government (17.8%); insurance (30%); donations (5%).	Exchange property for an equivalent flood risk-free lot; grant for moving and miscellaneous costs (AUD\$32,550/USD\$32,279).	Natural space; emergency services training; foraging.	Sipe & Vella, 2014
High River, Alberta, Canada	2013 seasonal flooding	Province of Alberta	100% appraised value pre-event, plus 20% for administrative and reclamation costs.	Undeveloped state.	Bogdan, 2020; Kovacs & Sandink, 2013
New York City "NYC Build it Back" program	2012 Hurricane Sandy	US HUD CDBG	100% appraised value post-event (allows areas outside enhanced area target).	Property can be transferred and will be redeveloped.	Maly & Ishikawa, 2013; Siders, 2013b
New York State Rising Buyout and Acquisition Programs	2012 Hurricane Sandy; 2011 Hurricane Irene; 2011 Storm Lee	US FEMA HMGP; US HUD CDBG	100% appraised value pre-event, incentives for residents in a high-risk area (10%), group buyouts (10%), staying in County (5%)	Parks; natural buffer zone; other non-residential/commercial uses (outside high-risk areas)	Maly & Ishikawa, 2013; Siders, 2013b; Environmental Law Institute, 2017
Toronto, ON, Canada	1954 Hurricane Hazel	Government of Canada; Government of Ontario; municipalities; donations	100% appraised value pre-event	Parks or flood-control purposes	Robinson et al., 2006
Waitakere City, New Zealand	2002 stormwater flooding	Infrastructure Auckland (now Auckland Regional Holdings)	100% appraised value pre-program announcement, plus moving costs and legal fees	Stormwater reserves and management parks; public gardens.	Vandenbeld and MacDonald, 2013; Atlas Communications, 2011

buyout return on investment using a program in Nashville-Davidson County, Tennessee, and found it to be at least 3:1, noting that proactive implementation increases the cost-benefit ratio. Pinter & Ree (2021) modelled economic flood risk in relocated communities in the Midwest US and found that a single flood event will often exceed the cost of relocation Yildirim & Demir (2021) used web-based visual data analytics to visualize past buyouts and mitigation projects, therefore allowing users to evaluate cost-benefit analyses at the property and community level. Their Risk Assessment and Mitigation Environment (FRAME) showed that most property buyouts programs had positive benefit to cost ratios, and that projected streamflow is a good indicator of how much damage could be avoided through the use of a property buyout program.

Many studies noted the financial burden of property buyouts on lower levels of government (BenDor et al., 2020; Cigler, 2009; de Koning et al., 2019; Koslov, 2016; Lovett, 2017; Nelson & Molloy, 2021; C. S. Robinson et al., 2018; Savard et al., 2016; Siders, 2019a, 2019b). While the bulk cost of a buyout is often shouldered by a national government, the programs can result in significant on-going costs for municipalities (BenDor et al., 2020; E. Zavar, 2016), a phenomenon which was empirically analyzed by BenDor et al. (2020). Fiscal losses fall into two main categories: loss of tax-revenue income on bought-out areas – especially if the properties were appealing for development (Bukvic & Owen, 2017; Siders, 2019a), and maintenance costs of bought-out areas, which are influenced directly by the use of the acquired properties.

The literature suggests that thoughtful property buyout program design can help mediate some of the costs put on municipalities. For example, buyout programs may consider including a financial incentive for staying in the community, which would keep property taxes local (BenDor et al., 2020; Bryner et al., 2017). Remaining local can also be a requirement for participants when non-FEMA financial assistance is used, as was in the case of North Carolina's post-Hurricane-Floyd SARF program (BenDor et al., 2020). In the reviewed programs, such incentives ranged from an additional 5% to stay in county (New York State Buyout Program), to 15% to stay in the same city (New York City program) (Maly & Ishikawa, 2013; Siders, 2019a). BenDor et al., (2020) showed this approach to be one of the most effective in reducing the financial burden on municipalities; in cases where property taxes contribute significantly to municipal revenue, such policies reduced the total financial impact by nearly 22%. In the New York City example, Binder et al. (2019) followed up three and a



half years after relocation and found that most buyout participants had indeed relocated to locations within or nearby their original community.

When bought out properties remain vacant (i.e. lots of mowed grass or bare soil) maintenance costs are typically high and these often accrue to municipalities (Freudenberg et al., 2016; Salvesen et al., 2018; E. Zavar & Hagelman, 2016). It is common for properties to remain vacant when program uptake is low or where bought-out properties are sporadically located in a 'checkerboard' or 'swiss cheese' pattern (Salvesen et al., 2018), as in the case of Oakwood Beach, NY (Binder et al., 2020). Following Hurricane Sandy, a state buyout program had limited uptake, resulting in a checkerboard pattern of vacant lots that were left unmanaged and overgrown. Conversely, the literature suggests that converting empty lots to planned open space can reduce maintenance costs and increase the value of nearby property (Binder et al., 2020; Koslov, 2016; Nelson & Camp, 2020), especially when contiguous properties or entire communities are bought out. Additionally, when large, connected swathes of a municipality are purchased, the government might save on essential infrastructure costs, such as the maintenance of roads and sewers, in addition to future hazard response and recovery cost savings (BenDor et al., 2020; Freudenberg et al., 2016; Kousky, 2014). If the lots are not able to be joined up as continuous space, there are still ways to reduce maintenance costs on the scale of an individual lot – for example through simply planting native species (Nordstrom & Jackson, 2018), using individual lots for small-scale recreation/parkland (Environmental Law Institute, 2017; E. Zavar & Hagelman, 2016), or leasing the land for low-risk activities such as parking (BenDor et al., 2020).

In a more positive sense, when post-buyout land use is planned, communities can increase land value and ecological and recreational benefits through community enhancements such as parks, community gardens, dog parks, and recreation spaces (Atoba et al., 2020; BenDor et al., 2020; Freudenberg et al., 2016; Salvesen et al., 2018; E. Zavar & Hagelman, 2016). Such uses leverage a perceived sense of 'publicness' to former private spaces, which has been observed following disasters and was coined 'post-disaster communalism' by Zavar & Schumann (2020, p. 402). The potential for creative ways to increase land value remains largely unexplored, likely due to lack of funding and planning capacity (Environmental Law Institute, 2017; E. Zavar & Hagelman, 2016). In order to take advantage of rezoning post-buyout, cities might consider researching spillover affects,

i.e. how particular land uses increase the value of adjacent land (Salvesen et al., 2018, p. 35). Some rezoning and land use changes could be coupled with external partnerships to manage the land, for example with conservation groups, parks organizations, or land trusts (BenDor et al., 2020; Environmental Law Institute, 2017; Salvesen et al., 2018). Such an approach was used in Toronto, Ontario, following Hurricane Hazel in the 1950s. Following the damaging event, the provincial government allowed Conservation Authorities to acquire land for flood management and recreation (Doberstein et al., 2019; D. Robinson & Cruikshank, 2006). Some 13,000 hectares of land were for flood control and risk reduction, with much of it rezoned for as recreational or green space (Doberstein et al., 2019). Slavikova et al. (2020) note that land rezoning and other flood risk management policies are crucial in avoiding repeat damages, thereby maximizing the benefits of buyout programs.

### 3.3.1.2 Funding sources

Finding funding sources for the entire cost of a property buyout program was a challenge noted in most buyout case studies. Property buyouts are expensive and funding them is a significant barrier to establishing a program – especially if the properties involved are high-value or historic (Bukvic, 2015; Doberstein et al., 2020; Healy & Soomere, 2008; Klima et al., 2020; Song & Peng, 2017). There are typically four main funding sources for a buyout program: a federal/central government, a local (municipal) or mid-level government (provincial/state), insurance companies, or the property owners (Noy, 2020). Which of these sources – if any – should bear the brunt of the cost is an on-going debate.

Money for buyout programs often comes out of disaster response funding. In Canada, provincial disaster relief programs funded buyouts following the 2019 floods in Quebec and New Brunswick respectively (Davies, 2020; Saunders-Hastings et al., 2020). In the US, funding is readily available following a natural hazard event through FEMA’s Hazard Mitigation Grant Program as well as HUD’s Community Development Block Grant. The aim of FEMA’s HMGP is to prevent or reduce future hazard risk through mitigation activities such as relocation (Environmental Law Institute, 2017), and therefore require that acquired land be reverted to open space appropriate for flood mitigation and/or green space (Tate et al., 2016). FEMA’s Hazard Mitigation Grant Program (HMGP)

typically covers 75% of a buyout cost, with state or local governments finding funds for the remaining 25% (E. Zavar & Hagelman, 2016). In extreme cases, homeowners may be required to cover this 25%, (Kick et al., 2011). HUD's CDBG is focused on community revitalization and economic development, which allows for a lot of flexibility in buyout program design, and therefore funding amount vary depending on the particulars of a given program (Tate et al., 2016).

Financing property buyout programs with money allocated for disaster response can constrain the scope of risk reduction projects, presenting a challenge for proactive buyout programs to reduce flood risk, or instances where a house, community, or program may not reach the specifications for the disaster funding. For example, in Kivalina, Alaska, a whole community applied for FEMA funding to relocate away from coastal flooding, but was not eligible for the program (Bronen & Chapin, 2013; Dannenberg et al., 2019). Post-Hurricane Sandy, some flooded neighbourhoods and individual houses appealed to be included in the New York State buyout program, but were denied as they were not considered high enough risk (Maly & Ishikawa, 2013; Siders, 2013b). Of all the implemented property buyout programs found in the review, only two were not funded with disaster financing. The two programs were located in Waitakere City, New Zealand, which used funded a buyout program with money earmarked for infrastructure projects (Atlas Communications & Media Ltd, 2011; Vandenberg & MacDonald, 2013) and Nijmegen, in the Netherlands, which bought out properties with a fund especially planned for Room for the River flood mitigation actions (Nijssen & Schouten, 2012).

Most often property buyouts are funded through a cost-sharing agreement between multiple levels of government. While this approach can support the development of such expensive programs, Peterson et al. (2020) note that it also has shortcomings, as it requires local governments to meet a certain contribution threshold, move through the buyouts according to lengthy federal timelines, and implement reactive programs. Some municipalities have found creative means of funding property buyouts, including municipal or green bonds, local sales taxes, or stormwater utility fees (National Wildlife Federation, 1998; Pasley, 2001; Peterson et al., 2020). For example, in South Carolina, a Resilient Revolving Loan Fund was developed to provide funding for local governments to take part in federal buyout programs. Some research found the public amenable to financially supporting adaptation activities; in survey of homeowners in South Florida, Treuer et al.

(2018) found that 75% of homeowners would support a bond to finance current or future climate adaptation actions. This approach of using a bond was used successfully in San Antonio, Texas, which funded the immediate actions related to flood-recovery from a voter-approved city bond (Pasley, 2001). Following the 1984 flood in Tulsa, Oklahoma, interest from unallocated sales taxes were used to cover the 25% cost difference left after FEMA funds were applied (National Wildlife Federation, 1998).

Funding property buyout programs with taxpayer funds remains an on-going debate amongst decision-makers. As is explored below (4.1.4. Insurance and land valuation), the choice to live in risk-prone areas is not always balanced through insurance premiums or property values, and taxpayers include many people who do not own property and will never be compensated in the same way (Noy, 2020). That being said, Harker (2016) argues that as all people have likely contributed to the increase in greenhouse gas emissions, all taxpayers should be responsible for the affects (such as sea level rise or increased flood events). Some research has explored transferring the brunt of a buyout's costs away from taxpayers and to insurers or property owners. One such approach to financing property buyouts took place in Christchurch, New Zealand following an earthquake event in 2011 (Noy, 2020). The program, which relocated around 20,000 people, shifted the cost of retreat onto insurers and away from taxpayers. Such an approach may require stronger insurance frameworks in countries like the US and Canada in order to ensure compliance (Cigler, 2009).

### 3.3.1.3 Financial compensation

Although it is standard to financially compensate property owners in a property buyout program, determining adequate compensation is a complex and context-specific task. All the completed buyout programs included in the review financially compensated property owners to move, however, there were discrepancies in valuation of property, as well as additional non-financial compensation. Most of these programs used pre-disaster event property value to calculate compensation, with two notable exceptions: Colorado, USA and New York City, USA. The Colorado program addressed flooding of mobile home park businesses, and offered park owners post-flood property values for their land, but did not provide any compensation for owners of the mobile

homes, who own the individual home but rent the land it sits on (Rumbach Andrew et al., 2020). In this case, the mobile home parks were not included on out-of-date flood maps, and as mobile home owners do not own any land, they did not qualify for a buyout. In New York City's "Build it Back" Program, properties outside target flood areas could take part in the program but only at post-flood property value (Maly & Ishikawa, 2013; Siders, 2013b). Offering pre-flood property values make buyouts more appealing for residents but results in high program costs (Salvesen et al., 2018). The valuation of a property can also be contentious midway through the buyout process; in some situations, a third-party appraisal might be allowed when residents are unsatisfied with the valuation. This was the case for Manitoba's Breezy Point and St Peters Road buyout program (IBI Group, 2017) as well as the 2011 program in Christchurch, New Zealand (Mitchell, 2015; Noy, 2020).

Though pre-disaster Fair Market Value (FMV) of property is the most commonly mentioned baseline mentioned in the literature for determining financial compensation, programs vary in how much of this valuation they actually offer, as well as other compensation. Compensation for land and property range from as little as 80% (Eferding Basin, Austria), to 110% of pre-disaster FMV (Ames, Iowa) (see Table 2 for more examples). Offers may also include additional allocations for moving and/or demolition costs. For example, Austria's Eferding Basin property buyout program offered 80% of a building's pre-flood market value and 80% of demolition costs (Seebauer & Winkler, 2020b). In the Canadian context, caps on compensation have been seen in Quebec and New Brunswick buyout program (Davies, 2020). In cases where 100% of the pre-flood FMV was paid, homeowners reported challenges in finding comparable housing for the same price outside of a flood-zone (Baker et al., 2018a; Binder et al., 2019; D. de Vries, 2017; Freudenberg et al., 2016; C. S. Robinson et al., 2018), and noted many additional costs such as moving costs, interim housing, legal fees, connection to utilities and services, construction of a house pad and drainage, and building demolition (Bryner et al., 2017; Seebauer & Winkler, 2020b; Sipe & Vella, 2014; Vandenberg & MacDonald, 2013). These added expenses are even more of a burden if the homeowner is on a fixed income, retired, has a new family, or still has a mortgage (D. de Vries, 2007; Salvesen et al., 2018; Seebauer & Winkler, 2020b).

Limited research has taken place to directly assess ideal financial compensation and its relationship with encouraging property owner acceptance of a buyout offer (Frimpong et al., 2019).

Overall, results show that financial compensation has a positive result on encouraging a buyout offer, even if the compensation doesn't cover all related costs (Greer & Binder, 2017). Likewise, in a homeowner survey, Frimpong et al., (2019) found that the amount offered can indeed have a positive affect on the likelihood of a homeowner accepting an offer – though this changed significantly depending on the extent of damage and some socio-demographic factors. That being said, Bukvic and Owen (2017) noted that financial considerations alone could not compare to the power of the influence of decisions made by family, friends, or neighbours. Likewise, Loughran & Elliott (2019) explored where residents moved following federally funded buyouts in Houston, Texas, and found concerns about neighbourhood status to be a factor in moving; many homeowners only moved if they were able to move to a neighbourhood of equal or greater socio-economic status.

There is consensus in the literature that buyout offers need to be high enough that they make homeowners feel like they are getting appropriate value for their property, and allow them to re-create their same quality of life elsewhere – including social ties (Braamskamp & Penning-Rowell, 2018; Cheong, 2011; D. H. de Vries & Fraser, 2012; Loughran & Elliott, 2019; Lovett, 2017; Perry & Lindell, 1997; Seebauer & Winkler, 2020a)(Lovett, 2017; Perry and Lindell, 1997; Braamskamp and Penning-Rowell 2018; deVries and Fraser 2012; Seebauer and Winkler, 2020; Cheong, 2011; Loughran and Elliott, 2019). This valuation might consider quality of property and structures, job opportunities, school quality, health care services, access to social activities and amenities, proximity to social networks, proximity to work, and safety considerations (Graham et al., 2014; Kick et al., 2011; Seebauer & Winkler, 2020a; Song & Peng, 2017). Policy makers might consider adjusting compensation offers to cover the cost of a comparable house and community outside of a flood-zone (Binder et al., 2019), though such considerations will be contextual and subjective, and therefore require consultation with the community (Elmore et al., 2003; Graham et al., 2014; Lovett, 2017) (see section 3.3.5.2.).

#### 3.3.1.4 Insurance and land valuation

Insurance came up in articles as both a hinderance and a tool to implementing buyout programs. Because insurance is primarily designed to compensate insurance holders for damages

already suffered, in the event of a flood, insurance payouts can catch homeowners in a cycle of rebuilding as opposed to moving (Moore, 2017). Relocation or other mitigation strategies might be better long-term adaptations (Melius & Caldwell, 2015; Tate et al., 2016). The claims process itself can also pose hurdles; post-Hurricane Sandy, affected property owners cited challenges with filing insurance claims and getting flood damages covered, as well as difficulties reinsuring homes post-flood once they were identified as vulnerable to flooding (Bryner et al., 2017). Insurance fraud was also noted as an issue in some articles. For example, following Hurricane Katrina, cases were documented of companies manipulating insurance adjustments to attribute losses to flood when they should have been covered under windstorm policies (Cigler, 2009).

The presence of an insurance policy is noted to have both positive and negative influences on buyout financial offers. Flood insurance payouts can cause governments to adjust financial compensation for homeowners, resulting in skewed buyout offers, and confusing bureaucracy and timelines. It is common for homeowners and communities with insurance to begin rebuilding with payout authorization before they know if a buyout will be offered. In the case of Oakwood Beach, New Jersey, homeowners were caught off guard when they found out that insured losses were exempt from compensation (Koslov, 2016; Siders, 2019a). This exemption was also seen in the Austrian Eferding Basin buyout (Seebauer & Winkler, 2020b). Compensation adjustment goes the other way as well. In one case, buyout financial compensation was reduced by 30% for floodplain residents without flood insurance (Greer & Binder, 2017).

At a more systemic level, research highlighted the role of skewed insurance premiums and perceptions of 'informal' insurance due to past buyouts in other flood-prone areas. In theory, premiums should reflect the level of risk associated with a property, and owners should pay accordingly (Craig, 2019; Noy, 2020; Young, 2018). However, in some countries such as the US, insurance of flood-prone property is heavily subsidized by government through insurance and government protection, or through insurance risk-pooling practices, resulting in a false perception of safety (Craig, 2019; Gordon & Little, 2009; Moore, 2017). Researchers note that removing such subsidies would allow insurance premiums to accurately reflect the flood risk of a given property, and owners may be inclined to move themselves without the need of a trigger event such as a large flood (Melius & Caldwell, 2015; Moore, 2017; Noy, 2020). In Canada, overland flood insurance is

becoming readily available, and the federal government has begun consultation with the insurance industry to explore flood insurance options for high-risk areas (Davies, 2020).

The literature also points to a second source of ill-placed security: the historical precedent of buyouts. For many years, in the US in particular, federal disaster recovery money has been readily available for homeowners and lower levels of government, providing a form of informal insurance for those who decide to live in a high-risk area (Frimpong et al., 2019; Gordon & Little, 2009; Kousky, 2014; Siders, 2019b). Property investments at the personal or commercial scale might occur despite high flood-risk, as losses are continually reimbursed and actions which actively reduce risk (e.g. avoidance of high risk zones) are therefore discouraged (Frimpong et al., 2019). For example, for many years the City of New Orleans invested in structural protections, but did not rezone flood-prone areas, encouraging extensive development in at-risk neighbourhoods very close to the water. Many of these neighbourhoods sustained substantial damage following Hurricane Katrina and needed to be rebuilt, abandoned, or bought out (Gordon & Little, 2009). A misconstrued perception of risk has also been noted in Australia, where Young (2018) notes that government buyouts at pre-flood value can create a false housing market that does not reflect actual risk. Their suggestion is that governments consider leasing at-risk land from property owners instead of acquiring it following a hazard event, with the caveat that property owners remove any structures present. By leasing affected land to the government, affected property owners would have a regular income stream to support them through their housing move and adjustments. On the government side, making it clear that the land owner would be responsible for removing any structures before it could be leased, owning and developing high risk property is disincentivized. In New Zealand, Harker (2016) also suggests that a property would be more accurately valued if prospective land buyers knew its risk of flooding or sea level rise through mandatory disclosures, likely leading to a natural devaluation of the property. While such realistic valuation of property is good in the long-term, there is a risk that only wealthy homeowners will be able to afford increased insurance premiums encouraging unequitable socio-economic spatial distribution (Cheong, 2011; de Koning et al., 2019; Siders, 2019b).

Insurance reform can be an opportunity for collaboration and innovation that relate to buyouts. In Canada, the Ontario and Alberta floods highlighted opportunities for government to



work with insurance companies to make flood insurance more available (IBI Group, 2017; McNeil, 2019), including subsidized overland flood insurance (Davies, 2020). Identifying flood risks, including through comprehensive flood maps, is an essential step towards effective flood governance, and an additional area where the private sector can be involved, leveraging added resources and technology (Kovacs & Sandink, 2013; McNeil, 2019). Beyond this, there are possibilities to move beyond current insurance law all together. For example, Craig (2019) proposes that governments think outside the current legal framework and target flood-prone areas with a “twice and out” policy (Craig, 2019, p. 223). In the event of a flood, a property owner would be offered an optional buyout. If they rebuild and the property is damaged a second time (or sustains enough damage to receive twice its market value in insurance payments) the property would be considered sold to the government. The Quebec government used a similar approach following the 2019 floods, whereby the province set a lifetime Disaster Financial Assistance compensation cap on properties, to be used for rebuilding or as a buyout at the discretion of the property owner (Davies, 2020; Saunders-Hastings et al., 2020). While such insurance and assistance approaches may encourage eventual buyouts and reduce partial community relocation, some homeowners may end up staying in a risk-prone area for an extended period (Craig, 2019; Han et al., 2020). Additionally, such programs do not address any of the equity issues associated with forced relocation (see section 3.3.2).

### **3.3.2 Justice and equity in buyout program design and implementation**

A common thread that emerged from literature is the need for property buyouts to consider equity and justice in program design and implementation. Many case-study articles, especially those out of the US, explored justice and equity aspects of buyout programs, and highlighted key considerations including levels of coerciveness, designing socially equitable programs, and both transparency and public trust.

#### **3.3.2.1 Levels of coercion**

Although buyouts can range on a spectrum of entirely mandatory on one end to entirely voluntary on the other, they are most commonly identified as the latter, and in the reviewed literature almost all buyout program case studies were described as voluntary. Three programs of note included explicit mandatory elements. In Nijmegen, the Netherlands, properties were bought

out to make room for a dike as part of the national Room for the River Programme (Nijssen & Schouten, 2012). The buyout plan resulted in local public protest, but national safety was prioritized over individual opinion and the buyouts proceeded. Another case with mandatory elements was in Alberta, following the 2013 floods. A voluntary property buyout program was launched by the province; however, at the municipal level, the Town of High River made it clear that high risk properties that were not bought out would be seized (Bogdan et al., 2020; Kovacs & Sandink, 2013). Similarly, in 2009 the Manitoba Government offered to buy out flooded cottages on Crown land at Breezy Point and St. Peters Road (IBI Group, 2017). Though technically a voluntary program, the government made it clear that individuals who did not take the offer would not have their leases renewed.

Buyout programs which are mandatory can build on legal mechanisms which already exist to acquire property for the sake of safety. In the US, eminent domain can legally be used to acquire property to protect communities from climate change, as long as owners are compensated financially (Lovett, 2017; Siders, 2013b). In New Zealand, the Public Works Act allows for compulsory property buyout programs (Gibbs, 2016), and most jurisdictions have some form of expropriation mechanism which allows for compulsory property acquisition. Indeed, mandatory buyouts have their merits: they guarantee people are moved from a risky location and therefore effectively reduce human and economic risk long-term. When buyouts are voluntary there is a risk of sporadic acceptance; that is, only some property owners accept buyouts and so only some homes are bought and removed, and communities subsequently becoming a mixture of isolated houses and vacant lots (BenDor et al., 2020; Salvesen et al., 2018). However, forcing buyouts through a program has proven politically unwise in many contexts (Cheong, 2011; Kousky, 2014; Lovett, 2017), and raises questions about the legal and moral grounds of forcing property owners off their land. In light of these moral and legal considerations, parameters of funding often require that buyout programs be voluntary, as in the case of FEMA funding (Siders, 2013b).

While on paper a buyout program may be voluntary, the literature revealed that many homeowners have felt like they had no other option than to accept an offer (D. de Vries, 2007). Cited reasons include pressure from officials, limited income to rebuild, removal of infrastructure, and barriers to obtaining rebuilding permits (D. de Vries, 2007, 2017; D. de Vries & Fraser, 2017).

These concerns were explicitly noted following buyout programs in Eferding Basin, Austria (Seebauer & Winkler, 2020b), Grand Forks, North Dakota, (Siders, 2013a, 2019b), and Lincoln City, North Carolina (D. de Vries, 2017). In the Lincoln City case, after a damaging hurricane the city used the extent of the damage to properties to create complications for residents who declined the buyout offer, affectively rendering the program mandatory (D. de Vries, 2017). Not only does such an approach deteriorate trust in government, but it can also influence acceptance of a buyout offer. de Vries and Fraser (2017) used logistic regression to find that people were more likely to accept a buyout offer if they did not feel pressured and have trust in officials. Therefore, to encourage uptake of a buyout program and respect property rights, governments can consider altering guidelines to ensure that programs do not pressure property owners explicitly or inadvertently (Binder et al., 2019), and that affected communities are consulted from program conception to completion.

#### 3.3.2.2 Social equity

Much of the research on completed property buyout programs noted that the impacts of a hazard/flood event were felt disproportionately by residents with increased social vulnerability (Calil & Newkirk, 2017; D. de Vries, 2007; Jurjonas & Seekamp, 2020; Klima et al., 2020; McGhee et al., 2020; Munoz & Tate, 2016; Rufat et al., 2015; Rumbach Andrew et al., 2020; Siders & Keenan, 2020a). Social vulnerability is related to a person's capacity to anticipate, cope with, resist, respond to, or recover from the impacts of hazards (Calil & Newkirk, 2017; Farbotko et al., 2020; Rumbach Andrew et al., 2020). Indicators mentioned in the literature include socioeconomic status, age, gender, race, ethnicity, language proficiency, risk perception, level of education and language, and health (Farbotko et al., 2020; Rufat et al., 2015).

Some research has explored links between buyout programs and vulnerable communities, with wildly varied and inconclusive findings. On the one hand, Siders and Keenan (2020a) found that property acquisitions tend to be used more than grey infrastructure as a climate adaptation strategy in areas with lower property values, lower median incomes, populations that identify as people of colour, and areas without structural flood protection. This may be attributed in part to the fact that many low-lying coastal areas have lower property values due to their flood risk, and are therefore likely to be occupied by impoverished and minority populations (Jurjonas & Seekamp, 2020).

Likewise, some research found that property buyout programs are most successful when the majority of residents are in fact homeowners, as opposed to renters – which is often the case in lower income brackets (D. de Vries, 2007; Hayward, 2008; Henry, 2013; Loughran & Elliott, 2019). In contrast, an analysis of FEMA buyouts from 1989 to 2017 found buyouts more likely to be implemented in richer areas with high population density – possibly due to the institutional capacity or tax base of such municipalities (Bukvic & Borate, 2020; Mach et al., 2019; Nelson & Molloy, 2021) and the ability of such residents to have their voices heard (Koslov, 2019). Some literature notes this to often be the case along coastlines, where both flood risk and property values are high (Kousky, 2014; Niven & Bardsley, 2013; Vandenbeld & MacDonald, 2013). Even within these richer areas, however, the findings realign: when a FEMA buyout program took place, the properties that were purchased were of comparatively lower property value and owned by residents with lower median incomes and education levels (Bukvic & Borate, 2020). Tate et al. (2016) note that this could be due to the focus of funding programs such as HUD’s Community Development Block Grant, which aims to support people of low and moderate income.

There are also mixed results in the literature regarding the intersection of social vulnerability (especially socioeconomic status) and the likelihood of accepting a buyout offer. For example, Bukvic et al. (2015) and Bukvic and Owen (2017) examined coastal communities after Hurricane Sandy and found that residents were more likely to accept a buyout offer if they were younger and of lower socioeconomic status. In contrast, Kick et al. (2011) found that buyouts to be more readily accepted by individuals of higher socioeconomic status, linking the finding to increased risk perception, weaker place attachment, and more financial mobility. Mayer et al. (2020) explored factors in household relocation by evaluating factors such as gender, age, place attachment, levels of education and income, marital status, and housing type. Their framework ultimately identified pre-disaster homeownership and housing type as the most significant predictors of buyout acceptance, suggesting a limited link to social vulnerability.

Despite inconclusiveness regarding socioeconomic status as a predictor for accepting a property buyout offer, research agrees that wealthier property owners are able to recover faster and more effectively regardless of whether they accept a buyout or not (Kick et al., 2011; Mach et al., 2019; C. S. Robinson et al., 2018; Siders & Keenan, 2020a; Weber & Moore, 2019). Kick et al.

(2011) noted that in the US, the 25% funding match required by FEMA can actively discourage residents from taking a buyout offer, and this therefore incentivizes staying in a flood-prone area. Even when residents successfully relocate, often the only housing that is financially feasible for them is also in floodplain, maintaining their level of flood risk (Binder et al., 2019). Wealthier property owners with their own financial resources are able to fund activities such as finding interim housing and paying for repairs, versus residents who must rely on external funds for any kind of recovery (Mach et al., 2019; Munoz & Tate, 2016; Weber & Moore, 2019). The latter are therefore adversely affected by bureaucratic delays or insufficient compensation. In a review of property buyouts, Munoz and Tate (2016) found that residents with fewer resources were more likely to apply for other grants, loans, and subsidies to meet needs immediately following a flood event. Additionally, wealthier homeowners may also have the resources to pursue additional financial compensation. For example, in programs at Breezy Point, Manitoba, and Cedar Rapids, Iowa, homeowners who were not happy with the government valuation of their property could hire a third-party for a second valuation that was paid for out of pocket (Baker et al., 2018a; Binder et al., 2020; Binder & Greer, 2016; IBI Group, 2017; Koslov, 2016; Munoz & Tate, 2016; Siders, 2019a).

Another way buyout programs affect socially vulnerable populations is through their impact on the kind of housing in a city. Due to the higher rates of affordable housing on flood-prone land, especially in the US, several studies have found that buyout programs often result in an overall reduction of affordable housing (D. de Vries, 2007; C. S. Robinson et al., 2018; Rumbach Andrew et al., 2020; Siders, 2019a). This reduction was noted explicitly in some completed buyout programs, including Colorado (Rumbach Andrew et al., 2020)(Rumbach et al., 2020) and Kinston, North Carolina (D. de Vries, 2007; Siders, 2019b).

The literature shares best practices related to the design and implementation of socially equitable buyout programs. Decision-makers can first target funding sources that prioritize equity. For example, the US HUD's Community Development Block Grant focuses on supporting people of low and moderate income, suggesting that it might be a good funding option for retreat that promotes socially equitable disaster recovery (Tate et al., 2016). Funding mechanisms can also consider including allocations to address the social costs of relocation (Bukvic & Borate, 2020). Several authors suggest it is also important to standardize indicators and measurement tools to

enable the use of social vulnerability analysis for buyout programs, in addition to cost-benefit analyses (Klima et al., 2020; Rufat et al., 2015; Tate et al., 2016). Such an analysis can include broad public health considerations, including mental and physical health (Dannenberg et al., 2019), as well as other assessment and evaluation frameworks that consider community needs beyond typical technical evaluations (E. Zavar & Fischer, 2021). In a study incorporating socio-economic vulnerability into flood risk, Klima et al. (2020) showed that this can be done at little to no additional cost. As planned relocation becomes a more common tool to address climate risk, decision-makers should consider carefully the wide range of affects the move may have on a population, as well as questions of cultural and spiritual rights linked to territory (Farbotko et al., 2020; Marter-Kenyon, 2020).

### 3.3.2.3 Transparency and public trust

Across many of the reviewed completed property buyout programs, a lack of transparency and trust between participants and governing agencies was noted as a barrier to positive program outcomes. Researchers noted limited transparency and trust in officials throughout the entire buyout process: from deciding on criteria for program inclusion, to relocation destinations, communication tools, timelines, use of land post-buyout, and administration (Binder et al., 2019; Binder & Greer, 2016; Bukvic & Owen, 2017; Siders, 2019b; Tanner & Árvai, 2018; Vandenbeld & MacDonald, 2013), and to program evaluation and reporting (Greer & Binder, 2017; Mach et al., 2019). For example, in a study of the buyouts following Hurricane Sandy, property owners expressed a lack of trust that officials were considering what was best for communities, and furthermore found the decision regarding buyout inclusions and exclusions unorganized and at times arbitrary (Binder et al., 2020; Binder & Greer, 2016). In Kinston, North Carolina, trust eroded after some of the bought-out houses were not destroyed as had been promised by the City, but instead moved to another neighbourhood and renovated into affordable housing (D. de Vries & Fraser, 2017). In this example, residents highlighted a lack of trust in both officials and the buyout program itself as the main driver of concerns about accepting an offer (D. de Vries, 2007). Other elements triggering lack of trust included local power struggles, acquisition price disputes, pressure to participate, and communication breakdown. Additionally, while governments may reference objective cost-benefit analyses, inherent value decisions and political factors within buyouts often go un-recognized,

possibly contributing to reduced trust and hence, participation rates (Siders, 2019b; Vandenbeld & MacDonald, 2013). Trust may be further eroded by historic inequities such as marginalization and racism (C. S. Robinson et al., 2018; E. Zavar & Fischer, 2021).

The literature suggests increased transparency can encourage uptake of buyouts and support for future managed retreat in two main ways: it can help communities and decision-makers understand buyout programs and learn from them, and can also build trust between residents, decision-makers, and the programs they propose (D. de Vries, 2007; Greer & Binder, 2017; Mach et al., 2019; Vandenbeld & MacDonald, 2013). Cultivating trust through openness also shows respect for the significant emotional factors that come with leaving a home, and can help address political and moral barriers to retreat.

To encourage transparency in the decision-making process, research recommends a democratic approach that can be led and evaluated by government (Greer & Binder, 2017). Engaging in pre-disaster public consultation and planning can lead to greater transparency, which in turn may help garner political support for buyouts and support community development goals (D. de Vries, 2007; Environmental Law Institute, 2017; Siders, 2019b). This consultation should include communities adjacent to high-risk buyout zones, as they often see many of the same negative affects of a flood without the support of a buyout (Binder et al., 2020). Partnering with local organizations and community leaders can help facilitate trustworthy and transparent consultation, as they likely have previous relationships and shared priorities with residents (Kousky, 2014).

### **3.3.3 Emotional dimensions of buyouts programs**

The literature consistently highlighted emotional dimensions of property buyout programs, including drivers that have significant influence on both the development of a program and a homeowner's decision to accept a buyout offer. These include perception of risk and attachment to a physical place and/or community.

#### **3.3.3.1 Risk Perception**

Individual perception of flood risk is often mentioned as a factor in the propensity of homeowners to accept a property buyout offer, although related findings, were mixed and

inconclusive. Some scholars consider relocation decision-making to be a rational process (Henry, 2013), where homeowners weigh the pros and cons of relocating based on the buyout offer on the table. Other literature identifies this perspective as limited, as it ignores emotional influences on decisions, such as risk perception and place attachment (Agyeman et al., 2009; Alexander & Ryan, 2012; de Koning et al., 2019; Seebauer & Winkler, 2020a). This identification was validated by a case of successful relocation out of Waitakere City, New Zealand, in which most properties were successfully negotiated, and buy-in from the community was high (Atlas Communications & Media Ltd, 2011; Vandenbeld & MacDonald, 2013). The program worked closely with citizens to help them understand their individual risk, household by household, for example by showing where in the home flood water might rise to. This approach followed findings from Song and Peng (Song & Peng, 2017) that individuals struggle to visualize sea level rise, leading to a misunderstanding of their risk.

Research is mixed regarding the influence prior experience with a flood event has on household perception of risk and the resulting likelihood to relocate. In a household survey of residents located in hurricane-prone North Carolina, Robinson et al. (2018) found that prior experience with a disaster event increased the chance of accepting a buyout offer. This was echoed by de Koning et al. (2019), Kick et al. (2011), and Seebauer et al. (2020b) who researched the Austrian case study of Eferding Basin. Homeowners were found to be more likely to accept a buyout offer if they had experienced a significant flood before and recalled memories of the trauma (Seebauer & Winkler, 2020b), and many respondents who took the buyout alluded to ongoing anxiety about when the next flood would come. However, other research has found that previously experiencing a flood does not result in automatic acceptance of a buyout offer. For example, through surveys following Hurricane Floyd, De Vries (2007) found that homeowners were hesitant to move if they had chosen to stay in place previously ("why move now?"), or if they had a negative experience with program officials. When exploring support for different flood risk management strategies following the 2013 Alberta floods, Tanner and Avra (2018) found that flood evacuees were less likely to support buyouts of at-risk homes than individuals living outside of at-risk areas. This was attributed to the fact that evacuees likely lived in areas of higher risk and did not want to lose their homes, therefore making buyouts unappealing (Tanner & Árvai, 2018)



One of the reasons why post-disaster windows of opportunity exist (see section 3.3.4.1) is because recent exposure to extreme risk tends to incite action from citizens, often resulting in large-scale policy shifts and spurring decision-making (Braamskamp & Penning-Rowsell, 2018; D. de Vries, 2017). Once the risk has subsided and life has returned to 'normal', scholars note that individuals tend to forget about the scale of risk (D. de Vries, 2017; Tanner & Árvai, 2018). Additionally, people generally put great trust in protection – even when armouring infrastructure might not be as safe as they think it is (Han et al., 2020; Siders, 2019a). Song and Peng (2017) found this phenomenon particularly strong in high income college graduates, who may be inclined to trust their own judgement and believe in the effectiveness of structural protection.

### 3.3.3.2 Place and community attachment

Consistent across literature was the influence that attachment to place and community have on a person's amenability to accept a buyout offer, as well as their ability to recover from related trauma. This may include attachment to a birthplace or long-time home, a physical or emotional community, or even a place-specific job ((Binder et al., 2019; Bronen & Chapin, 2013, 2013; Elmore et al., 2003; Forsyth & Peiser, 2021; Henry, 2013; Kick et al., 2011; Loughran & Elliott, 2019; Perry & Lindell, 1997; Seebauer & Winkler, 2020a; Song & Peng, 2017). Such attachments are often stronger in rural locations or small communities (Bukvic & Borate, 2020). Some research has found that one of the most influential factors in taking a buyout offer was attachment to people and social connections, and buyout acceptance is more likely if a homeowner's family or neighbours are also considering moving. In one study, Elmore et al. (2003) noted that many residents considered place attachment to be as or more important than the probability of future flooding when faced with retreat as an option. This shows the extent to which this emotional consideration can overwhelm more rational or scientific considerations, such as risk awareness or financial compensation (Kick et al., 2011; Morrice, 2013; Perry & Lindell, 1997). Attachment to place has been linked to both emotional concepts of home, which is often associated with safety and familiarity, as well as to strong emotional ties to the physical structures of a property or a community. This can include spiritual attachment to a coastline itself; in New Zealand, for example, the coastline has immense spiritual and cultural value, as many sites sacred to the Māori people are found in coastal areas (Harker, 2016; Hayward, 2008).

Place attachment can thus result in homeowners staying put in the face of hazards such as flooding. Haney (2019) found that when some residents return to their homes immediately following a disaster event, their excitement and nostalgia for the place tends to encourage them to stay. In a case study of New Orleans following Hurricane Katrina in 2005, Morrice (2013, p. 38) found that 71% of residents had returned to the city by 2010, many citing a strong nostalgia for the city and desire to return home. Group identity and history can also play a strong role in declining buyouts. Phillips et al. (2012) explored this in a case study of Princeville, North Carolina. As the first town in the US to be founded by African Americans, the community chose to rebuild instead of moving after a severe flood. Only 90 of 2000 residents accepted a FEMA buyout, resulting in an alternative plan which rebuilt the town and added a museum, honouring the history of the town and making much-needed improvements to old infrastructure. While the collective wishes of the community were honoured, the rebuild was not without longer-term challenges; as houses were built back better, the increased property taxes were unaffordable for some, and some residents ended up moving anyways.

Limited research has explored the influence of place attachment on longer-term recovery in the context of property buyouts. Binder et al. (2019) returned to New York State three years after Hurricane Sandy to explore how different recovery strategies impacted the psychosocial and community-level recovery of residents from similar communities. Comparing residents that relocated to nearby versus other communities, the research found that residents who relocated to other communities reported lower levels of social capital, place attachment, and place identity. This highlights the role of place attachment and social connections in trauma recovery, as well as the need to consider what success looks like in a buyout program (Binder et al., 2019; Farbotko et al., 2020).

In order to address the place attachment considerations of residents, the literature recommends that buyout programs include significant public consultation (Agyeman et al., 2009; Alexander & Ryan, 2012; Bukvic & Owen, 2017; Seebauer & Winkler, 2020a; Song & Peng, 2017). By doing so, decision-makers acknowledge that different households and communities will have varying barriers to moving, and residents can help inform what incentives or program details might encourage buyout acceptance (Lovett, 2017). For example, some buyout programs have seen cities

buy land or repurpose city-owned land for residents to relocate to, as was the case in Cherokee City, Iowa (Siders, 2013a), Grand Forks, North Dakota (Siders, 2013a, 2019b), Grantham, Queensland, Australia (Sipe & Vella, 2014), and Valmeyer, Illinois, USA (Koslov, 2016). Three of these programs noted success and high community uptake; unfortunately, the program in Grand Forks, ND proved less successful. In addition to purchasing land, the city used public-private partnership to build new houses which were unaffordable for many relocating residents (Siders, 2013a, 2019b). When possible, whole community resettlement or complete community retreat decided in collaboration with citizens is likely to see increased uptake and maintain social ties more than individual retreat (Forsyth & Peiser, 2021). Additionally, relocation program staff may consider guiding participants through emotional coping mechanisms to help deal with the buyout and recovery trajectory (Seebauer & Winkler, 2020a). Seebauer & Winkler's (2020a) study of a voluntary home buyout program in the Danube floodplain in Austria found that residents employed five main coping strategies to deal with the relocation process (i.e. cognitive restructuring, opposition, problem solving, rumination, and escape/avoidance), each of them offering opportunities for program support.

### **3.3.4 Optimizing timing for effective property buyout programs**

Most property buyouts have taken place following a sudden disaster flood event. As noted previously, only two completed buyout programs found in the review were not implemented in response to a large-scale flood (Waitakere City, New Zealand and Nijmegen, the Netherlands). That being said, all the programs were in response to some level of flooding. In Waitakere City, the buyout program was prompted by significant stormwater flooding in 2002 (Atlas Communications & Media Ltd, 2011; Vandenbeld & MacDonald, 2013), and the Nijmegen buyout was part of a larger Room for the River project, which was in response to country-wide repeat flooding (Nijssen & Schouten, 2012).

#### **3.3.4.1 Post-disaster windows of opportunity**

Almost all the highlighted case studies had property buyout programs take place following a flood crisis event when there was a post-crisis window of opportunity for change. This window of opportunity is a period of time following a sudden crisis or disaster event such as a flood that brings

attention to an issue and facilitates change from established patterns in the form of new policies and/or norms (Braamskamp & Penning-Rowell, 2018; D. de Vries, 2017; Kousky, 2014). Property buyout programs seem particularly well-suited to be pursued within a post-disaster ‘window’, as they involve significant life changes and financial cost (Cheong, 2011; de Koning et al., 2019; Noy, 2020; Song & Peng, 2017; Tanner & Árvai, 2018), and the homeowner has usually already suffered significant home damage or life disruption. Conversely, there is often a lack of will to pursue retreat options pre-emptively (Gibbs, 2016); politicians worry about public opinion, the local tax base, investment, and long-term development goals (Bukvic & Owen, 2017; Cheong, 2011), and can often postpone large-scale and politically fraught responses such as retreat until it is absolutely necessary (Harker, 2016; Wilby & Keenan, 2012; Zheng et al., 2014). All of these concerns were noted by Doberstein et al. (2020) in a case study exploring barriers to managed retreat in Vancouver, Canada.

Following a disaster, risk is top of mind and can be the trigger event that makes relocation and other changes a viable option (Seebauer & Winkler, 2020b). For example, in the case of San Antonio, Texas, a major flood event resulted in a buyout program and subsequent overhaul of stormwater management in the City (Pasley, 2001). Following the flood, new proactive policies were created, including a stormwater utility and a shift in responsibility for stormwater retention onto private landowners (see section 3.3.4.2). The Province of Ontario saw a similar shift in stormwater management following Hurricane Hazel (Doberstein et al., 2019); in addition to homes being moved through a buyout program, very soon after the disaster event legislation was amended to allow Conservation Authorities to acquire land for flood management. Braamskamp and Penning-Rowell (2018) found the same need for a trigger event for the 2012 buyout program in Staten Island; without Hurricane Sandy there would not have been enough political will and urgency for implementation of a buyout program. Other case studies mentioned that windows of opportunities do not remain open indefinitely; some programs noted limited uptake because timelines were too long, and the post-disaster window of opportunity had closed. Braamskamp and Penning-Rowell (2018) found that if initiatives take too long to go through, people are likely to change their minds as they begin to forget the risk.

**Table 3: Timing of completed property buyout programs found in the systematic review**

Case	Trigger Event	Literature Reference
Ames, Iowa	Reactive	(Siders, 2013a, 2019b)
Breezy Point & St Peters Road, Manitoba, Canada	Reactive	(IBI Group, 2017)
Cedar Rapids, Iowa, USA	Reactive	Lovett, 2016; Siders, 2019a; Munoz and Tate, 2016; Tate et al., 2016
Cherokee City, Iowa	Reactive	Siders, 2013b
Christchurch, New Zealand	Reactive	Mitchell, 2015; Noy, 2020
Colorado, USA	Reactive	Rumbach et al., 2020
Eferding Basin, Austria	Reactive	Seebauer & Winkler, 2020
Grand Forks, North Dakota	Reactive	Siders, 2019a; Siders, 2013b
Grantham, Queensland, Australia	Reactive	Sipe & Vella, 2014
High River, Alberta, Canada	Reactive	(Bogdan et al., 2020; Kovacs & Sandink, 2013; Saunders-Hastings et al., 2020)
New Orleans, Louisiana, USA	Reactive	Bryner et al., 2017; Cigler, 2009
New Jersey Blue Acres Program	Reactive	Lovett, 2016; Nordstrom & Jackson, 2018; Maly & Ishikawa, 2013; Environmental Law Institute, 2017
New York City “NYC Build it Back” program	Reactive	Maly & Ishikawa, 2013; Siders, 2013b
New York State Rising Buyout and Acquisition Programs	Reactive	Maly & Ishikawa, 2013; Siders, 2013b; Environmental Law Institute, 2017
Nijmegen, the Netherlands	Proactive	Nijssen, n.d.
Toronto, ON, Canada	Reactive	Robinson et al., 2006; Davies, 2020; Doberstein et al; 2019
Waitakere City, New Zealand	Proactive	Vandenbeld and MacDonald, 2013; Atlas Communications, 2011

### 3.3.4.2 Proactive versus reactive flood risk reduction

Few of the reviewed property buyout programs were proactive, though many communities attempted to integrate proactive tools into subsequent long-term flood risk reduction. Proactive risk reduction represents a departure from traditional reactive buyout programs, which historically have struggled to meet program goals and garner public support (Baker et al., 2018b; Binder & Greer, 2016; Bukvic, 2015; Frimpong et al., 2019; Siders, 2013a). Proactive programs typically have a more positive cost-benefit ratio than their reactive counterparts, especially if the program is kept to a moderate size (Nelson & Camp, 2020).

In addition to fully proactive buyout programs, which would take place separate from a trigger event, other proactive management activities can be used. They include allocating funding for pre-disaster adaptation and mitigation actions (Tate et al., 2016; Treuer et al., 2018), ensuring flood maps are up to date (Kovacs & Sandink, 2013; McNeil, 2019), and pre-planning buyout programs (Salvesen et al., 2018). Pre-planned programs could simply be ready for implementation in the event of a hazard trigger event, or they could be implemented in stages as part of flood management activities (Salvesen et al., 2018). Such a staged approach could help prioritize retreat actions and considerations when designing and building infrastructure in urbanized areas (Calil et al., 2015; Sørensen et al., 2016; Wilby & Keenan, 2012), and can garner public support by meeting other societal goals and planning for multiple scenarios (Baker et al., 2018b; Bronen & Chapin, 2013; Bukvic, 2015; Environmental Law Institute, 2017). Details that can be planned in advance include buyout zones (Baker et al., 2018b; Salvesen et al., 2018), determining appropriate financial compensation, locating possible areas for relocation (Siders, 2013a), identifying willing participants (Salvesen et al., 2018), and determining measures to maintain community ties. Public consultation can be undertaken early to help plan many of these details, encourage uptake of a future program, and aid community members in understanding the need for retreat (Binder et al., 2018; Scott & Lennon, 2020). One buyout program that showcased the power of proactive planning was that in Waitakere City, New Zealand. The program was perceived very positively by residents, as it involved extensive public engagement and thorough education (Atlas Communications & Media Ltd, 2011; Vandenbeld & MacDonald, 2013). The proactive program carefully assembled a team, strategically timed public consultation in order to minimize gossip and hearsay, worked with individual homeowners to tailor incentives, and developed a plan for the bought-out properties that would meet flood management and community needs (stormwater reserves, flood management parks, and public gardens).

Planning buyout zones in advance is an important strategy for holistic and orderly flood risk reduction that efficiently targets community needs. This approach can help identify key areas in terms of flood risk and social vulnerability (Klima et al., 2020) and help communities meet conservation goals (Atoba et al., 2020; Calil & Newkirk, 2017). For example, Calil et al. (2015) identified many synergies between the objectives of flood risk reduction, habitat restoration, and

conservation projects. Strategically choosing land that meets multiple objectives can prioritize government funds and take advantage of the ecosystem services, such as protective buffering and recreation opportunities (Atoba et al., 2020; Calil et al., 2015; Environmental Law Institute, 2017; Freudenberg et al., 2016; Melius & Caldwell, 2015; Nordstrom & Jackson, 2018; Salvesen et al., 2018), though Nordstrom and Jackson (2018) note that limited uptake of a buyout can lead to fewer environmental benefits. This approach of maximizing benefits has been modelled by Calil and Newark (2017), who used spatial data to identify zones in Florida that, if targeted by a property buyout program, would reduce flood exposure, optimize conservation benefits, and decrease social vulnerability. More recently, Atoba et al. (2020) developed a framework to identify parcels for acquisition that maximized ecological value and economic benefits, finding it important to identify parcels close to existing natural features and to consider key parcels on the periphery of identified floodplain that may significantly increase the benefits in question.

While it can be difficult to carefully plan a reactive program, it is possible. One case study in particular shares relevant lessons: following the 2008 Midwest floods, the City of Cedar Rapids, Iowa chose to move forward with a property buyout program (Lovett, 2017; Mach et al., 2019; Munoz & Tate, 2016; Siders, 2019b; Tate et al., 2016). The program included three zones, each of which had different goals: a greenway (high flood risk, intended for recreational use and green space), a construction/study area (medium flood risk, intended for some hard flood protection, relocation of some roads and utilities, and recreational use), and a community development area (lower flood risk, intended for affordable housing and flood-resilient buildings). The whole program and individual zone details were decided through deliberate and collaborative consultation with the public and other stakeholders, resulting in very positive public perception of the program.

#### 3.3.4.3 Program timelines

Program timelines varied widely in the review, and data on the exact length of buyouts was limited in literature. In a historical review of FEMA buyouts, Mach et al. (2019) found the average FEMA HMGP buyout project took 5.7 years from the start of the trigger event until properties were purchased, demolitions or relocations were completed, and land converted to another use (p. 4). Of

the programs reviewed, timelines lasted from two years (Ames, Iowa) (Siders, 2013b, 2019a) to nine years (Nijmegen, the Netherlands) (Nijssen & Schouten, 2012).

The timeline of a buyout program depends on multiple factors, including the level of coercion, payout details, whether a structure is being moved or demolished, and the eventual land use. Based on reviewed case studies, an ideal program would work with homeowners to quickly settle on a purchase price and date, therefore minimizing emotional and financial strain, but also giving enough time to settle affairs (such as finding new housing) (Binder et al., 2018). This whole process can happen very quickly; in the case of the San Antonio buyout program, the first houses were bought two months following the trigger flood event (Pasley, 2001).

Timing can affect buyout program uptake in multiple ways. Few homeowners can or want to wait indefinitely to move forward with relocation or rebuilding (Bryner et al., 2017; Salvesen et al., 2018). In the case of the New Jersey buyout program, some homeowners who had initially accepted offers ended up withdrawing their buyout applications due to delays in payment (Binder & Greer, 2016), and some homeowners in New Orleans faced the same predicament following Hurricane Katrina (Bryner et al., 2017). Just waiting to hear confirmation of a buyout program can also cause challenges; homeowners could begin rebuilding before they know a buyout will take place (Seebauer & Winkler, 2020b; Weber & Moore, 2019). This was the case following Hurricane Sandy in Oakwood Beech, Staten Island; while homeowners waited for buyouts to be processed, they began repairing their homes, not expecting that these repair costs would be subtracted from the buyout offer. This resulted in some homeowners ultimately declining the offer (Binder et al., 2018). This same situation was also seen in the Efferding Basin, Austria case (Seebauer & Winkler, 2020b).

Factors that can increase program expedience include strong leadership, clear communication with involved parties, and streamlined government bureaucracy (Sipe & Vella, 2014; Weber & Moore, 2019). Many of these factors could be supported by planning property buyout programs in advance, including proactive investment in adaptation options (Treuer et al., 2018) and financial assessments of costs and benefits (Wilby & Keenan, 2012). Decision-makers could also consider adding deadlines to buyout incentives, as happened in the Austrian buyout of Efferding Basin (Seebauer & Winkler, 2020b)



Lessons can be learned from programs that had relatively quick timelines, such as the Australian buyout in Grantham, Queensland (Sipe & Vella, 2014). Though the program was not proactive, research found that strong leadership from the local council supported both community consultation and effective involvement of the state and federal government – including funding and streamlining planning regulations regarding reconstruction. Consequently, some families were occupying new homes nine months following the trigger flood.

### **3.3.5 Mechanisms and agents for buyout program success**

The literature noted mechanisms and agents that can contribute to the success of property buyout programs. They include the organizations involved and their capacity, as well as public participation in decision-making.

#### **3.3.5.1 Organization involvement and capacity**

Governments at all levels were the primary organizations involved in the development and implementation of the completed buyout programs included in the review. As has been mentioned previously, this is in part due to the organization of FEMA and HUD in the US, which provides federal funding for buyout programs and works with lower levels of government for implementation (Siders, 2019a). All of the reviewed buyout programs saw a national government provide some funding, and in almost every program, the state/province and/or local governments took part in implementation. The exception to this was a program in Christchurch, New Zealand, which developed a national agency specifically to lead the recovery (Mitchell, 2015; Noy, 2020). Some programs involved community organizations such as neighbourhood associations and churches to act as a go-between for residents and authorities. For example, following Hurricane Sandy, community groups in Staten Island were essential in both securing a buyout program as well as liaising with residents about program details (Siders, 2019b). Some government agencies have also contracted work out to private firms; in the Australian buyout program in Grantham, Queensland, a land swap lottery was run by a private firm to ensure impartiality (Sipe & Vella, 2014). The lottery assigned eligible property owners lots in a flood-free zone using a random draw system. In this case study it was also noted that community groups provided support immediately following the flood through donations and other services.

Governments may be the default organizations for leading the planning and implementation of property buyout programs, but they do not always have the capacity or governance structures to do this effectively. In both the US and Canada, buyouts are typically run in collaboration with multiple levels of government, as there is not one level of government or single government agency that has the sole jurisdiction to administer buyouts (Bukvic & Owen, 2017; Doberstein et al., 2020). Effective programs require significant human and financial resources and capacity – from navigating funding applications, administration and communication processes, public consultation and land use planning regulation (Dannenberg et al., 2019; Mach et al., 2019; Sipe & Vella, 2014). It is therefore no surprise that in the US, buyout programs have been linked to strong local governments and the presence of city planners or resilience experts with specialized capacities (Mach et al., 2019). The case of Christchurch, New Zealand, shows one attempt at increasing capacity. Following the earthquakes which triggered the retreat, the federal government created the Canterbury Earthquake Recovery Authority (CERA), a new central government agency dedicated to running the recovery efforts and property buyouts (Mitchell, 2015; Noy, 2020). Within CERA there were seven teams with separate foci and corresponding skill sets. For example, the Social Recovery Group was comprised of individuals from social and public sectors who had experience working with people experiencing difficult circumstances. The personal characteristic found in this group skewed heavily to empathy, understanding, resilience, and patience. This careful and strategic development of teams was also found in the Grantham, Queensland, and Waitakere City, New Zealand buyout programs. In both cases, team members were chosen for specific skillsets and teams were kept small in order to facilitate ease of decision-making and scheduling (Atlas Communications & Media Ltd, 2011; Sipe & Vella, 2014; Vandenbeld & MacDonald, 2013). The skill sets, resources, and relationships necessary to undertake an effective buyout program can often be found in community organizations and actors, and governments can take advantage of this by involving a broader range of community organizations and encouraging local leadership (Bronen & Chapin, 2013; Hayward, 2008; Kick et al., 2011; Kousky, 2014; E. Zavar & Fischer, 2021), as well as ensuring practitioners have appropriate training (E. Zavar & Fischer, 2021). Building governance and capacity at the local level can support decision making and implementation (Dannenberg et al., 2019); though local

councils likely do not have the capacity to deal with larger-scale ramifications of retreat (Hayward, 2008).

As government agencies are the organizations at the centre of buyout programs, it is expected that their development, design and implementation is influenced by political concerns (Gibbs, 2016; Siders, 2019b). This is likely why mechanisms such as eminent domain (US), Public Works legislation (New Zealand), or expropriation (Canada) are rarely used to acquire property without owner agreement in order to protect communities from climate change. Though such these mechanisms are technically legal, their use would quickly become a political sticking point and therefore buyout programs largely remain voluntary (Gibbs, 2016; Healy & Soomere, 2008; Kousky, 2014; Lovett, 2017). Political concerns related to buyouts range from losing property taxes, to development priorities, expectations of property owners, perceptions of limiting property rights, and availability of affordable housing (Cheong, 2011; Gibbs, 2016; Harker, 2016). In Cedar Rapids, Iowa and Grand Forks, North Dakota, buyouts gained support when politicians focused on the positive long-term city revitalization affects of retreat through increases in public park stock (Siders, 2019b; Tate et al., 2016). In contrast, New York City politicians voiced opposition to the Hurricane Sandy buyout program due to concerns over city taxes and affordable housing (Siders, 2019b). In New Orleans, politicians pushing buyouts following Hurricane Katrina experienced extreme backlash, as they were seen to be displacing many black and racialized communities (Phillips et al., 2012; Siders, 2019b).

Some literature shared considerations related to politics and buyout programs. Gibbs (2016) notes that it may be prudent for decision-makers to consider political risk when both implementing effective property buyout programs and developing future policy, as this process can help politicians understand relevant concerns and possible distributional issues of buyouts. Such considerations might also reduce inconsistencies between the guidelines and goals found within local government policy documents and on-the-ground actions (Niven & Bardsley, 2013), or messaging and action (Bogdan et al., 2020). Saunders -Hastings et al. (2020) note that changes in government are often scheduled, therefore allowing decision-makers to plan retreat activities to avoid changes in funding or decisions before or after elections. Lastly, Koslov (2019) suggests removing climate change from discussions around adaptation actions such as buyouts in order to depoliticize conversations and

facilitate action from residents, though she acknowledges this ‘agnostic adaptation’ (p. 586) can enable decision-makers to side-step questions of responsibility.

### 3.3.5.2 Public participation in decision-making

Consistent across all literature is the importance of public consultation in property buyout programs. Consultation should start from the very beginning of the buyout process, including the very decision of whether a buyout program should be used or not. Some, communities may not want to move (Marino, 2018), as was the case in Kinston, North Carolina (D. de Vries, 2007; Siders, 2019b). While comprehensive public consultation may be more difficult when a buyout is reactive to a flood, successful buyout programs such as that in Grantham, Queensland show that it is indeed possible to meaningfully involve a community in reactive program planning (Sipe & Vella, 2014). Initiative to engage a community in decision-making would ideally come from the buyout implementing body, likely a government, but in some cases communities have seen success by mobilizing themselves. In the case of Oakwood Beech, NY, residents successfully petitioned for a buyout program (Maly & Ishikawa, 2013).

Public consultation helps residents to understand the risk they face, as well as allowing them to be involved in deciding on the appropriate solution to reduce risk (Binder et al., 2018; Bukvic & Owen, 2017; Perry & Lindell, 1997; Savard et al., 2016; Song & Peng, 2017; Vandebeld & MacDonald, 2013). Additionally, open and consistent public consultation increasing trust in the decision-making process (D. de Vries, 2017; Kousky, 2014; E. Zavar & Fischer, 2021) and therefore tends to increase the likelihood that there will be widespread uptake of buyout offer (Bryner et al., 2017). Likewise, engaging with residents helps decision-makers to understand the many context-specific factors that influence people’s decisions related to retreat, and allows them to design buyout programs and future policies with these factors in mind (Bryner et al., 2017; Graham et al., 2014; Vandebeld & MacDonald, 2013; E. Zavar & Fischer, 2021) . Once public consultation has been integrated into buyout program design, it can be easier to distinguish between government-imposed or led retreat and community-planned and led programs, which may increase buy-in from the community (Koslov, 2016).

Regarding the quality of public consultation, Zavar & Fischer (2021) note that “real” engagement does not simply involve consultation on program implementation, but aims to uphold and integrate local values, knowledge, and world views. Such engagement can be done through the use of community-oriented consultation frameworks, which do not rely solely on professional techniques of assessment and evaluation but instead seek to, “purposefully integrate and prioritize resident knowledge and interpretations of events and relationships” (Corburn, 2003, p. 421). Real engagement also includes determining what a given community defines as success, or a best outcome, as opposed to simply engaging residents in consultation on an already-decided program (Binder et al., 2015, 2019; Gibbs, 2016).

Relocation is complex and highly contextual, which means that public consultation should likewise be personalized and tailored to the local context. One tactic employed by the City of Waitakere, New Zealand, was to approach each homeowner individually about selling their property (Atlas Communications & Media Ltd, 2011; Vandenbeld & MacDonald, 2013). Teams of two met with homeowners and used flood-risk maps and models to show where future water levels would rise to in the house, and to discuss individual barriers to relocation. In some cases, the buyout offers included homeowner-specific actions such as moving special trees, installing plaques acknowledging multi-generational properties, or extending a buyout to a property not originally included in order to allow neighbours to move together. Following the program, property owners were invited to take part in the environmental restoration of their properties. This small-scale consultation approach also helps avoid the catch of ‘magnetic agents’ (E. Zavar, 2016), who are individuals who direct buyout management strategies so strongly that the greater community is not longer represented.

### **3.4 Summary**

This review aimed to explore themes and key considerations related to property buyout programs as managed retreat, in order to identify interview questions and themes related to successful property buyouts that reduce flood risk in Canada. The main considerations identified in the review broadly relate to finance, social equity, emotional dimensions, timing, and participating agents. Due to the complex nature of buyout programs, these themes are inherently interconnected and cannot be considered in isolation.

The reviewed documents shared perspectives on various technical aspects of property buyout programs, including financial compensation, program timing, additional supports, and organizational capacity. Financial compensation can be an effective way to encourage uptake of a buyout program, especially if homeowners are offered pre-flood value and compensation for other relocation costs. This compensation should be received quickly, in order to facilitate relocation and reduce further emotional trauma from moving. To ensure timely and otherwise successful programs, governments – local governments, in particular – would benefit from increased capacity, which may be done by increasing local partnerships.

One key point that emerged across all of the themes is the importance of context; indeed, though some best practices emerged from each theme, more often there are lessons to be learned through buyout programs that changed terms and details to suit the local community and its residents. Considering this, the importance of public consultation cannot be overstated. For property buyout programs to be effective in reducing flood risk, involved communities must be supported in understanding the risk at hand and involved in finding a solution. This is especially important when working with vulnerable communities, who are so often left out of conversations regarding environmental and spatial justice. Without context-specific program details, buyout programs face numerous challenges and will likely continue to see limited uptake unless governments move forward with mandatory projects, bringing another set of challenges and ethical issues. When planning programs, it is also important to think critically about what success means to the actors involved. Exploring and answering this question with the local community can help deepen public participation, mitigate bias, and help guide program parameters and supports. Remaining open to different directions will also be important – as demonstrated in the review, retreat may not be the best move for the health of a community, especially if vulnerabilities will be further exacerbated.

With close to 20 years of research to draw upon when designing buyout programs, we can use research conclusions to explore enablers and challenges of current day buyouts, especially in communities and policy jurisdictions that have not yet been studied. In order to better understand and plan property buyout programs for the Canadian context, further research is needed on empirical programs that have taken place in the Canadian risk reduction policy and funding

landscape. In addition, few buyout programs focused on risk reduction have included a hard timeline by which a buyout must be accepted. This research aims to address some of these gaps in knowledge by exploring the property buyout program in Grand Forks, BC.

## Chapter 4

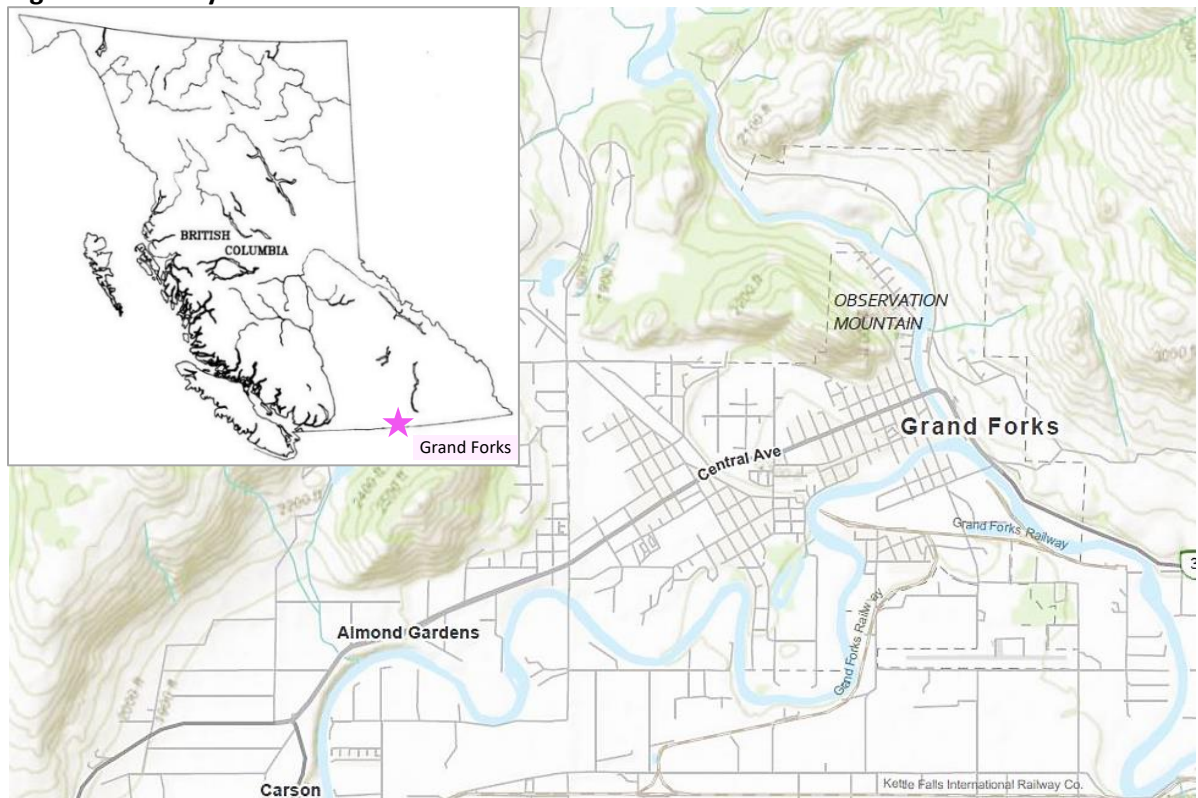
### Case Study

#### 4.1 Case study site and context

##### 4.1.1 Overview of the City of Grand Forks

The City of Grand Forks is situated in south interior British Columbia, Canada, on the traditional territories of the Sinixt, Okanagan, and Ktunaxa peoples (Native Land Digital, 2021). The settlement was established in a mountain valley in 1897, at the confluence of the Granby and Kettle Rivers – the forks of which gave the city its name. Grand Forks has a current population of around 4,270 (Ministry of Municipal Affairs, 2020), and serves as a hub for the Boundary Region, which is located between the Okanagan Valley and the Kootenay Rockies (see Figure 3). It covers an area of 10.43 square kilometers (City of Grand Forks & Regional District of Kootenay Boundary, 2020b).

**Figure 3: The City of Grand Forks**



(Province of British Columbia, 2019a)



Grand Forks is one of eight municipalities that make up the Regional District of Kootenay Boundary. The regional government is comprised of directors from each municipality and unincorporated electoral area, and makes decisions related to strategic planning, policy, bylaws, and regional services (Regional District of Kootenay Boundary, 2021b). At the city level, Grand Forks is governed by a municipal government comprised of a mayor and six councillors. The current Council was elected in 2018 and will serve until 2022 (City of Grand Forks, 2021a). The local economy includes forestry, manufacturing, agriculture, and tourism. In 2020, the top five employment industries were health care and social services (14.6%), manufacturing (11.8%), agriculture, forestry, fishing and hunting (11.3%), construction (10.7%), and retail trade (9.7%) (City of Grand Forks & Regional District of Kootenay Boundary, 2020a). As of 2016, the median income in the City of Grand Forks was \$49,097 (Statistics Canada, 2016). As in many parts of British Columbia, availability of affordable housing is a concern.

The weather and climate in the Boundary Region are significantly influenced by the varied terrain, including four mountain ranges, the Columbia drainage basin, and the largest number of individual floodplains in BC (Climate & Agriculture Initiative BC, 2021; Pacific Climate Impacts Consortium, 2013). Grand Forks is located in the Kettle River Watershed (KRW), and typically experiences hot, dry summers and mild to severe winters (Pacific Climate Impacts Consortium, 2013; Regional District of Kootenay Boundary, 2020). Annual precipitation averages around 530 millimeters, falling evenly throughout the year (Climate & Agriculture Initiative BC, 2021). The hydrological characteristics of Grand Forks and surrounding area are linked closely to the Granby and Kettle Rivers. The Granby River flows north to south and joins the Kettle River beside downtown (Acres International Limited, 1991). After exiting Grand Forks, the Kettle River flows into the United States. Both riverine flood<sup>3</sup> and drought are common, as the KRW follows a snow-dominated hydrological regime. This results in a large freshet (spring melt) and lower levels of precipitation over the summer (Regional District of Kootenay Boundary, 2020).

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<sup>3</sup> Riverine floods are defined as flooding that occurs as streams and rivers rise due to rapid snowmelt, heavy rainfall, and/or ice jamming, and inundate surrounding floodplains (Associated Engineering Ltd, 2021, pp. 1–2).

## 4.1.2 Flooding & climate change context

### 4.1.2.1 Flooding context of Grand Forks, BC

In addition to moderate annual freshet flooding between late April and mid-June, the City of Grand Forks has recorded several large flood events. Between 1948 and 1986, four large floods have been documented, all in the month of May and linked to extreme snow melt (Acres International Limited, 1991). Until 2018, 1948 was the flood of record<sup>4</sup>. It was caused by runoff from high snowmelt and heavy rain, and at the time was rated a 1-in-200-year flood event (Acres International Limited, 1991). During the 2018 flood event the Granby River peaked at 60cm over the 1948 flood level (Boundary Integrated Watershed Service, 2018).

**Figure 4: Steady-flow data from 1992 flood frequency analysis**

RETURN PERIOD (Years)	STATION		
	KETTLE RIVER NEAR LAURIER		GRANBY RIVER AT GRAND FORKS
	INST m <sup>3</sup> /s	DAILY <sup>2</sup> m <sup>3</sup> /s	DAILY <sup>3</sup> m <sup>3</sup> /s
10	797	765	326
20	853	821	344
50	918	887	363
100	963	932	375
200	1006	974	385

(Acres International Limited, 1991)

Flood and risk mapping of the area was updated after the 2018 flood. Prior to this, the most recent floodplain mapping study of the area was conducted from August 1991 to January 1992, as part of the Canada-British Columbia Floodplain Mapping Agreement (Acres International Limited, 1991). This agreement co-funded floodplain mapping between the federal and provincial governments, and was terminated in 2003 (APEGBC, 2017). The City also worked with the Municipal Natural Assets Initiative to financially value the Kettle River floodplain in 2017 (Molnar et al., 2018).

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<sup>4</sup> A flood of record (FOR) is the maximum documented flood event by flood stage or discharge at a given site during a period of record keeping (APEGBC, 2017). The FOR may be used for forecasting, to determine designated flood levels, and for other planning purposes.

This information was used to support updated floodplain mapping, which was released for review in 2019 (City of Grand Forks, 2019i).

Though the Boundary Region is no stranger to climate-related hazard events, in recent years the area has seen an increase in both the frequency and magnitude of floods and drought. Grand Forks experienced riverine flooding in 2017 and 2019, in addition to the 1-in-200 year flood in 2018 (Lavoie, 2018). In the summer of 2021, the Boundary Region was put under level five drought, the highest rating from the province and deemed almost certain to adversely affect socio-economic and ecosystem values. Long-term climate forecasts for the region include an average temperature increase of 1.6°C to 3.2°C, spring temperature extremes, increased spring precipitation, drier summers, and earlier snowmelt (Associated Engineering Ltd, 2021; Pacific Climate Impacts Consortium, 2020; Province of British Columbia, 2021a; Regional District of Kootenay Boundary, 2020). When combined together, such climate-induced changes will increase the likelihood and severity of freshet flooding, and make accurate forecasting difficult (Associated Engineering Ltd, 2021).

Clearcut logging and poor forestry practices in the watershed have also been named as contributing factors to the degree of flooding in recent years. While experts have not conclusively agreed on the extent to which these factors may have affected flooding frequency and scale, data does draw a link between clear cutting and flooding (Lavoie, 2021). As mature forest acts as a giant sponge, drainage areas that have been heavily clearcut will release water faster, possibly increasing flood extent (Wood, 2021). Following the 2018 flood, some residents in Grand Forks felt so strongly about this connection that they launched a class action lawsuit in BC Supreme Court, alleging that the Ministry of Forests, Lands and Natural Resources Operations and a group of logging companies overestimated the amount of timber that could be sustainably clearcut by 20 per cent over 20 years, resulting in increased surface runoff and stream flows into the Granby and Kettle rivers during spring freshets (Popyk, 2020). A second class action lawsuit was filed against a Boundary logging company in 2021 (Tritschler, 2021a).

#### 4.1.2.2 Relevant climate change adaptation initiatives

In acknowledgement of the need to understand and address increased climate risk, BC completed a province-wide Preliminary Strategic Climate Risk Assessment in 2019. The report evaluated the health, social, economic, and environmental consequence of events projected to be possible in the 2050s using a climate change risk assessment framework, with the goal of supporting risk preparation and planning at the local and provincial level (Ministry of Environment and Climate Change Strategy, 2019). Events included severe riverine flooding, moderate flooding, and extreme precipitation and landslide (Ministry of Environment and Climate Change Strategy, 2019). Following this risk assessment, BC began drafting a Climate Preparedness and Adaptation Strategy. A draft strategy and Phase 1 Actions for 2021-2022 were released in June of 2021. Public input was accepted until August 2021, and the next phase of the strategy is expected in 2022 (Clean BC, 2021). Phase 1 actions include: improving climate risk data, monitoring and forecasting; initial work on a BC Flood Strategy; improving provincial response to extreme heat and wildfire; leveraging nature-based solutions for climate change adaptation and greenhouse gas reduction; and assessing climate impacts on vulnerable highways and roads (Clean BC, 2021).

On a regional level, the Regional District of Kootenay Boundary declared a climate action imperative on October 30, 2019, underpinning climate action and sustainability across all decisions and practices (Regional District of Kootenay Boundary, 2021a). A long-term climate action plan, including climate risk planning, will be developed in 2022 (Regional District of Kootenay Boundary, 2021d).

In 2018 the federal government launched the Disaster Mitigation and Adaptation Fund (DMAF), a merit-based fund that supports public infrastructure projects that mitigate or protect against the impacts of climate change, natural hazard disasters, and extreme weather (Infrastructure Canada, 2021c). DMAF funds new projects with budgets between \$1 million and \$20 million, or large projects of over \$20 million, with maximum contributions ranging from 25% to 100% of the cost (Infrastructure Canada, 2021c). Approved projects range widely but are generally infrastructure-based, from structural stormwater drainage, dyke repair, and erosion management, to natural infrastructure (Infrastructure Canada, 2021c). At the time of writing, land acquisition for the rehabilitation of natural infrastructure is an eligible expenditure in projects where it is not the

only component (Infrastructure Canada, 2021a). The acquired land must be protected as natural infrastructure for a minimum of 40 years (Infrastructure Canada, 2021a).

### **4.1.3 Flood risk governance & tools in British Columbia**

Understanding the local context for flood risk governance is critical for research into managed retreat and property buyout programs. This context includes the governance mandates and structures, policies and tools available to flood risk actors.

#### **4.1.3.1 Flood risk governance**

In BC, local governments have been responsible for flood management since 2003 (McElroy, 2021), a process that has variously been referred to as 'decentralization' and 'downloading of responsibility'. Through the *Flood Hazard Statutes Amendment Act*, the province was removed from the subdivision and bylaw approval process in municipal areas (Kerr Wood Leidal Associates Ltd., 2020; Flood Hazard Statutes Amendment Act, 2003). Local governments became responsible for land use planning for hazardous lands, floodplain and risk mapping, and applying for funding to build or improve dikes (British Columbia Real Estate Association & University of British Columbia Okanagan, 2021; Ebbwater Consulting Inc., 2021b; McElroy, 2021). While this approach allows local knowledge and context to guide flood planning and related activities, effective follow-through is often hindered by insufficient expertise, resources, and funding available at local levels (British Columbia Real Estate Association & University of British Columbia Okanagan, 2021; Fraser Basin Council, 2021). Partially in response to this recognition of limits to flood management decentralization, in 2021, BC began developing a BC Flood Strategy, which was underway at the time of writing (Clean BC, 2021)

#### **4.1.3.2 Floodplain and risk mapping**

After responsibility for floodplain mapping was transferred to local governments in 2003, fewer maps were developed or updated, resulting in areas with outdated, limited, or non-existent floodplain and risk data (Northwest Hydraulic Consultants Ltd, 2021a). At the time of writing, grants for floodplain and risk mapping were co-funded by the Province of BC and the Government of Canada via two main programs: the Union of BC Municipality's Community Emergency Preparedness

Fund and the Public Safety Canada's National Disaster Mitigation Program (Kerr Wood Leidal Associates Ltd., 2020; Public Safety Canada, 2021a; Union of British Columbia Municipalities, 2021). Funding is limited and therefore the process is competitive, which has contributed to a lack of comprehensive flood hazard and risk information in the province (British Columbia Real Estate Association & University of British Columbia Okanagan, 2021). Additionally, guidelines for floodplain maps are non-prescriptive, which results in varying quality, accessibility, and even accuracy of data. This can make the data difficult to use on a regional or provincial scale (Northwest Hydraulic Consultants Ltd, 2021a). Of the maps created since 2015, only 62% meet the BC Flood Hazard Area Land Use Management Guidelines (British Columbia Real Estate Association & University of British Columbia Okanagan, 2021).

#### 4.1.3.3 Insurance

In BC – and Canada overall – flood insurance can be expensive and coverage limited, especially in areas with the highest flood risk. Overland flood insurance has been available to homeowners in BC since 2015 (IBC, 2019). As of 2021, around 50% of BC property owners had purchased coverage (McLaughlin, 2021). Areas that are high-risk for flooding are often not eligible for coverage – in BC up to 10% of residences have too high a flood risk to be offered insurance (Red Dragon Consulting Ltd, 2021) meaning that the areas that could benefit the most from flood insurance are uninsurable. In order to address this gap in protection, in 2020 the federal government created a Task Force on Flood Insurance and Relocation (Public Safety Canada, 2020). At the time of writing, the mandate of the Task Force was to explore the possibility of a subsidized national flood insurance program, as well as exploring options for the coordinated relocation of residents out of areas of high flood risk (Insurance Bureau of Canada, 2020; Public Safety Canada, 2020).

#### 4.1.3.4 Flood risk policy and planning tools

Responsibility for managing land in flood hazard areas is delegated to local governments in the BC *Local Government Act*, as well as requiring them to consider guidelines from the province (e.g. *Flood Hazard Area Land Use Management Guidelines*) and any plans or programs that stem from this guidance. The *Flood Hazard Area Land Use Management Guidelines* focus on land

development regulations to keep people out of harm's way (Province of British Columbia, 2018b, p. 5). The guidelines were last amended in 2018 to include considerations for the impact of sea level rise on building setbacks and flood construction levels in coastal areas (Province of British Columbia, 2021b). Additionally, a few resources exist to support local governments and professionals in planning for and managing flood risk. They include:

- *Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC* (EGBC, 2018). These practice guidelines were commissioned by the BC Ministry of Forests, Lands, Natural Resource Operations, and Rural Development (MFLNRORD) and developed by the governing body of professional engineers and geoscientists in BC. They guide professional practice for flood and risk assessments, including climate change and land use considerations.
- *Environmental Protection in Flood Hazard Management: A Guide for Practitioners* (Fraser Basin Council, 2010). This report provides an overview of flood hazard management, related challenges and opportunities, and best practices in floodplain management and protection.

Local governments also have several additional policy and planning mechanisms and tools available for managing development in flood hazard areas, including:

- Regional Growth Strategies (RGS)
- Official Community Plans (OCPs)
- Bylaws
- Development Permit Areas
- Covenant measures
- Building Act and Code
- Building permitting

#### Regional Growth Strategies (RGS)

These regional strategic plans define and direct a region's long-term strategic growth. RGS's can include policies related to climate change adaptation and natural hazard planning (Ebbwater Consulting Inc., 2021b; Province of British Columbia, 2021d). The Regional District of Kootenay Boundary has not yet completed an RGS.

#### Official Community Plans (OCPs)

Section 473 (1) (d) of the *Local Government Act* specifies that a community's OCP must contain land use policy statements and maps to designate restrictions on hazardous and/or environmentally sensitive land. This includes plan policies and a hazard schedule (Local Government

Act, 2004, sec. 877). While this empowers local governments to make decisions specific to their local contexts and development areas, not all communities have an OCP, and they do not to be comprehensively reviewed on a regular basis.

### Bylaws

The *Local Government Act* also gives authority to apply flood protection measures to builds on existing lots through bylaws. This includes a flood plain bylaw to designate land as flood plain (section 524) and zoning bylaws for land that is found to be hazardous before or after an OCP is enacted (section 479).

#### *Flood Plain Bylaws*

Flood plain bylaws may specify flood levels and setbacks and include provisions for areas of a flood plain; zones, uses within a zone or an area of a flood plain, types of geological or hydrological features, standards of works and services; siting circumstances, types of buildings or other structures and different types of machinery, equipment or goods within them, and different uses within a building or other structure (Local Government Act, 2004, sec. 524). Section 524 (7) also enables a local government to exempt a person from restrictions posed by the flood plain bylaw in certain situations. Such exemptions can include considerations that are in line with provincial guidelines and/or reporting from a certified professional that the land is safe for the intended use. When exemptions are granted, the local government can require that a person enter into a covenant under section 2019 of the *Land Title Act*.

#### *Zoning Bylaws*

Zoning bylaws can be enacted by local governments to create zones and regulate matters such as use of land, buildings, and other structures; density of use; the siting, size and dimensions of buildings, structures and uses; and the shape and size of land parcels (Local Government Act, 2004, sec. 479). Changes can be made to zoning bylaws as data is updated, including hazard or climate change information. For example, a municipality may decide to change the land use of a recently mapped floodplain to floodable open space. If a hazard is discovered after buildings, structures, and/or use are already in place, the zoning does not need to be updated to include it and they may



be permitted to remain as non-conforming. This can lead to safety, financial and insurance considerations for the land owners (Local Government Act, 2004, sec. 528).

### Development Permits

Development Permit Areas (DPAs) can be designated by an OCP for certain purposes, including the protection of development from hazardous conditions, and the protection of the natural environment, its ecosystems and biological diversity (Local Government Act, 2004, sec. 488 (1)). Guidelines associated with a given DPA must be in either an OCP or an adopted zoning bylaw. With a DPA in place, a local government can control the development process and ensure it is proceeding in a way that is safe from the hazard in question. When a DPA has been designated to protect from hazardous conditions, a development permit can specify that the area remain free of development if they are subject to specified hazards, including flooding, mud flows, torrents of debris, erosion, land slip, rock falls, subsidence, tsunamis, avalanches, or wildfire. Such a DPA can also limit the density, use, and types of structures built depending on the hazard; in the case of unstable soil or water, no septic tank, drainage and deposit fields, or irrigation or water systems can be constructed (Local Government Act, 2004, sec. 490 (2)). For land within a DPA designated for the protection of the natural environment, a development permit may (Local Government Act, 2004, sec. 490 (1)):

- specify areas of land to remain free of development;
- require specified natural features or areas to be preserved, protected, restored or enhanced;
- require natural water courses to be dedicated;
- require works to be constructed to preserve, protect, restore or enhance natural water courses or other features of the environment;
- require protection measures, including that vegetation or trees be planted or retained in order to preserve, protect, restore or enhance fish habitat or riparian areas, control drainage, or control erosion or protect banks

For these DPAs, professional reports can also be required at the applicant's expense to assist the local government in evaluating the conditions of the development permit. While such parameters can help support safer development, DPAs are applied using the knowledge available at a given time and are not applicable retroactively, possibly resulting in gaps in protection when the nature and/or area of a hazard changes.

### Covenant Measures

The *Land Title Act* allows covenants in favour of a local government to be registered against the title of the land (Land Title Act, 1996, sec. 219). Covenants can be used in relation to land use, building, subdivision, protection of amenities and/or selling or transferring title. In particular, under section 86 (1) of the *Land Title Act*, Municipal Approving Officers regulating subdivision development must consider if the land is subject to flooding, erosion, land slip or avalanche. Additionally the officers must require a report certifying that the land may be used for the use intended and enter into covenants as needed (Land Title Act, 1996, sec. 86 (1) (d)). Covenants can be required as a condition of rezoning but not as a condition of development permits.

### Building Act and Code

Under the Building Act General Regulation, local authorities are given jurisdiction over buildings in areas established as flood plains under section 524 of the Local Government Act. These buildings are considered 'unrestricted', allowing local authorities to establish technical requirements above and beyond what is required by the BC Building Code (Building Act General Regulation, 2017). That being said, the BC Building Code does not provide technical requirements for construction in flood plains or other high-risk areas. It also does not require 'building back better' after a flood.

### Building permitting

As permitted under the *Local Government Act* (section 302) and *Community Charter* (section 56), if a Building Inspector suspects a hazard such as flooding, they may require a professional report that determines whether the land may be used safely for the intended use. A building permit can then only be issued subject to registration of a covenant (Land Title Act, section 219) according to any conditions of the report.

#### 4.1.3.5 Policy and tools currently under development

In addition to the Climate Preparedness and Adaptation Strategy, at the time of this research the Province of BC is developing and updating a large number of flood and emergency management policies, amendments, strategies, Acts, and other reports. Relevant projects include:

- Climate Preparedness and Adaptation Strategy

- Modernization of the Emergency Program Act
- Provincial Disaster Financial Assistance
- BC Flood Strategy and Discussion Paper
- Legislation regarding municipal and regional service consistency
- First Nation governance

#### **4.1.4 Emergency management governance and tools**

For the purposes of this thesis, the research is primarily focused on policy and tools related to flood risk reduction rather than emergency response during flood events. However, in Canada managed retreat activities often fall into the context of long-term disaster risk reduction and take place following a hazard event. Therefore, property buyout programs and other managed retreat activities are closely linked to emergency managed governance and tools.

##### **4.1.4.1 Emergency management governance**

Emergency management (EM) in Canada is a shared responsibility between the federal government and the provinces, as laid out in Canada’s Emergency Management Framework and the 2019 Emergency Management Strategy for Canada (Public Safety Canada, 2019). As noted in this strategy, increased risk of disasters in Canada has shifted EM from primarily reactive/responsive activities to proactive prevention/mitigation efforts, including Disaster Risk Reduction<sup>5</sup> (DRR) actions such as build back better (Public Safety Canada, 2019, p. 3). To support a whole of society approach<sup>6</sup> to DRR and EM, Canada adopted the UN Sendai Framework for Disaster Risk Reduction (2015-2030) (Public Safety Canada, 2018a). In October 2018, BC became the first province to adopt the Sendai Framework, and a year later released a discussion paper outlining proposed policy direction for modernizing the province’s emergency management legislation (Province of British Columbia, 2020a). The new act will replace the existing 1993 Emergency Program Act (EPA), championing a

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<sup>5</sup> Defined by the United Nations as “systematic efforts to analyze and reduce the causal factors of disasters” (UNISDR, n.d.). Examples of DRR include reducing exposure to hazards, lessening vulnerability of people and property, wise management of land and the environment, and improving preparedness and early warning for adverse events (UNISDR, n.d.)

<sup>6</sup> An ‘all of society’, or ‘whole of society’ approach involves inclusive engagement, participation, and coordination within and across all sectors and relevant stakeholders at all levels of society and governance. This includes clear communication of responsibilities across government institutions at all levels, public and private stakeholders, and business and academia to ensure mutual outreach, partnership, complementarity in roles, accountability and follow-up (UNISDR, 2015)

new approach whereby four phases of emergency management (Figure 5) will be considered equally (Province of British Columbia, 2021c; Union of British Columbia Municipalities, 2020). In addition to the Sendai Framework, the Province aims to align the act with The UN Declaration on the Rights of Indigenous People, the Declaration on the Rights of Indigenous Peoples Act, and the Draft Principles that Guide the Province's Relationship with Indigenous Peoples (Province of British Columbia, 2021c). The modernization has also been informed by recovery challenges experienced following the 2017 wildfires and 2018 floods, after which an initial framework for disaster recovery was developed. This framework (Figure 6) aimed to establish clear roles and responsibilities across sectors, with associated Assistant Deputy Ministers responsible for their sector's recovery strategy (Province of British Columbia, 2019b).

**Figure 5: BC's phases of emergency management**



(Province of BC, 2021b)

**Figure 6: BC's four disaster recovery sectors**



(Province of BC, 2019)

Through 2019, the Province of BC ran broad public engagement sessions and collected feedback on the policy proposals for the new legislation. Key themes that were identified included strong connections to climate change and DRR, considerations for vulnerable populations, capacity and resources to implement the act, further detail on implementation, and stronger connections and parallels to existing legislation and regulatory frameworks (Province of British Columbia, 2020b). As of late 2021, the new legislation was to be introduced in fall of 2022 (Province of British Columbia, 2021c).

#### 4.1.4.2 Emergency management tools

Within emergency management in Canada, post-disaster financial assistance programs are closely related to flood risk, as they provide financial assistance to residents for recovery and rebuilding (Insurance Bureau of Canada, 2019), and occasionally retreat. Programs are administered at the provincial level, with costs shared by the federal governments through the Disaster Financial Assistance Arrangements (DFAAs) once a disaster reaches a certain threshold (Public Safety Canada, 2021b). Provinces and territories can apply for reimbursement for eligible expenses, including evacuation operations, replacing essential personal property, and restoring public works and infrastructure to their previous condition (Public Safety Canada, 2021b).

In BC, provincial financial compensation is administered through Disaster Financial Assistance (DFA). The goal of BC's DFA is to help restore or repair essential items and property to their pre-flood state. In the event of a disaster, the provincial government can declare the event eligible for DFA, which then triggers compensation for eligible residents (Emergency Management BC, 2021). There are four categories for applicants: homeowners and residential tenants, charitable organizations, small business owners, and farm owners (Emergency Management BC, 2021). Eligible losses must be uninsurable, and are compensated based on median value (for replacement of essential contents) or for damage caused explicitly by the disaster (for structural repairs) (Emergency Management BC, 2021). If appropriate insurance was "readily and reasonably available" DFA will not provide compensation, whether the resident knew about coverage or not (Insurance Bureau of Canada, 2019). Unlike in other provinces, buyouts or other managed retreat activities have not been included in BC's DFA.

In the past ten years the federal government has seen a significant increase in payouts from DFAA, linked to more extreme weather events (Public Safety Canada, 2021b). Consequently, in 2015 the Government of Canada changed the expense thresholds at which DFAA is triggered, shifting more of the cost to provincial governments (Insurance Bureau of Canada, 2020).

#### **4.1.5 Tools for managed retreat**

At the time of writing, there are no formalized program or funding mechanisms specifically for managed retreat to reduce flood risk in BC, though managed retreat has been identified in recent reports as a non-structural flood management approach (Northwest Hydraulic Consultants Ltd, 2021b). However, some grants and land use planning tools mentioned above can be used to accomplish the goals of a managed retreat program, especially in reaction to a flood disaster. Such goals may include removing existing development from an area, restricting future development in an area, or adding or restoring green infrastructure such as floodplain.

## **4.2 Results**

Through this research I aimed to contribute to managed retreat literature by undertaking case study research of the recently implemented property buyout program in Grand Forks, BC. These results address the research objectives by summarizing primary and secondary data sources in four main sections: first, a narrative account of the flood and subsequent decision-process related to the Grand Forks property buyout program, including details and timing of the program and related activities; second, barriers and enablers to the development of the property buyout program; third, barriers and enablers to the implementation of the property buyout program; and lastly, other considerations for successful risk reduction measures in similar communities.

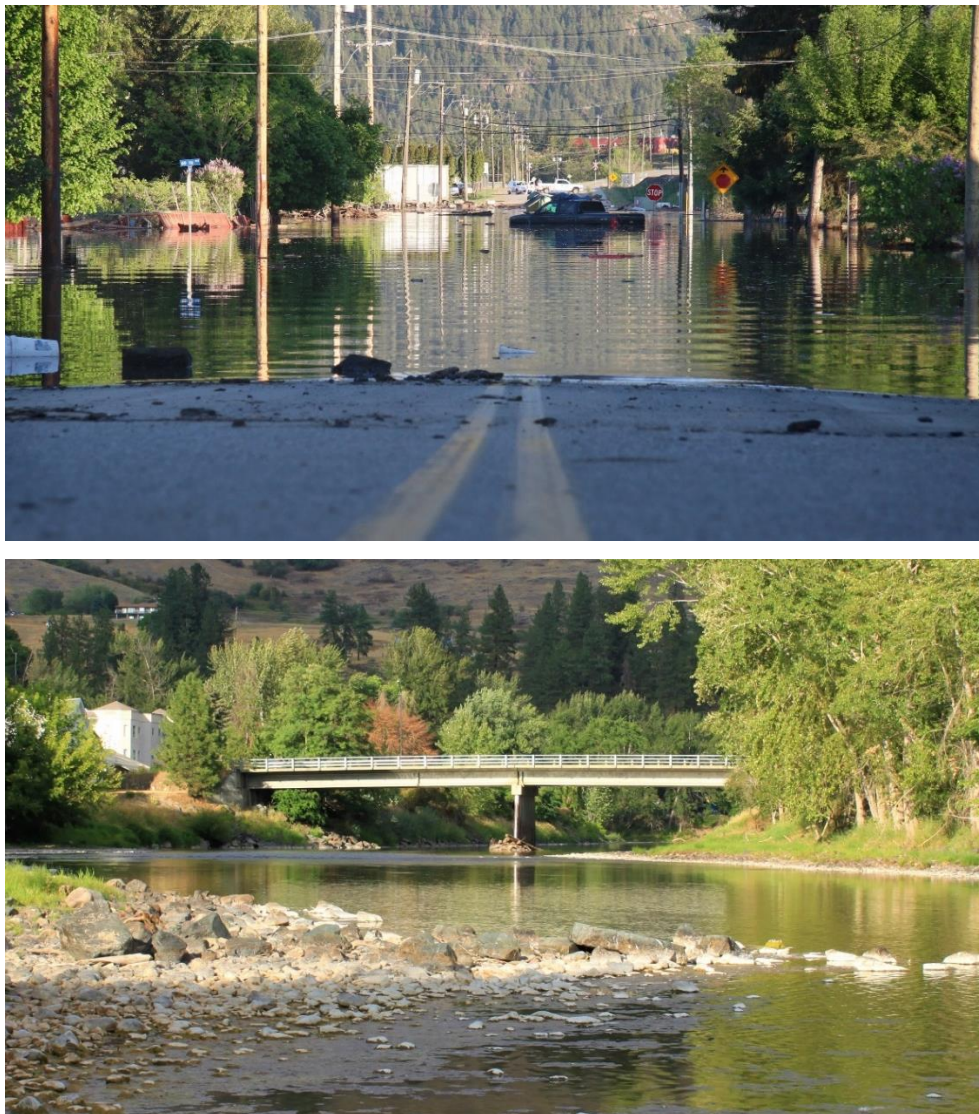
### **4.2.1 Narrative account of the flood, aftermath, and related decision-making process**

#### The flood event

On May 7, 2018, the City of Grand Forks launched a floodplain risk management and protection program with engineering consultant Urban Systems (Hernandez & Walker, 2018). The three-year program would assess flood risks, prepare flood maps – last updated in 1992 – and develop mitigation plans to protect the community from flooding, all paid for by the Gas Tax

Strategic Priorities Program Grant – known as of 2021 as the Canada Community-Building Fund (Acres International Limited, 1991; City of Grand Forks, 2017; Infrastructure Canada, 2021; Urban Systems, 2017; KI #12). It was freshet season, and the snowpack was 238% of normal in the Boundary Basin (Province of British Columbia, 2018a). Four days later, the City and surrounding area experienced a 1-in-200 year flood event, the worst flooding on record (Wadhani, 2018).

**Figure 7: The 2nd St. bridge from downtown Grand Forks into North Ruckle following the 2018 flood (top) and a side view of the same bridge in dry season (bottom)**



(Canadian Red Cross, 2018; Le Geyt, 2021)

A combination of the melting snowpack, warm weather and sustained rain caused the Granby and Kettle Rivers to rise for two days before cresting on May 10, breaking their banks and flowing overland (Dobson Engineering Ltd., 2018; Wadhani, 2018). Peak flows in Grand Forks reached 1,373 cubic metres per second, a significant increase from the usual May peaks of 566-850 cubic metres per second (Parfitt, 2019). In addition to large volumes of water in both waterways, flooding was made worse by water-damming where the rivers meet, resulting in widespread overland and sewer backup flooding (Yumagulova, 2019). Although the Forecast Centre was watching the weather, water volumes were much higher than anticipated and the City was ill-prepared (Dobson Engineering Ltd., 2018; KI #1; KI #10; KI #11; KI #12). A municipal interviewee described the uncertainty before the flood:

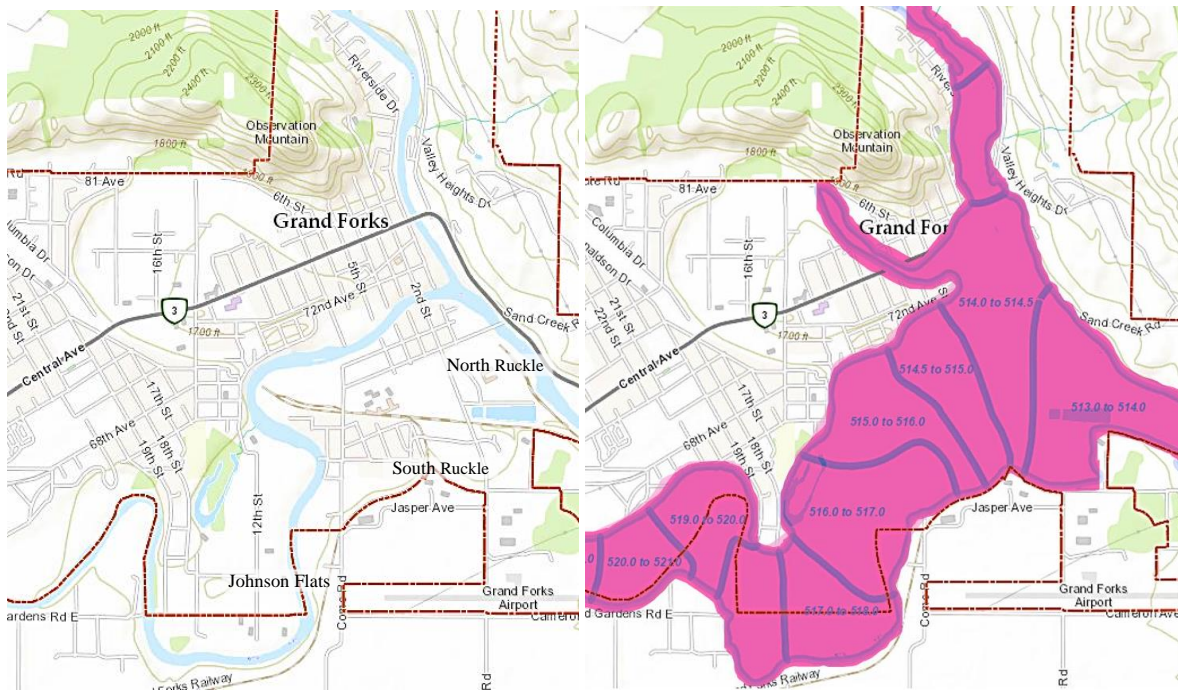
*“[The] Forecast Centre had been inconsistent. They phoned the emergency operation center and said ... you have a great amount of water coming towards you ... and you have like 24 hours. And then phoned back 20 minutes later, and said actually, you have 18 hours ... and then they phone back again and said it'll be there in 12 hours.”* (KI# 10)

Over the course of the three day flood event, 1,471 households received evacuation orders, around 400 homes experienced moderate to major damage and more than 50 homes were damaged beyond repair (NOR-EX Engineering Ltd., 2019). Flood damages totaled nearly \$50 million, including significant damage to dikes, community infrastructure, residential homes, and commercial property (City of Grand Forks, 2018a). The worst of the flooding was concentrated at the confluence of the rivers, including the downtown area and the neighbourhoods of Johnston Flatts, South Ruckle, and North Ruckle (see Figure 8).

The emergency flood response was coordinated by the Regional District of Kootenay Boundary (RDKB), and their provincial counterpart, Emergency Management British Columbia (EMBC). Soon after the flood, the Province of BC approved DFA for the event, enabling eligible uninsured residents to apply for financial compensation for related losses (British Columbia Ministry of Public Safety and Solicitor General, 2018). As overland insurance was only recently available in some parts of Grand Forks and many areas uninsurable, few residential properties had coverage (KI #11). By the week of May 20, most of the evacuees had returned to their homes (City of Grand Forks, 2021c).



**Figure 8: City of Grand Forks rivers (left) and 2018 flood extent (right)**



Compiled from (Regional District of Kootenay Boundary, 2021c).

### Flood recovery begins

In June, the RDKB and City of Grand Forks received funding from EMBC to develop a flood recovery team, and proposed a community-based recovery process that would span short and long-term flood recovery). The resulting Boundary Flood Recovery (BFR) Team was formed, including leads from the community who could represent different aspects of flood recovery (see Figure 9) (City of Grand Forks, 2018b). The focus of the team was to manage all initiatives to support short- and long-term flood recovery while representing the needs and interests of the community (City of Grand Forks, 2018c; City of Grand Forks, 2018a; KI #1; KI #7; KI #10; KI #12; KI #14; KI #15; KI #21). A municipal interviewee described the composition of the team:

*“The flood recovery team had both [regional and municipal] governments leading recovery, and five different working groups, most of which had funded coordinators or leads that were representing different aspects of flood recovery... for instance we had the executive director of the family services organization look at various aspects of social and well-being, wellness aspects of flood recovery, we had a critical infrastructure lead who was also*

*our manager of public works for the city overseeing repair to critical infrastructure for all agencies, ... so through this network we had lead people from everywhere from school district[s] to health agencies.” (KI #1)*

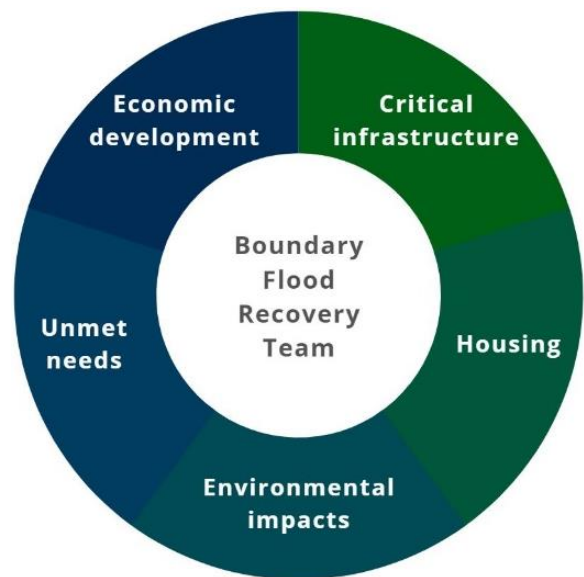
This community-based recovery model was well-received by both community and government agencies. In particular, interviewees cited the benefits of diverse, local perspectives contributing to decision making (KI #1; KI #7; KI #12; KI #14; KI #15; KI #21). In addition to building local capacity and community trust, the team encouraged collaborative leadership and strengthened personal connections (Hoogveen & Klein, 2021).

With the BFR Team in place and functioning well, long-term planning began and the idea of managed retreat emerged. Grand Forks’ annual freshet floods had become more frequent and damaging, resulting in public and political support for a plan to increase flood resiliency and prevent a repeat of the 2018 flooding (Lavoie, 2018; Regional District of Kootenay Boundary, 2018). A local engineer proposed the idea of managed retreat, and buyouts were

brought up through conversations with various stakeholders (KI #1; KI #9; KI # 21; KI #27). City administration began researching the feasibility of such a program, looking to an on-going program in New Brunswick for ideas (KI #1). In June, Dobson Engineering Ltd. was hired to provide information on recovery options for the Regional District Board and the City of Grand Forks Council. The scope of work included an overview of flooding impacts to infrastructure, private lands, and residences, identification of areas of permanent flood risk, confirmation of peak-flows and flood levels for the 2018 event, and suggestions of long-term risk reduction options (Dobson Engineering Ltd., 2018, p. 1).

From June through September, many residents remained in limbo, uncertain of how to proceed regarding damaged properties. In some cases, residents who had received provincial DFA, and anticipated a buyout, used the money for personal purchases, as opposed to repairing or

**Figure 9: Pillars of the Boundary Flood Recovery Team**



(Le Geyt, 2021)

replacing their property (KI #10; KI #12; KI #13; KI #15). As explained by one interviewee, “you had people that went and bought a pickup and said, ‘Well, they're going to buy me out anyway. So why would I put money into [my house]’” (KI #10).

In mid-June city administration heard about the Government of Canada’s DMAF from provincial staff and began preparing an Expression of Interest, to be submitted by late July (Infrastructure Canada, 2018; KI #1). Initial recommendations for enhancing resilience mitigating risk came from the Dobson report, including structural protections, retreat, and other adaptation measures (Dobson Engineering Ltd., 2018). A key informant detailed the process that followed:

*“We facilitated a peer review by other engineers and flood risk reduction experts from the UK, Alberta, [and] BC, to review Don Dobson's suggestions. Took [them] to a 50-person stakeholder meeting that was... local, provincial, government agencies who are involved in approving flood mitigation projects right through to the public works departments, through to the planning departments.... Counselors, board members, the mayor, and the Regional District Board... all the various organizations that were involved in supporting flood recovery.” (KI #1)*

Public consultation on the proposed suggestions began soon after the stakeholder meeting and continued until September. Information sessions were held for the four main affected neighbourhoods (limited to affected property owners in order to facilitate open and confidential discussion), and a survey was sent to property owners asking for feedback on the options discussed (Thompson, 2018). Interviewees noted that they heard from property owners that they would be in favour of a buy-out if the compensation was fair (KI #1; KI #2; KI #3; KI #8; KI #10; KI #12; KI #21; KI #27). In mid-September, Grand Forks City Council accepted the suite of risk reduction measures from the Dobson Engineering Ltd. Report (see Table 4), which included property buyouts and strategic grey and natural infrastructure, and directed city administration to submit the relevant funding proposals (Ballard, 2018).

The decision by Council to accept the above adaptation options – and other subsequent decisions related to the buyout program – was made in-camera, in accordance with the BC Community Charter. Section 90 of the Charter allows for a council meeting to be closed if the subject matter pertains to:

- the acquisition, disposition or expropriation of land or improvements, such that the that disclosure may harm the interests of the municipality (section 90-1 e);

- litigation or potential litigation affecting the municipality (section 90-1 g); or
- information that is prohibited, or information that if it were presented in a document would be prohibited, from disclosure under section 21 of the Freedom of Information and Protection of Privacy Act (section 90-1 j) (Community Charter, 2003; KI #3).

**Table 4: Flood Adaptation Options Adopted by Grand Forks City Council**

PARA Adaptation Option	Details
Protect	Three new dykes
Accommodate	• Raising high-priority roads
Retreat	• Property buyouts in four neighbourhoods • Restoration of floodplain and riparian areas
Avoid	• Land re-zoning and restrictions

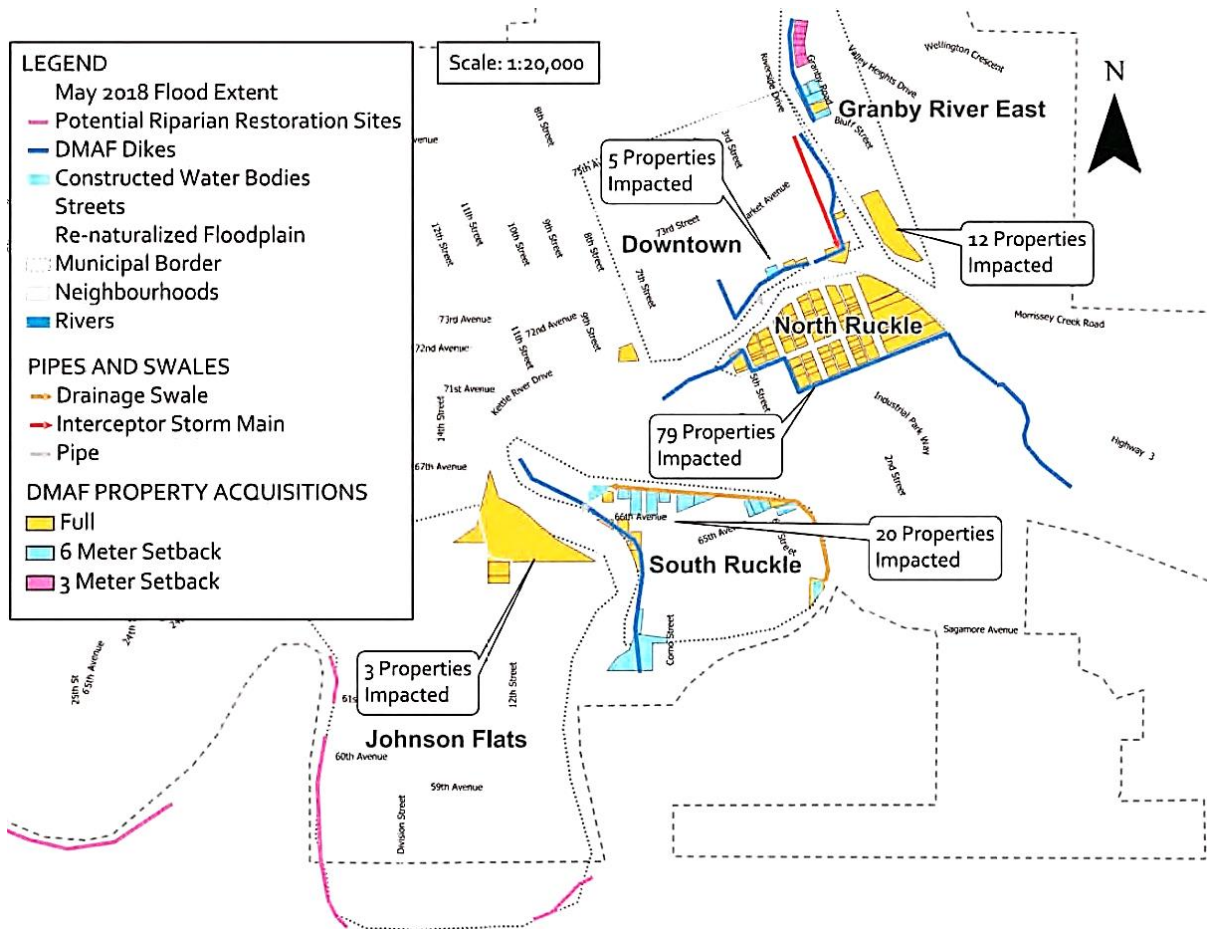
Compiled from (City of Grand Forks, 2021c)

The chosen adaptation plan, which became known as the “Grand Forks Flood Mitigation Program” was designed to protect the Grand Forks downtown and industrial areas lying north and west of the fork of the rivers, while re-establishing floodplain to the south to make room for the rivers to flood (see Figure 10) (City of Grand Forks, 2021c). This would mark the first-time managed retreat was used to reduce flood risk in British Columbia (KI #1; KI #8).

#### The Flood Risk Reduction Program

In October, City of Grand Forks administration was informed that the DMAF Expression of Interest had been accepted, and they were invited to submit a full proposal. Two firms were hired to support the submission: Associated Engineering Ltd, to provide technical reports of the concepts from Don Dobson’s report, and Keystone Consulting & Appraisals, to appraise the damaged houses (City of Grand Forks, 2021b; KI #1). The proposal – submitted to DMAF in early January 2019 – included technical descriptions and costings of the various flood protection and restoration options, archeological assessments, environmental reviews, and other documents (NOR-EX Engineering Ltd., 2019). Based on the Hazard Risk Assessments completed as part of the submission, the Grand Forks Flood Mitigation Program was estimated to have a Return on Investment (ROI) of 3.40:1 – a conservative calculation that considered solely damage to structures and their contents, not other likely costs such as loss of life, ecological damage, lost income, lost business revenue, social stress, and damage to infrastructure (City of Surrey, 2019; NOR-EX Engineering Ltd., 2019; KI #1; KI #8).

**Figure 10: City of Grand Forks flood restoration works, as of 2019**



(City of Grand Forks, 2019h)

Through the fall of 2018, property owners and other stakeholders were updated on the Flood Mitigation Program primarily through website updates and two public meetings (Dinsdale, 2020; KI # 1; KI #8). In early 2019, the BFR Team facilitated two public meetings and informed the community that the City had applied for funding from DMAF as well as a smaller grant from the National Disaster Mitigation Program (see Table 5) (Dinsdale, 2020). Despite these communication efforts, interviewees noted the widespread uncertainty that pervaded the community at that time (KI #1; KI #10; KI #14; KI #15; KI #16):

*“...the buyout... it was a very unclear thing until it was approved and publicly announced in the summer [of 2019]. So all we knew was that the municipal and regional government were*

*submitting this large application to the federal government, that was January. We knew... the geographic area that was slated for buyout and I even put “buyout” in quotes because it wasn't even that clear at that time that that's the direction they were going to go... there was just a lot of uncertainty.” (KI #16)*

**Table 5: 2018 flood-related funding sought by the City of Grand Forks**

<b>Fund</b>	<b>Funding Body</b>	<b>Intended Use</b>	<b>Amount requested</b>	<b>Amount received</b>
Disaster Mitigation & Adaptation Fund	Federal Government (Infrastructure Canada) & Province of BC	<ul style="list-style-type: none"> <li>• Property buyouts</li> <li>• Grey and green flood protection infrastructure (wetlands, dikes, storm drainage, bank stabilization)</li> </ul>	\$49.9 million	\$53 million
National Disaster Mitigation Program	Federal Government (Public Safety Canada) & Province of BC	<ul style="list-style-type: none"> <li>• Downtown flood protection</li> <li>• Downtown stormwater improvements</li> </ul>	\$3 million	\$0

Compiled from (City of Grand Forks, 2021c)

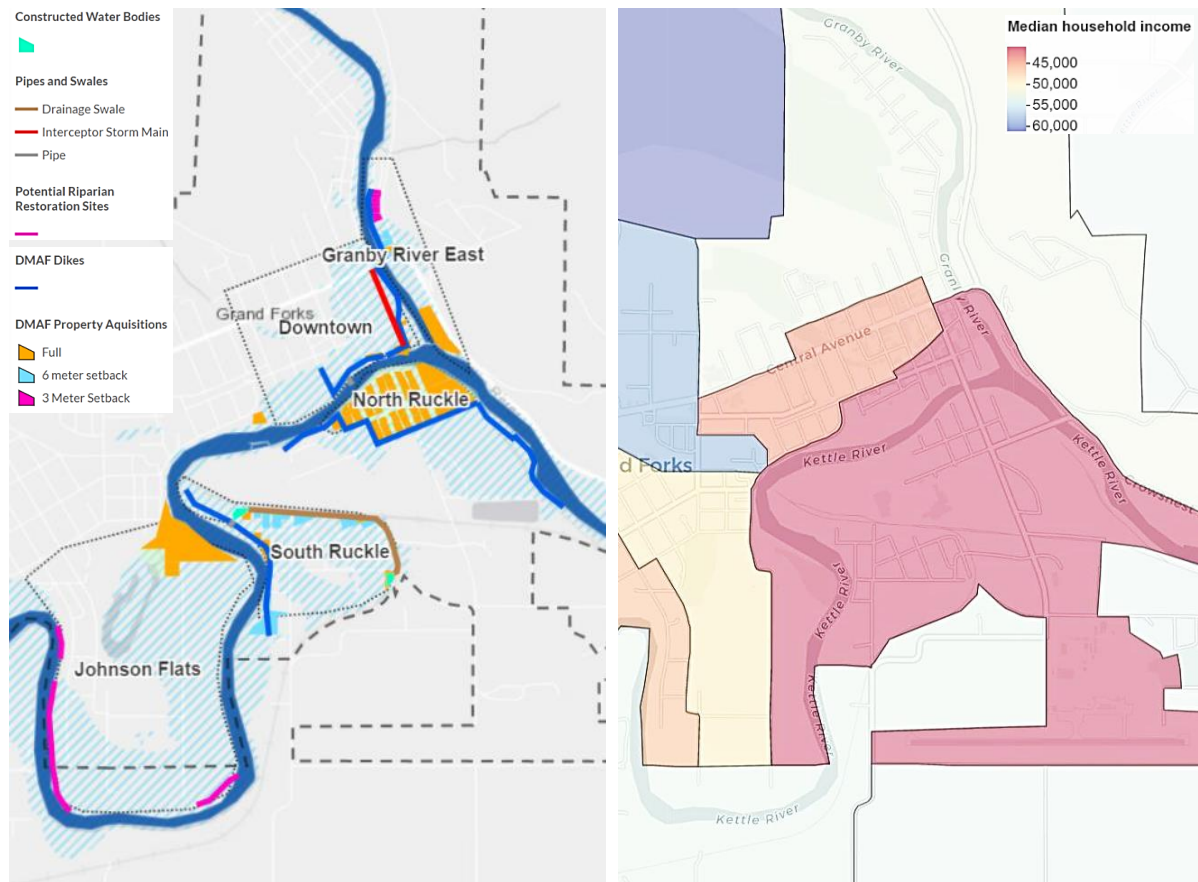
Interim housing solutions via the Household Emergency Assistance Program

While this longer-term recovery was being planned, many property owners remained displaced and unable to return to their damaged homes. The areas most-affected by the flood were the lowest-income neighbourhoods in the City (see Figure 11), resulting in displaced people with little financial or social mobility and therefore few options of where to live (Hoogeveen & Klein, 2021; KI #15; KI #16). This inequity has been viewed in other flood events across North America (Siders & Keenan, 2020b) where flood-affected neighbourhoods are often also low income neighbourhoods.

By mid-October of 2018, 41 properties were vacant, with around twenty families living in recreational vehicles and six living in hotels (City of Grand Forks, 2021c). EMBC’s standard billeting supports last around six months, so to bridge the gap until a possible buyout program was implemented, a new Household Emergency Assistance Program was developed (Canadian Red Cross, 2019). The program ran from 2018 until March 2019, and was funded by the Government of British Columbia and administered by the Canadian Red Cross (Canadian Red Cross, 2019; Poteneau,

2019). It assigned case workers to evaluate individual housing needs and administer financial support to a maximum of \$2,850 per household (City of Grand Forks, 2021c; Poteneau, 2019). The program also paid for housing-related expenses such as propane tanks and refueling for property owners who chose to stay in their recreational vehicles (City of Grand Forks, 2021b; KI #16).

**Figure 11: City of Grand Forks flood extent/flood mitigation works (left) and 2017 median income by neighbourhood (right)**



(City of Grand Forks, 2019a; City of Grand Forks & Regional District of Kootenay Boundary, 2020b)

### Funding leads to pivots

In June of 2019 – more than a year after the flood event – it was announced that Grand Forks' Flood Mitigation Program would receive around \$53 million in funding. The funds would be provided

through a cost-sharing arrangement between the Government of Canada (nearly \$20 million) and the Province of BC (\$31.5 million),

with the City of Grand Forks covering additional expenses (between \$1 million and \$5 million, pending final costs) (Dinsdale, 2020; Infrastructure Canada, 2019). The federal funding came from the Disaster Mitigation and Adaptation Fund, which stipulated that the money had to be used to acquire land to create natural/green infrastructure (such as floodable green space) and not to relocate communities (Infrastructure Canada, 2015; KI# 2; 23). Accordingly, the money to purchase the properties on the land and ‘relocate’ them came from the \$31.5 million committed by the Province of BC.

**Figure 12: BC Parliamentary Secretary for Emergency Preparedness Jennifer Rice announces funding with members of the Boundary Flooding Recovery Team beside the Kettle River in Grand Forks**



(Alan, 2019)

While the funding was welcomed by the City, it was soon noted that the total amount would be insufficient to cover pre-flood market value for properties marked for a buyout program (Lirette, 2019; KI #1-4; KI #4-10). In a July 15, 2019 report to Council, city administration calculated that the estimated difference between pre and post-flood values was \$6.6 million, with a median loss of \$68,400 for affected properties (City of Grand Forks, 2019d). With few of these properties insured against overland flood, many property owners would have limited options for replacing their dwelling with something comparable in the area, or even paying off their existing mortgage (City of Grand Forks, 2019d; KI #2; KI #11; KI #12; KI #13; KI #14, KI #27). Though many residents received BC Disaster Financial Assistance – DFA payments in the area totaled around \$2.2 million – the program only funds structural repairs that return a property to its previous state. The situation was further complicated by mixed messaging from elected and non-elected officials regarding pre- versus post-



flood buyout offers, leading to a range of expectations from property owners (KI #6; KI #9; KI #10; KI #12; #16; KI #17). As noted by one key informant:

*“Unfortunately, the City had made some significant statements partway through the process that [the properties] would be purchased at pre-flood values, which was not [an option] to the municipality through [funding from] senior government.” (KI #6)*

To supplement the financial compensation that would be offered through the buyout program, City Council endorsed a suite of policy options to encourage local affordable and attainable housing projects, and directed staff to consult with affected property owners on in-kind compensation options (City of Grand Forks, 2019d, 2019c). In-kind compensations would be offered for free, as a way to supplement the financial buyout offer. In a survey shared over the summer, “In-Kind Options” were identified as affordable rental options, support to move houses, subsidized manufactured homes, buying or trading city-owned land, and supporting new housing developments such as cooperatives, condominiums or townhouses (City of Grand Forks, 2019b). On August 12 2019, City Council approved incentives for laneway homes, garden suites and tiny houses, as well as amending zoning by-laws and waiving development and building permit fees (City of Grand Forks, 2019e). Staff were also directed to begin financial and feasibility analyses on relevant city housing projects (City of Grand Forks, 2019e). In line with these priorities, BC Housing fast-tracked an affordable housing project in Grand Forks which saw residents move in starting in November 2019 (BC Housing, 2019).

Despite these actions, some property owners continued to protest against the coming post-flood offers, citing low offers, lack of transparency through the buyout process, and procedural justice (Edwards, 2019a). This eventually led to an apology from the City of Grand Forks at the end of 2019, citing miscommunications regarding the buyout program and the intention of the Flood Mitigation Program (City of Grand Forks, 2019b; Edwards, 2019b; KI #1; KI #27).

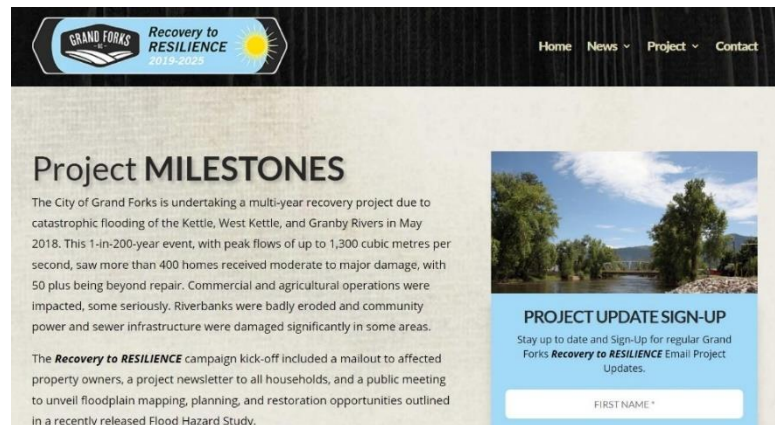
#### The Land Acquisition Program actualizes

On September 10, 2019, city administration issued a Request for Proposals to design and administer the buyout program (City of Grand Forks, 2019f). Six weeks later, the City also began implementing a “Recovery to RESILIENCE” campaign developed by Alliance Communications to support communications efforts, help affected property owners find and move to new homes, and

foster connections and collaboration between stakeholders throughout the Flood Mitigation Program (City of Grand Forks, 2019g; Dinsdale, 2020). The campaign featured a new website (resilience.grandforks.ca) with extensive information on the Flood Mitigation Project.

In late fall, Keystone Consulting & Appraisals – the same company that appraised properties after the flood event – won the buyout program bid with an Acquisition Team of real estate specialists, appraisers, lawyers, construction specialists, architects, support staff and a Project Director. The contract included program design services, real estate valuation, and program implementation

**Figure 13: Snapshot from Recovery to RESILIENCE website, resilience.grandforks.ca**



(Keystone Consulting & Appraisals, 2021). Keystone began public consultation on the Land Acquisition Program (LAP) in late 2019, with one-on-one and workshop-style groups (Shields, 2019). On January 20th 2020, City Council approved the presented LAP, and details of compensation factors and the approved method for determining post-flood FMV were shared in a letter to affected property owners and uploaded to Keystone’s website the following week (see Table 6) (City of Grand Forks, 2020c; Dinsdale, 2020). Another week later, Council also approved funding to explore in-kind compensation options, including provision of free serviced City lots and free relocation of moveable houses, as part of a Reinvestment Program (City of Grand Forks, 2020c).

The LAP was described as voluntary, and Council incentivized participation by “topping-up” the financial offers to be closer to pre-flood FMV, as well as choosing minimum compensation amount (KI # 1; KI #15; KI #9). Additionally, the offer calculation formula was developed to include compensation components normally found only in mandatory expropriation, as outlined in BC’s Expropriation Act (see Table 6). These include disturbance damages and discretionary allowances (Expropriation Act, 1996). Using this formula, the resulting financial offers were slightly above what

an expropriation lawyer would likely get a property owner for their assets, minus lawyer fees (KI #1; KI #3; KI #4; KI #6; KI #8; KI#9; KI #27). A key informant explained the approach:

*“The aim for this was to be 100% voluntary to avoid expropriation where possible... what Keystone did was analyze what would be the full value of fair market value plus disturbance damages..., what they would be legally owed under expropriation, and then [added] some additional components.” (KI #1)*

Interviewees highlighted the prohibitive costs – both financial and social – on property owners and the City of going through expropriation (KI #1; KI #6; KI #8; KI #9; KI #17). The high financial costs of expropriation usually stem from legal fees as well as disturbance damage payments. A few key informants noted an average cost differential of around 19.5% between post-flood FMV and expropriation per property (KI #6; KI #9), which would be paid out of the municipality’s general revenue (KI #1; KI #6; KI #27).

**Table 6: Land Acquisition Program compensation formula**

Asset	Minimum Compensation	Compensation Components	Financial Allocation
Built property	\$20,000 OR the sum of:	Assessed Fair Market Value	FMV
		Disturbance Allowance	FMV x 5%
		Professional Fee Allowance	\$4,000
		Moving Cost Allowance	\$1,000 – \$5,000
		Conveyance Allowance	\$1,400
		Property Transfer Tax	1-2% of FMV
		Interest Penalty Allowance	Fact-based
		Discretionary Allowance	FMV x 7.5%
Vacant land	\$5,000 OR the sum of:	Assessed Fair Market Value	FMV
		Professional Fee Allowance	\$2,000
		Conveyance Allowance	\$1,200
		Property Transfer Tax	1-2% of FMV
		Interest Penalty Allowance	Fact-based
		Discretionary Allowance	FMV x 5%

Compiled from (Keystone Consulting & Appraisals, 2021)

The first phase of the LAP began in early 2020 and involved individual meetings between the LAP team and property owners included in the buyout zone (see Figure 14) (Keystone Consulting & Appraisals, 2021; KI #15; KI #6). At this meeting, property owners discussed the program with Keystone, and filled out a questionnaire regarding individual property and financial situations, any

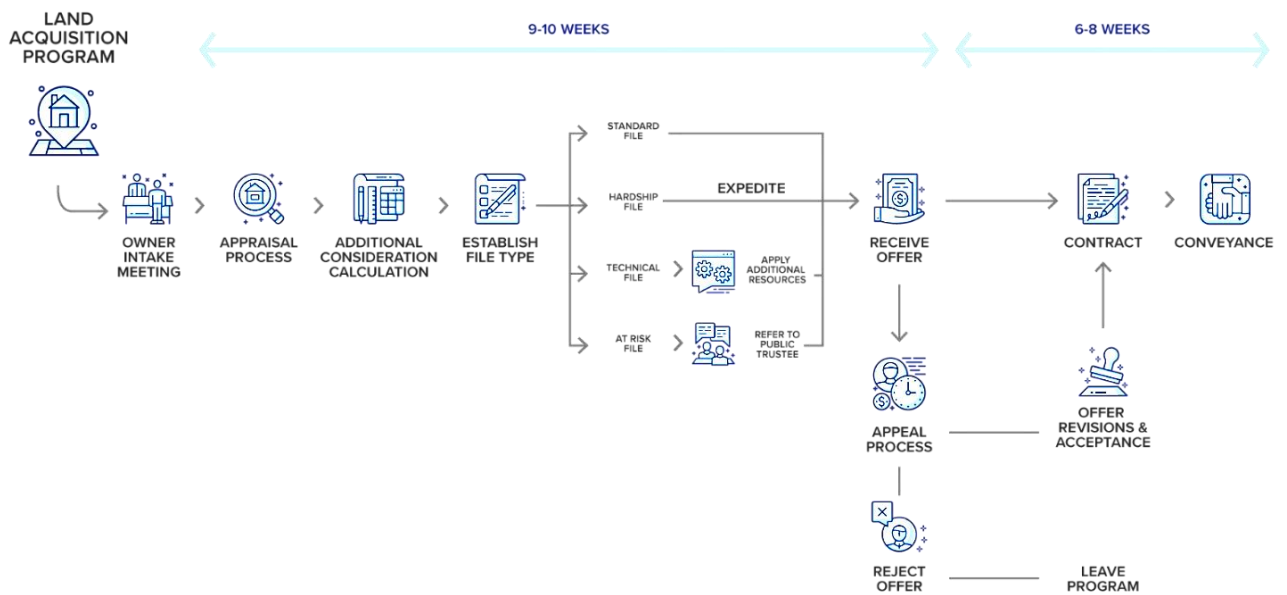
concerns, and future needs. Keystone used this intake to assign each file a designation to help them direct the file and provide additional resources as needed (see Table 7) (Keystone Consulting & Appraisals, 2021; KI #6). In some cases, homeowners requested support from Boundary Family Services or legal representation to help them understand the offer or provide emotional support (KI #6; KI #15; KI #6).

**Table 7: Land Acquisition Program file types**

File Type	Criteria	Examples
Standard	Property and owner(s) are able to move through the LAP. No additional resources needed.	<ul style="list-style-type: none"> <li>House is paid off</li> <li>Owner understands program</li> </ul>
Hardship	Owner(s) are experiencing undue hardship and the file will be expedited.	<ul style="list-style-type: none"> <li>High financial need</li> <li>Lack of appropriate interim housing</li> </ul>
Technical	Technical details related to the property and/or owner(s) require additional resources to proceed.	<ul style="list-style-type: none"> <li>Negative equity</li> <li>Disputed ownership</li> <li>Outstanding insurance claims</li> </ul>
At-risk	Property owners may struggle to understand the program and make an informed choice, therefore needing additional supports and/or protections to go through the LAP.	<ul style="list-style-type: none"> <li>Mental health challenges</li> <li>Limited mental faculty</li> <li>Addiction</li> </ul>

Compiled from Keystone Consulting & Appraisals, 2021; KI #1; KI #6)

**Figure 14: Land Acquisition Program Implementation Schedule**



(Keystone Consulting & Appraisals, 2021)

Following the initial stage, Keystone Appraisals staff met with individual property owners to discuss an offer, after which the property owners could accept, appeal, or reject (Keystone Consulting & Appraisals, 2021)(Keystone Consulting & Appraisals, 2021). If a property owner wished to appeal the offer, they had 30 days to do so, after which an independent review panel evaluated the case and recommended a new price (Today In BC, 2020). This process continued through 2020 and into 2021. Close to the half of the sale agreements were deferred, meaning property owners were given 70% of the sale immediately, allowed to stay in the residence until late spring of 2021, and given the remaining 30% upon final sale (Today In BC, 2020; KI #1; KI #27). On August 10, 2021, expropriation notices went up on the two houses yet to accept and offer (Tritschler, 2021b). As mentioned previously, decisions and discussion related to buyout offers were done in-camera.

**Figure 15: An expropriation notice posted in front of a house in North Ruckle**



(Le Geyt, 2021)



### Addressing short and long-term municipal costs

As the City began to acquire properties from the LAP in early 2020, it was confronted with the financial, environmental, and social costs associated with dealing with the physical houses themselves (City of Grand Forks, 2020f; Keystone Consulting, 2020). Shorter term, more direct costs included demolishing the structures and managing hazardous materials (as high as \$6.7 million), as well as landfill lifespan management costs and increased greenhouse gas emissions (City of Grand Forks, 2020d; KI #1; KI #8). Longer term, indirect costs included reduced municipal tax revenue (up to \$90,000 annually), and the previously mentioned loss of affordable housing and rental stock, which also risked affecting the local labour market and investment opportunities (City of Grand Forks, 2020d; KI #1).

**Figure 17: A North Ruckle house purchased through the buyout program**



(Le Geyt, 2021)

To address some of these challenges, city staff concurrently been exploring reinvestment opportunities. A *City-owned Real Estate Strategy* was launched under the Real Estate Strategy budget launched in January of 2020 (City of Grand Forks, 2020a, 2020b), and on July 20, 2020, City Council approved principles, priorities, and workflow for a Reinvestment Program, which would focus on reinvesting in the housing and assets acquired through the LAP into the community, as well as in-kind compensation and salvage options (City of Grand Forks, 2020d). The program was designed to guide the relocation and retrofitting of some physical structures, with a focus on maintaining affordable and attainable housing stock and extending the life of the local landfill (City of Grand Forks, 2020f, 2020e). Council also approved an Energy Project Manager position – pending funding – to incorporate energy efficiency in the houses, build local capacity for green building projects, and support community climate adaptation and mitigation goals (City of Grand Forks, 2020e).

By mid-October, Keystone Appraisals and city administration had prepared an analysis on structure movability, site selection, servicing, and cost-benefits (City of Grand Forks, 2020i), and in early November had further specified options for City-owned infill lot development as well as ideas for reinvesting the remaining usable homes within the private and non-profit sectors (City of Grand Forks, 2020k, 2020l). Come February of 2021, the Reinvestment Program was focusing specifically on funding for partnerships in order to reduce risks and constraints related to City-owned land (City of Grand Forks, 2021d) and through the spring staff continued to explore possible partnership to undertake development of the properties on City-owned land (City of Grand Forks, 2021h). By May this was the sole focus of the Reinvestment Program: City Council voted against in-kind compensation options for the buyout program, citing lack of financial feasibility (KI #27). On August 20 2021, an RFP was issued for proponents interested in purchasing and relocating over 30 houses and improvements acquired by the City through the LAP (City of Grand Forks, 2021l). Evaluation criteria were related to local attainable housing goals, waste reduction, and sustainable housing considerations as outlined by the Energy Project Manager (City of Grand Forks, 2021l). A second intake was launched the last week of September (City of Grand Forks, 2021n).

Exploring solutions to urgent housing need



While the Reinvestment Program aimed to address housing shortages longer term, as the buyout program unfolded the City was faced with an urgent rental and housing stock shortage. In 2017, one year before the flood, the Canadian Rental Housing Index estimated the Region's rental supply to be missing at least 391 units (BC Non-Profit Housing Association, 2016). The LAP affected 40-50 rental properties and 60-80 homes, many of which were considered more affordable (City of Grand Forks, 2020f). One key informant described the lack of affordability in Grand Forks in the year after the flood:

*“Accommodation was crazy expensive... I remember there was a two-bedroom townhouse that somebody was advertising on Facebook group for \$1800 in this tiny little town of 4000 people... the accommodation prices, I'm gonna say, doubled during that time.”* (KI #16)

In order to address this pressing need, Grand Forks City Council passed a motion on August 31 2020 to convert some of the acquired houses in the community of North Ruckle into medium-term rental properties (City of Grand Forks, 2020g). Supporters of the program cited several benefits to the program, including an increase in local rental stock, eyes on the street in the neighbourhood, and revenue-generation (City of Grand Forks, 2020g, 2020h; Knox, 2020). Opponents to the program included property owners who had already accepted a buyout offer (Knox, 2020; KI #15).

In December of 2020, the rental program was extended and tenants allowed to remain in the North Ruckle units until June 30, 2021, at which point the North Ruckle Dike and Floodplain Restoration Program would begin (City of Grand Forks, 2020m, 2021e). Rental units which would not be demolished for the Flood Mitigation Program were extended until mid-2022, including 13 manufactured homes in the River's Shore Mobile Home Park, three rentals in South Ruckle and one rental in Johnson Flats (City of Grand Forks, 2021e). In addition to continuing to provide medium-term rental stock, the City anticipated these rentals would return an additional \$75,000 to the City (City of Grand Forks, 2021e). As of July 12, 2021, all rental properties needed for the Flood Mitigation Program were vacated save one, resulting in a Council resolution to proceedings with legal actions to remove the overholding renters as needed (City of Grand Forks, 2021i).

#### Building long-term flood resilience through planning tools

Amidst all the activities related to the Flood Mitigation Program, the local Official Community Plan (OCP) was due for an update. According to the City of Grand Forks Strategic Plan, the OCP is to

be revised and updated as specific community issues emerge (City of Grand Forks, 2021b; Paragon Strategic Services, 2015). In October of 2020 Grand Forks staff presented Council with amendments to the OCP update (City of Grand Forks, 2020j). The updated OCP would also be a timely mechanism for addressing some DMAF grant requirements, which required that the bought-out areas would be protected as green infrastructure in the form of floodable open space for a minimum of 40 years (Infrastructure Canada, 2018). The proposed OCP changes included protection of the bought-out lands through a new land use designation, re-zoning, a park dedication, a new floodplain land use by-law, and land use and policy language updates to formally recognize the importance of floodplain functions, open space, and natural assets (City of Grand Forks, 2020j, 2021c). Preliminary site visits and community engagement began with the hired consultant, MVH Urban Planning and Design, Inc., in the summer of 2021, with further engagement slated for the fall (City of Grand Forks, 2021k).

#### 4.2.2 Thematic analysis

This second part of Chapter 5 presents the results of the thematic analysis of the semi-structured interviews. Each section explores a particular theme. The first section focuses on program development, followed by program implementation, and finishing with results regarding elements for future successful risk reduction.

**Table 8: Key informant guide for in-text mentions**

None	0
Few	1-6
Several	7-12
Many	13-19
Most	20-26
All	27

##### 4.2.2.1 Constraints of buyout program development

The key informant interviews highlighted numerous constraints on developing the Grand Forks property buyout program. Key informants spanned a wide range of perspectives and identified specific key constraints, which I outline below.

###### 4.2.2.1.1 Community trauma

*“Nobody has any idea what it's gonna feel like to sit in a room with people you know personally, saying, you're not going home... we can't be prepared for that.” (KI #14)*

A common theme that arose when exploring constraints related to the development of the property buyout program was that of trauma – both on the side of property owners and decision-makers. As is the case with many managed retreat projects, the Grand Forks program was reactive to a flood event and developed while the community was still in recovery. Common affects of trauma were noted by several key informants, in reference to affected property owners, decision-makers, and the broader Grand Forks community. Mentioned affects included heightened emotional state, limited processing skills, and fatigue, all of which made it difficult to make decisions regarding long-term flood risk (KI #8; KI #9; KI #10; KI #12; KI #14; KI #15; KI #17; KI #15; KI #27). As explained in one interview:

*“People in crisis are maybe receiving 10% or 20% of what you're actually saying... depending on how they're receiving things, they'll be either wishful thinking or passive, submissive thinking. So they'll take... 10 or 20% of what you've said, and latch on to that.” (KI #27)*

While many interviewees cited the benefits of community-lead recovery and local decision-making, this model also means that many decision-makers are in the community and experienced the hazard themselves, to varying degrees. As put by one municipal key informant:

*“The flood was tough on everybody. Not just the people that were directly impacted by the water, but the locals dealing with the public consultation meetings and upset forums and just the general negotiations on the city side of buying houses out. We had some debriefing meetings that you could tell that the team was beat up.” (KI #10)*

Another informant spoke frankly about the realities of making decisions within their own community:

*“You're walking that fine line between what you know is best and screwing over the people that live in your community. And it very well could be that, you know, it could ruin them financially... having those incredibly tough conversations changes you forever.” (KI #14)*

In addition, interviewees spoke of the “toll” it took on the community and city staff to make difficult decisions (KI #8), the emotional and practical challenges of being “so accessible” (KI #10), and the re-traumatizing nature of post-hazard decision-making (KI #12).

#### 4.2.2.1.2 Conflicting recovery goals

*“The government money is only being used to accomplish future flood mitigation works, not compensate previous damages.” (KI #6)*

Interviewees illuminated a conflict between the perceived and explicit goals of government versus affected property owners regarding long term recovery. This mismatch was evident soon after the flood event and contributed to contention throughout the development of the property buyout program. Key informants noted that property owners wanted the government to “save” them or “fix” things (KI #20), “make them whole” (KI #21) and either return their houses and property to the way they were before, or just more generally improve their personal situation following the flood (KI #6; KI # 9; KI #12; KI # 14; KI #15; KI # 19; KI #21; KI # 23). Conversely, on the government side, interviewees identified priorities of public risk reduction, including reducing financial and human liability, as well as managing politics (KI #6; KI #8; KI #9; KI #11; KI #14; KI #16; KI #17; KI #22; KI #25). Many of these priorities were framed around the concept of the greater good for the community (KI #1; KI #6; KI #8-9; KI #11-12; KI #14; KI #19).

Interviewees explained that this systematic mismatch of goals and approaches resulted in property owners and other members of the public misunderstanding both the process of developing long-term recovery plans, as well as many of the program components. For example, one key informant commented on the quantitative, engineering-based analysis that led to the delineation of the buyout zones, as opposed to a qualitative, human-centered analysis:

*“...the federal and provincial... and municipal goal is to remove those houses and return that to riparian area and floodable areas, those 140 properties [chosen for buyouts] just happened to be inside of the flood mitigation work... The properties outside of that area are not being considered and not being bought out, and yet they could be as significantly impacted as the properties within.” (KI #6)*

Key informants commented that if the prevailing priority of the long-term risk reduction plan was to save residents, as many of them wanted, then the buyout zones would likely include any property owner who was experiencing hardship. Despite attempts to explicitly clarify program goals, some property owners remained dissatisfied. As said by one local key informant:

*“... that was one of the messages we kept having to say is, we can't make you whole again, right. Like, that's not what we're here for, we're gonna move in that direction, we're trying to make it better. We're not trying to get everybody back to where they [were].” (KI #21)*

#### 4.2.2.1.3 Limited risk data

*“We hadn’t done our homework. You can’t do that when you live in the confluence of two rivers.”  
(KI #14)*

As noted in section 5.2, the City of Grand Forks had started the process of updating their floodplain and risk maps just before the 2018 flood event. Several interviewees noted that without updated flood risk data, the community had a limited understanding of the extent of their flood risk:

*“Overall flooding information just wasn’t up to date or readily available so... people in the downtown area and other communities like North Ruckle may not have been fully aware of the risks that they were facing” (KI #11)*

In addition to a better understanding of general local flood risk, the 2018 event highlighted the need for specific, thorough data which could have helped the community prepare for a larger-scale flood scenario. As said by one key informant, “we were completely at risk, because we didn’t understand what would happen in that perfect storm that happened to us in 2018” (KI #14). Several interviewees noted that the 2018 event affected areas that had never flooded before, and is the new flood of record.

With only flood and risk data from 1992 to work off, new data had to be gathered before the community could move forward with concrete long-term risk reduction planning (KI #1; KI #4; KI #10; KI #11; KI #12; KI #14; KI #19; KI #21). New floodplain maps were released for review in November of 2019 (City of Grand Forks, 2019i). Interviewees highlighted the constraints of undertaking the mapping while also going through disaster recovery efforts, including delayed decisions and details relating to the Flood Mitigation Program. As one key informant said, “...if we had had a better sense of areas of highest risk... perhaps we could have made it even smoother in terms of some of those decisions [such as buyout zones and zoning changes]” (KI# 4).

Without detailed data and clear knowledge of the risks in the community, property owners struggled to make their own informed decisions regarding rebuilding their property or relocating entirely:

*“What people really wanted to know was, ‘Are there mitigation options that can help us, you know, can we build dikes? Can we build flood walls? Can we put in drainage, that sort of thing? Are there things that you can do that will help us?’ Of course, we were in the middle*

*of floodplain mapping, we didn't have a mitigation plan at the time. So we didn't have answers for that.” (KI #12)*

When asked more generally about flood mapping and risk assessments in the province, key informants echoed constraints mentioned in section 4.1.2, *Flooding and climate change context*, including province-wide issues of limited and inconsistent data.

#### 4.2.2.1.4 Funding restrictions

*“How are we going to get to longer-term risk reduction without having dedicated funding for it?”  
(KI #4)*

All interviewees noted funding restrictions as a significant constraint of developing managed retreat programs in BC. Most key informants commented on the negative impact funding had on developing the Grand Fork property buyout program. To the first point, interviewees commented on the high cost of buyout programs, and the lack of granting programs specific to managed retreat activities. Even in the case of the Grand Forks program, DMAF only paid for acquisition of the land, and additional funding was needed to purchase the properties on said land (Infrastructure Canada, 2019, 2021a). In programs where funds are available for long-term flood risk reduction, interviewees highlighted difficult applications processes, competitive granting pools, minimum thresholds for projects, and funding limitations. One federal government interviewee commented:

*“I don't think that we do them any favors by having such a high administrative burden for accessing federal funding, because that further disincentivizes the provinces from putting forward small projects, because it's a pain to administer them. And so unless it's a lot of money, they don't see it necessarily as being worth their while to make the investment. And then the ultimate loser is the small communities that keep getting flooded every year.” (KI #26)*

The Grand Forks program experienced all the above constraints related to funding. After considering managed retreat for the flood-impacted communities, key informants noted that city administration faced the challenge of finding relevant funds to apply for. As the cost of large-scale flood works and property buyouts far surpass the limited revenues of a local government, external funding was necessary for such risk reduction measures. Once city administration found possible funding through the DMAF, several key informants commented on the lengthy and arduous application process. Applicants first submit an initial pre-application, after which they may be invited

to develop a full application with technical supporting documents (Infrastructure Canada, 2021a).

The process was described by one municipal key informant:

*“[We] had limited support in getting the initial [pre-]application in but... then we hired Associated Engineering to come and help put the actual application in... We had to spend hundreds, thousands to get the grant.”* (KI #10)

The granting format was further criticized by another key informant, who said, “I think grants are often the worst way to do [long-term risk reduction], because you don't know what's available. And you have to have a certain capacity to even apply for it” (KI #4).

While the DMAF application was eventually successful, the funding was not announced until June of 2019 – 18 months after the flood event (Infrastructure Canada, 2019). The nature of DMAF as a multi-level government cost-sharing agreement meant that the details had to be negotiated between the Province of BC, the federal government, and the City of Grand Forks before funds could be released (Alan, 2019; Infrastructure Canada, 2021a; KI #6; KI #8). This in contrast to DFA or DFAA, which have been designed for quick release of funds (Emergency Management BC, 2021; Infrastructure Canada, 2021c; Public Safety Canada, 2021b). Despite the funding commitments from both the provincial and federal governments, key informants noted that Grand Forks did not have cash flow to begin work until early in 2020, when the province fast-tracked \$20 million of their promised funds (KI #8; KI #10).

Once funds were received and the Grand Forks Flood Mitigation Program moved forward, interviewees highlighted the new challenge of real estate market changes over the multi-year process, resulting in a budget shortfall based on the original 2018 estimated costs (KI #1; KI #6; KI #9). As a result, the City of Grand Forks will likely see an increase in their share of the costs (KI #1; KI #6; KI #8; KI #27). A few key informants noted this challenge as common in large-scale infrastructure projects, and highlighted the need to anticipate such timelines and increases when planning such projects (KI #6; KI #9; KI #25).

#### 4.2.2.1.5 Limited buyout program guidance

*“This was the first community in BC that went through this [property buyouts]. From a provincial level, they were scrambling, figuring out what to do. From a local level, we were scrambling.”* (KI #12)

As mentioned in Chapter 4, there is little guidance for communities considering managed retreat projects in BC. Interviewees noted the “well-oiled machine” (KI #21) that is short-term disaster recovery in the province (KI #4; KI #6; KI #10; KI #13; KI #15; KI #16, KI #21; KI 24; KI 26), but highlighted constraints for local and regional governments planning longer-term risk reduction (KI #1-4; KI # 6-10; KI #12-27). As described by one key informant, “local [and] regional governments are often left behind. Their pathway is less scripted and there is a period of exploring what their [risk reduction] options could be” (KI #6).

Additional guidance could have been used at several stages of the process that resulted in the development of the property buyout program. Without clear guidance regarding funding options, recommended policy direction, land use planning tools and regulations, and data-gathering, or even who to talk to in provincial or federal government, local decision-makers struggled to be transparent, help property owners consider options, and advocate for realistic plans (KI #3; KI #4; KI #7-10; KI #12; KI #14; KI #15). As noted in one interview:

*“We needed to understand what was even possible from the [federal and provincial governments] ... we need to know what [the province] is going to do in events like this. And we need to know who to talk to about it, as it relates to buyouts, like we didn't even know if buyout was an option. We were struggling to get that out for months and months and months.”* (KI #14)

Some interviewees also highlighted the extended timeframe that resulted from Grand Forks having to “lay the groundwork” regarding long-term risk reduction options (KI #12). The flood recovery team brainstormed many options which were ultimately found unfeasible, whether due to regulation or cost, and ended up back at square one again. For example, one key informant described the process in relation to raising houses:

*“One of the first things we did was we thought, if we can protect these homes by raising them, leaving them in place... But ultimately there was no provincial or federal funding available for raising homes. It probably took us four months to really run that down and say, 'Okay, yeah, no, this is not a viable option'. If we'd had really clear guidance about that from the beginning, then that would have shortened our recovery window, because we would have said, 'Okay, well, that's not an option. Next thing'.”* (KI #12)

A few interviewees noted that BC's provincial government tends to provide autonomy for local governments to make decisions, working from the bottom up. However, as said by one key informant, “it puts a lot of expectations and burden on local authorities to deal with things” (KI #25).



Accordingly, beyond the specific issues faced while developing the Grand Forks property buyout program, some interviewees highlighted more systemic issues with inconsistent or limited guidance in BC. Key informants noted that this lack of consistency can lead to mixed work out of the private sector. For example, one provincial key informant described seeing varying flood construction levels:

*“There isn't any consistent help for local governments, they're all using different consultants who are using different methods and interpreting the data differently... for example, working in two different cities side by side that have two different flood construction levels - so in this one, they're having to do it to 4.5 meters, and this one, they're having to do it to 4 - and so it's then making it harder for them to have a consistent approach, and it translates to higher costs and less efficiency.”* (KI #22)

One interviewee described the results of this ‘laissez-faire’ approach as “patchwork” (KI #22), highlighting a downside of locally led initiatives.

#### 4.2.2.1.6 Limited capacity

*“The poor city, oh my God, they were under so much pressure, working so much.”* (KI #16)

Limited capacity at the local or regional government levels was identified in all interviews as a significant constraint on effective long-term flood risk reduction, and to developing the Grand Forks property buyout program in particular. Linked closely to *Limited buyout program guidance*, key informants spoke to the constraints of limited capacity at every step of program development: exploring the feasibility of a property buyout program following the flood, communicating effectively with property owners and other stakeholders, understanding relevant land use planning and policy, finding and securing appropriate funding, and running the property buyout program. Key informants highlighted the nature of small local government where staff are often juggling multiple roles (KI #1; KI #4; KI #6-10; KI #12; KI #15-17; KI #19-22; KI #24-27). As said by one key informant, “oftentimes, you'll have a small community that might have like two and a half staff who wear like 15 different hats” (KI #19). This lack of capacity resulted in stretched or ill-equipped local staff, with some jobs suffering as a result (KI #8; KI #12; KI #17; KI #19-22). One such task included communication:

*“Communities like Grand Forks, that are smaller in capacity, they don't have personnel that they can just dedicate to one role for communication. Many of these people are doing two or three, maybe four different jobs... and things suffered like communication.”* (KI #12)

A few key informants described the frantic nature of the working environment at the city in the summer months following the flood, which resulted in a reactive approach to issues that arose. As described by one municipal key informant, “[the mentality was] to make it happen, just make it happen. I think staff was so overwhelmed, and we couldn't be more prepared... just reactive. There was no, no planning” (KI #8).

Limited capacity was generalized by interviewees as an issue for risk reduction measures in BC more broadly, especially since responsibilities have been transferred to local governments since the early 2000s. Several key informants acknowledged the rationale for this download, namely that local governments know their contexts and community needs better than the province (KI #17-22; KI #24), and want to avoid “cookie-cutter regulations” (KI #22). However, they also commented that with a transfer of responsibility there is a need for additional support (KI #19-22; KI #24). As said in one interview:

*“If you are going to transfer new responsibilities to local government, then it is important for the province to also provide not only that long term sustainable funding, but there really needs to be that support and capacity building. Because it's very difficult for a local government like Grand Forks to take on so many new responsibilities.”* (KI #20)

Furthermore, some interviewees even expressed frustration at the “provincial reticence around helping the local governments” (KI #22). This support could take the form of capacity building, funding, expertise, and data (KI # 8; KI #11; KI # 17; KI #19-22| KI #24; KI #26).

#### 4.2.2.1.7 Governance constraints

*“There is no single authority fully responsible and accountable for flood risk reduction. That's partly the problem, or the challenge, is that those responsibilities are so widely distributed.”* (KI #24)

Various stakeholders and governing groups were involved in the decision-making process that led to the property buyout program, both at the community level and throughout government. Many interviewees mentioned constraints related to working and consulting with so many different groups before finalizing the details of the program. The groups in question included provincial government ministries, the federal government, local and regional governments, community groups, and non-governmental organizations. Key informants described the consultation and communication process as “onerous” (KI #20), “siloed” (KI #15), and “a struggle” (KI #14),

highlighting in particular the challenges of working with multiple government ministries. When explaining the working relationship between Grand Forks and the province, one municipal key informant said:

*“We were getting frustrated because we were getting the runaround from one ministry to the other. We asked for an appointee from the Premier as a liaison to higher ministers because we were dealing with staff on our [lower] level. Those staff may have talked to their ministries but not the ministers... No-one talked.” (KI #8)*

While a few interviewees praised the efforts of the province to mobilize resources (see section 5.1.1.2), several key informants disparaged the lack of information-sharing, noting that details and updates were not readily shared, and that the City needed to find the right person to talk to. Interviewees linked these noted communication shortcomings to a greater issue regarding the governance of long-term flood recovery and risk reduction in BC. Many key informants praised BC’s immediate disaster response, with one key informant noting EMBC’s smooth processes and even calling it a “very well-oiled machine” (KI #21). Regarding long-term recovery and risk reduction, however, several key informants noted a disconnect from the initial response phase to the recovery phase and subsequent risk reduction measures. BC’s Disaster Financial Assistance was brought up by several key informants as a missed opportunity to encourage a “retreat mindset” (KI #12), as currently there is no limit to the number of times a property can receive DFA, or caps on the compensation. Additionally, several interview participants noted that limited mandates kept relevant government ministries from contributing to risk reduction solutions. One key informant shared an example:

*“We have a road that’s washed out, if we could build that road back slightly differently [i.e. to function as a dike] that might cost, you might add 10% on to the budget, but it would protect a bunch of property. But the Ministry of Transportation, their answer [was], ‘Our mandate doesn’t include that. So we can’t do that, we just physically cannot do that’... That need for a wider mandate for some of those different ministries to reduce disaster risk is really important.” (KI #21)*

A few interviewees expressed hope that BC’s modernization of the emergency management legislation would be a first step in addressing limited mandates and other governance constraints.

#### 4.2.2.1.8 Unsuccessful communication

*“We definitely dropped the ball on communication but the level of uncertainty there was extreme.” (KI #1)*

Most key informants mentioned communication as a significant constraint for the development of the property buyout program. Interviewees cited difficulty reaching all the relevant property owners to share information and elicit feedback, issues keeping everyone up to date, challenges communicating with emotional and traumatized individuals, and perceived secrecy between different levels of government (KI #1; KI #3; KI #8-10; KI #12; KI #14-17; KI #27).

Interviewees illuminated mixed perspectives on the City’s communication efforts. A few interviewees praised the City’s efforts to reach all affected community members, noting various formats including town hall meetings, mail outs, private meetings, and social media posts. However, other key informants noted a lack of consistency in both the forms and frequency of communications. This was attributed by several interviewees to the aforementioned lack of capacity, whereby the city did not have the human resources to dedicate staff to communication tasks specifically.

As mentioned previously, some interviewees who shared information about the City’s communication efforts commented on the challenge of working with individuals still in a traumatized state. Key informants reiterated that traumatized residents were not hearing the whole conversation, but instead “latching” (KI #27) on to phrases such as “we didn’t get”, or “we can’t” (KI #15) and hearing, “what they need to hear – they hear what’s going to save them” (KI #14). This phenomenon, led to significant challenges managing residents’ expectations of city staff and the buyout program. This issue was compounded by the uncertainty that shrouded the program for so long. As said by one key informant, “People just really wanted straight answers. And it was hard for us to give them to because we didn't know the answers at the time” (KI #12). Several interviewees spoke about the difficulty of finding the balance between transparency and sensitivity: sharing information about the buyout program or other planning efforts and gathering input, but not promising anything that was not yet confirmed (KI #1; KI #6; KI #8-10; KI #12; KI #15; KI #16). As said by one municipal key informant:

*“We said it at so many meetings, this is exploratory, the funding isn't in place yet..., but people still latch on to what was said and consider it to be a promise. And a promise to try,*

*to advocate, people read that as being, we will do this, or we'll do that. And I don't know if there's ever any way around that because you have to make public that you're applying for funding. You have to do outreach and consider how you're best going to navigate it. And that means talking to the people affected.” (KI #27)*

In an interview with provincial key informants, they frankly described the City’s position regarding transparency as, “damned if you do and damned if you don't” (KI #17).

A few interviewees noted that in addition to lack of communication clarity throughout the development of the buyout program, there were also mixed messages that came from the city and elected officials, in particular, regarding the buyout zones and amount of compensation property owners would receive through the buyout. As noted by one key informant, “some politicians early on made some promises about buying everybody out, that ultimately ended up not being possible just because of the size of the grants we could access” (KI #12). Interviewees described discrepancies in what property owners were being told and how they were being approached, saying that local leaders were not “on the same page” (KI #15).

Clear and effective communication with the community became such an issue for the City that Grand Forks eventually hired a communications consultant to manage the task. However, a few interviewees commented that it was “way too late” (KI #8), and that in the meantime, councillors, governments, and property owners all risked taking “positions which can work against the buyout program later” (KI #6). One such position which caused strife in the community was the sentiment that the North Ruckle neighbourhood was being “sacrificed” (KI #8; KI #14) to protect the businesses in the downtown area. A few key informants described ‘us against them’ backlash in the community and on social media that even led to property owners included in the buyout zone boycotting businesses who would be protected in the downtown core. One key informant embedded in the Grand Forks community described the perspectives they heard from property owners:

*“... they said, ‘You're gonna protect business, you're gonna build walls around them, and you're gonna leave us out’, or ‘You're gonna buy us out and [give] us some pitiful amounts of money and send us packing’.” (KI #14)*

As noted in section 4.2.2.1.7, *Governance constraints*, communication issues at the local level were further exacerbated by limited information-sharing between different levels of government, and even between ministries at higher levels of government. As put by one interview participant,

*“People often say... governments work in their own siloes and there’s not a lot of sharing that goes on... And, you know, we felt that. And I think that that’s bigger than what we could take on.” (KI #15)*

#### 4.2.2.1.9 Conflicting municipal priorities

*“The challenge that we hear from municipalities is they have competing priorities. They’re trying to balance increasing their population and their overall tax base with developments that make sense.” (KI #11)*

Several interviewees commented on the constraints that come with local governments balancing their priorities. Informants noted land affordability, housing affordability, the local economy, and the city tax base as key priorities governments must consider while balancing the responsibility of risk management (KI #1; KI #6; KI #8; KI #11; KI #15; KI #19; KI #20; KI #22; KI #24; KI #25). As stated by one municipal key informant, “like everything, you never really have enough money to do everything that you would like to do, so you’re always triaging what takes place” (KI #9). Local government priorities also have varying timelines, adding to the challenge. For example, one key informant commented on a city’s responsibility to consider both long-term flood protection as well as shorter term housing needs and city revenue (KI #24). This issue was noted specifically in the Grand Forks case, as the areas slated for buyouts were residential, and many of them more affordable. As was explained by one key informant:

*“A buyout program like this puts additional pressure on the housing market in town, which was already strained before 2018. So the availability of low-cost housing is an issue. It’s tough to replace that.” (KI #12)*

As noted by a few interviewees, local governments are often disincentivized to keep development out of floodplain or other hazard areas because they get their revenue from development charges and property taxes (KI #11; KI #20; KI #22; KI #24-25). This is relevant to both new development and de-development, where the local government likely has to purchase the property in addition to losing out on future revenue. All these factors are coupled with short electoral terms in city councils, further disincentivizing long-term risk reduction in BC communities. In the case of Grand Forks, a few interviewees noted that potential tax loss was one consideration when the city council was deciding on their managed retreat approach (KI #1; 6; KI #8; KI #11; KI #15; KI #19).

A few interviewees noted the difficult context in mountainous BC whereby, “almost every community in BC is built on a floodplain” (KI #22). This has resulted in historical patterns of development in areas with flood risk (KI #5; KI #6; KI #10-12; KI #22). As noted by one key informant, “we didn’t think about this stuff 120 years ago, when these communities were built... now we have to figure out a way to reduce the risks” (KI #12).

#### 4.2.2.2 Enablers of program development

All interview participants spoke directly or indirectly to factors that enabled and supported the development of the Grand Forks property buyout program. I have grouped these key enablers into themes of window of opportunity; resource mobilization; and localized decision-making leadership, and supports. They are explored in detail below.

##### 4.2.2.2.1 Window of opportunity

*“In my community, up until 2018, you couldn’t have told anyone you couldn’t live anywhere. But now... they feel really different.” (KI #14)*

As was explored in Chapter 3, section 3.3.4.1, the window of opportunity created by a disaster is often a key factor in a community’s decision to move forward with a drastic move such as removing people and property from an area. Several of the interviewees commented on both the empirical evidence of this window, as well as its influence on the development of the Grand Forks property buyout program (KI #1; KI #4; KI #6; KI #10; KI #14, KI #16; KI #17, KI #24-27). This influence was noted at all levels of governments, as well as in the local community.

Key informants commented on the significance of moving people out of an area, highlighting the scale of a trigger needed to mobilize such change at all levels of government. In particular, a few interviewees shared insight about political shifts following the 2018 flood. One interview participant commented that, “...getting the political willpower to essentially sterilize properties is really, really hard, and maybe only achievable after a flood” (KI #1).

Other interviewees identified the funding that became available for risk-reduction efforts as a result of the large-scale and well-documented disaster, which went above and beyond typical triggered disaster recovery funds. As noted in one interview, “you could not find a \$70 million dollar

grant for Grand Forks for anything in senior government, except as a response to a significant [event] – something that's on the front page of papers around the world” (KI #6).

When asked about the window in relation to the Grand Forks community, several key informants clearly identified that property owners were more amenable to change soon after the flood, including “diminished” place attachment” (KI #27). Interestingly, though the community had experienced some flooding before, it was the large-scale nature of the 2018 flood that pushed the community to move. One key informant commented:

*“...it's such a difficult decision for town to decide that we're just gonna make that whole region inaccessible forever. That is a very big decision... And it's not something you can do easily – only in a hugely impactful event like the flood in Grand Forks. And because Grand Forks had already multiple events leading up to it over the years, we were like, okay, we can't do this anymore. It's a tough thing.”* (KI #16)

When asked more broadly about the window of opportunity in relation to risk reduction, several interviewees noted its importance and the need to be prepared and proactive in such instances. The window was also described as an opportunity to force a “more uniform approach” from higher levels of government (KI #14), and an opportunity to design “better, more sustainable communities from a risk perspective” (KI #17). Further details can be found in section 5.1.5.1.

#### 4.2.2.2.2 Resource mobilization

*“We're little Grand Forks, our annual budget is like \$7 million, right? We don't have \$50 million in the bank to simply go, “Oh let's buy these properties and move everybody to safety”.”* (KI #8)

While there were many noted constraints related to developing the Grand Forks property buyout program, several key informants noted that the project would not have been possible without the availability and subsequent mobilization of resources at all levels of government. These resources were primarily funding from senior governments and human resources from local governments.

Several interviewees noted that despite numerous challenges related to DMAF, without that program and those funds it was unlikely that Grand Forks administration would have found sufficient funding to move forward with a property buyout program. One key informant described the availability and timing of DMAF as being “fortuitous” (KI #12). In addition to DMAF availability,



resources were able to be mobilized through collaboration at all levels of government. In fact, one key informant noted that the turn around time was relatively quick considering the extensive bureaucracy needed to supply so many financial and human resources. Along with this mobilization, a few key informants praised the collaboration that made the program happen. As stated by one interview participant:

*“What I really liked about this program at the end of the day... is federal government, provincial government and municipal government all working together to solve the problem... federal government having a great grant, provincial government chipping in \$30 million... And then the municipal government putting in a lot of human resources, and also chipping in [financially].” (KI #8)*

One municipal interviewee praised the apparent “synergy” (KI #8) between multiple levels of government, as well as the care that they felt some government officials demonstrated when talking about and dealing with Grand Forks.

#### 4.2.2.2.3 Localized decision-making, leadership, and supports

*“We’re all locals... You know, we all live here, work here, hang out here, we know people that – and are friends with people that – are affected and in the buy-out program. I think it was a benefit to the team” (KI #15)*

Many interviewees commented on the positive influence local decision-makers, leadership, and localized supports had on the trajectory of the long-term risk reduction planning. Several key informants attributed the initial idea and successful development of the Grand Forks property buyout program to local champions who both pushed the idea of managed retreat and worked for its success. Interview participants mentioned excellent locals in “key positions” (KI #8), strong directors who “put and kept the team together” (KI #10), and decision-makers who were “advocates for the town” (KI #15). When asked about the origin of the managed retreat plan, one informant described the influence of a local leader:

*“Our regional representative, he took on this perspective of build back better. He definitely took the bull by his horns and was like, ‘this is a good option, this is what we should be doing’.” (KI #15)*

In addition to local leadership, community supports were also locally-lead. Interviewees spoke positively about the post-disaster response that saw locally managed case workers trained in conflict resolution and crisis management connect directly with residents. Key informants reported

their role to be independent from the city or region, and included connecting individual with funding, financial planning, mental health supports, and legal advice (KI #1; KI #7; KI #13-16). Several interviewees noted the positive influence these case managers had on supporting community wellness through recovery, and therefore supporting residents as they considered the various flood recovery options.

These long-term flood recovery options were proposed by the locally led and run Boundary Flood Recovery Team, which was noted by several interviewees as an important factor in community receptiveness to the property buyout program. As mentioned in section 5.1, the Boundary Flood Recovery Team was comprised of local community leaders who had connections to both the physical community and social networks. These connections came with significant social capital and the team members were recognized and trusted by more of the community (KI #1; KI #9; KI #10; KI #12-17; KI #21; KI #26). One key informant talked about the benefits of having a very competent local team who could easily identify which programs would be helpful or not, and had existing connections and organizations within the community which facilitated effective decision-making (KI #8). A few interviewees also noted that having locals guide the development of the property buyout program also meant that the community was more self-sufficient when the initial recovery phase was over, when some government and NGO supports left.

More broadly, a few other interviewees highlighted the fact that BC's guideline-heavy approach to flood guidance allows local governments some flexibility. One consultant commented:

*“Everything in BC is guidelines. So the benefit of that is that if you have a champion, in a local government, you can do some really cool things, because we're not completely constrained by what is expected of you by the province.”* (KI #25)

While this approach has its own shortcomings, key informants noted that communities with sufficient resources and leadership are able to implement innovative plans.

#### 4.2.2.3 Constraints of program implementation

Interviewees explored constraints related to the implementation of the Grand Forks property buyout program, following its development. Key constraints have been grouped into themes, including: the lengthy timeline to arrive at program implementation; place attachment; funding limitations; program participant diversity; and level of perceived coercion to accept a buyout offer.

#### 4.2.2.3.1 Lengthy timeline

*“We knew that it [interest in the buyout] would start to wane off once people stayed there in the flooded neighbourhoods” (KI #10)*

In section 4.2.2.2.1 it was noted that the disaster window of opportunity had a positive impact on developing the Grand Forks property buyout program. In terms of implementation, however, key informants noticed that the lengthy timeline to arrive at implementation was not favourable. As described previously, the process of securing funding for the Grand Forks property buyout program was arduous and long. Funding was not secured for more than a year following the 2018 flood event, and as a result the program was not implemented until January of 2020. By the time the buyout team was ready to begin implementing the program, interviewees identified that the disaster window of opportunity had closed. This resulted in increased reticence to accept the buyout offers. A few key informants mentioned property owners who had voted in favour of the buyout program changing their minds as time went on. Once the City announced the post-flood funding details, support for the program further waned. As described by one municipal key informant:

*“If we had done another survey or a follow up survey, I wouldn't be surprised to see support go down from about 80% to less than 50% for the buyout program, just based on the kind of feedback that we were getting.” (KI #1)*

This dwindling motivation to move was further solidified by a moderate freshet in 2019, as noted by another municipal interviewee:

*“At first after the flood we immediately did a straw poll [at community] meetings. And like 90% of people said, ‘Buy me out now, I want out’. Not even a year later, they were like, ‘No, we want to stay!’... if we would have had the funding on day one, when they said, ‘We want a buyout’... people would have signed right then and there.” (KI #8)*

In addition to diminished interest in program participation, several interview participants also noted that hardship had increased for many of the flooded residents. One key informant explained:

*“After two years, prevailing conditions and the impacts of a flood become magnified. Those people who were less capable of responding... if they're stuck in poor houses or living in the garage or the trailer after two years, they're angry, fatigued, suffering from stresses.” (KI #6)*

#### 4.2.2.3.2 Place attachment

*“Nobody can pay for memories. So how do you judge that?” (KI #10)*

Attachment to place has been shown to have a strong influence on an individual’s likelihood to accept a buyout offer (Binder et al., 2019; Bronen & Chapin, 2013, 2013; Elmore et al., 2003; Forsyth & Peiser, 2021; Henry, 2013; Kick et al., 2011; Loughran & Elliott, 2019; Perry & Lindell, 1997; Seebauer & Winkler, 2020a; Song & Peng, 2017). Many interviewees identified emotional and community attachments as key reasons why property owners in Grand Forks were hesitant to accept a buyout, no matter how much they were offered. This was well put by one key informant in social services:

*“It’s not about a house for these people, it’s about their home, it’s about their life, it’s about the fact that they’ve lived in some of these places their entire life and it’s been passed down from, you know, generation to generation. And no amount of money can replace those things.” (KI #15)*

Such ties have been noted to be stronger in rural or small communities (Bukvic & Borate, 2020). This was observed in Grand Forks, with a few interviewees specifically referenced the rural history of the area. As noted by one key informant, “we have people who are in their 80s who were born in that house, that used to be the farmhouse” (KI #6).

While social connections were mentioned by a few key informants, I identified the main attachments mentioned as being to family homes (KI #3; KI #8; KI #10; KI #11; KI #15; KI #17) and proximity to the water (KI # 8; KI #10; KI #11; KI #15). Interviewees described the neighbourhoods and properties in the buyout zones as “established” (KI #11), “homesteads” (KI #11), “multi-generational” (KI #6; KI#15; KI #17), and having “a million-dollar view” (KI #10).

Interviewees also explored the difficulties of changing life plans. For example, one key informant shared the story of a property owner who had planned on living in their house for their whole life: “...one person said, please, do not make me move. I bought here, I want to die here” (KI #10). A few interviewees noted that some of the impacted property owners were over 60 years old and had lived there for a long time, with no plans to move. As said in one interview, “people there... are in their 70s and 80s, and they’ve lived there all their lives, in some cases” (KI #3). When asked further about how such property owners felt about moving, one key informant described a sense of

betrayal: "... the community that you've lived in your whole life, your whole story is there and [they think] how can they [the city] do this to me?" (KI # 14).

While several key informants noticed that property owners had a heightened perception of the risk associated with living the flood zone, a few observed that some property owners' tolerance of this risk changed when it came to their homes. Interviewees described this as a shifting "risk value" (KI #17), as well as the "short memory" (KI #8) some property owners seemed to have regarding their personal flood risk. Such shifting risk tolerance was attributed both to place attachment and personal asset management.

#### 4.2.2.3.3 Funding limitations

*"[With] any program that is based on a fair market value proposition... you have winners and losers. Generally, the people who have lost the most, lose the most." (KI #6)*

While interviewees linked the majority of funding constraints to project development, some key informants commented on the relationship between financial analyses and the implementation of the property buyout program. In particular, constraints were linked to buyout offer totals and the limited non-financial in-kind program. As explained in section 5.2, the purpose of the in-kind program was to supplement the financial buyout offers, and included options such as the provision of free serviced City lots, free relocation of moveable houses, subsidized manufactured homes, and supporting new housing developments such as cooperatives, condominiums or townhouses (City of Grand Forks, 2019b, 2020b).

As mentioned previously, the funding provided for the Grand Forks Flood Mitigation Program was not sufficient to cover pre-flood market value of properties in the buyout zones. As such, buyout offers were calculated using post-flood assessed FMV, to the displeasure of both property owners and decision-makers. Several interviewees commented on the mixed reaction to this news. While some taxpayers supported offers based on current FMV, one key informant described city staff as having a "sinking moment" (KI #1) when they realized the shortfall, and property owners were disappointed at the news. Interview participants shared negative reactions from property owners, including feeling "shell shocked" (KI#1), "unhappy" (KI #2), and "angry" (KI #13), especially in light of previous explicit and implied promises of buyout offers based on pre-flood FMV. As noted

by one key informant, for many property owners, accepting the buyout would result in “financial ruin” (KI #10).

Many interviewees explicitly attributed their hesitation accepting a buyout offer to the funding shortfall. As stated by one key informant, “the reason people [held] out is because everybody [wanted] pre-flood value, that's what was promised” (KI #6). Another key informant was sympathetic, saying, “most homeowners that I talk to, they want top dollar and that's completely understandable because they need the most they can to increase their potential of relocating and having a stable financial future” (KI #2). A few interviewees commented that the city administration appealed for funding to cover pre-flood market value, petitioning granting bodies for additional funds. As described by one municipal interview:

*“We did an appraisal estimating what the [property] value was before the flood, and then on what it was at the end of 2018 and [that] value went into the funding [application] package to the federal and provincial government. We put in an additional request to overcome the gap to get us to pre-flood value and ultimately that was denied.” (KI #1)*

The difference in pre- versus post-flood FMV for relevant properties ranged from 30% to 70% lower (KI #1), based on the appraisals conducted by building inspectors and engineers. Several key informants highlighted the hardship this gap brought some property owners, ranging from outstanding mortgages and negative equity, to limited options for where to move. One key informant described a typical scenario:

*“Let's say they had \$150,000 mortgage on a \$200,000, house. Okay, that's doable. But all of a sudden, the house is worth \$100 000 at the fair market value... With the funding formula, it brought it [the financial buyout offer] up to maybe \$140 000. There's still \$10,000... They've lost their house, they had to move, and then they still owe \$10,000 on the property that they don't even own.” (KI #8)*

In addition to such a loss, key informants noted that for a period of time, many residents were paying costs associated with their flooded property while also paying to live elsewhere. Such costs included utilities, land costs, and a mortgage (KI #10; KI #15-16).

In the face of such realities, Grand Forks City Council and city administration explored non-financial in-kind compensation options to supplement the financial offers and support individuals for whom the financial offer would not be as equitable (see Section 5.2). In particular, interviewees pointed to provision of free serviced City lots and the free relocation of moveable houses as two key

in-kind options. Early on in the interview process, a few key informants spoke very optimistically about the in-kind program, hoping it would help to settle outstanding offers, including cases where financial settlements were complicated or would cause undue hardship. As mentioned previously, this program was perceived by several interviewees as a creative way to address the diversity of buyout participants and tailor offers to individual situations. Towards the end of my scheduled interviews, City Council voted against the in-kind program due to a lack of financial feasibility and policy direction. When asked about this news, the remaining interviewees expressed disappointment that the program was voted down, highlighting concerns that property owners would suffer additional hardship from the buyout program. One interview commented:

*“Yeah, [the in-kind program] didn't take off at all. And ultimately, the Council's decision on the overall land acquisition program was to provide enough financial compensation that, you know, by and large people would have the opportunity to find other options. And that happened for all of the people who have signed so far. There's a few people still currently in [the land acquisition program] who hadn't signed on yet who, I think would really benefit from some additional support, and whether or not Council's able to do that over this next phase of problem solving remains to be seen. But in terms of the mechanics of actually purchasing someone's house, moving it, selling it back to them. There's a whole bunch of complicated factors that, that Council foresaw not being able to navigate easily through.”*  
(KI #27)

#### 4.2.2.3.4 Participant diversity

*“You have this vast array of community conditions that result from the flooding impact. Physically how the properties have been impacted, demographically what kind of individual they are – less educated, unemployed, single family, are they more resourceful... It becomes a bit of a quagmire in terms of trying to put first all of those individual personalities through this standardized program. You have to standardize the program because there's so many units to deal with, but at the same time you also have 140 property owners which are all unique.”* (KI #6)

Buyout researchers have commented on the shortcomings of property buyout programs that use a one-size-fits-all approach (Baker et al., 2018b; Binder & Greer, 2016) . As was noted in many interviews, the property owners included in the buyout program were highly diverse, in terms of financial situation, personal capacity, life circumstance, and housing resources. Many key informants linked the high number of unique challenges experienced by participants to pre-existing vulnerabilities commonly found in floodplain residents, including poverty and diminished mental

capacity. As said by one key informant, “that's why some people were living in flood prone areas, because the cost of the homes was less” (KI #12).

The wide range of characteristics and circumstances encountered in the buyout program made it difficult to design and implement a program that equally compensated all participants and achieved the program’s goal of 100% voluntary acceptance of buyout offers. Though some characteristics are inherently connected, they have been grouped into the sub-categories of technical and personal. A summary of the diverse characteristics mentioned by key informants can be found in Table 9.

**Table 9: Summary of characteristics mentioned by key informants**

Characteristic Type	Characteristic description	KI Reference
Technical	Outstanding debt	1; 8; 10
	Disputed ownership	6
	Property with sweat-equity	1; 9
Personal	Mental health challenges	1; 6; 8; 10; 15; 16;
	Addiction	1; 6; 8; 10; 15; 16
	Limited cognitive ability	1; 10; 12; 15; 16; 17
	Health conditions	1; 10; 12
	Life circumstances	1; 3; 10; 12; 15; 16; 17
	Fixed income	10; 16; 17
	Unstable interim housing	1; 10; 16
	Procedural justice	1
	Physical disability	1; 10; 16

*Technical*

Interviewees highlighted technical characteristics that made offer acceptance unappealing or technically complicated for participants. A few key informants mentioned disputed ownership of properties or assets, making it difficult to process the buyout offers in a straightforward manner. Most often, interviewees commented on situations of outstanding debt, including existing mortgages and personal debt. For example, a few key informants shared the story of an individual who had significant personal debts and would likely have had all of their assets taken for debt repayment if their house was sold (KI #1; KI #15).



## *Personal*

Several interviewees listed personal characteristics that influenced capacity or willingness to participate in the buyout, some of which interview participants linked in turn to the socioeconomic status and vulnerabilities of people living in the flooded areas. These included financial instability, health conditions, mental health challenges, poverty, substance use disorder, limited mental cognition, unstable families, and life stage (KI #1; KI #6; KI #8; KI #10; KI #12; KI #14-17; KI #27).

Buyout program participants were experiencing different life circumstances which posed challenges for program success. For example, one interview mentioned property owners who had young children (KI #15), and many interviews referred to individuals who were elderly. According to key informants, there were a higher-than-average number of senior citizens in the flooded areas, experiencing a range of life circumstances (KI #1; KI #3; KI #10-12; KI #15-17). Many of these individuals were on fixed incomes, making the buyout offer a difficult decision. As explained by one key informant,

*“A 75-year-old senior surviving on a \$1,200 dollar a month CPP, being offered a \$24,000 buyout, what is she supposed to do with that? She can't even afford a long-term care home. Okay, so now what? A mobile home in the worst part of BC is going to cost you \$50,000, \$70,000.” (KI #16)*

Even in cases where limited income was less of an issue, a few key informants highlighted the challenges and stresses of making such a big change in the later stages of life – in particular taking on another mortgage (KI #3; KI #10; KI #12; KI #16). As explained by one interviewee, “if you're 60 or 70 years old and you're settled in your home, and now you have to think about buying a new home and taking on a new mortgage, that's pretty stressful” (KI #12). Another key informant noted that for some elderly property owners, living with their existing flood risk was preferable to the challenges of moving:

*“They say, ‘You know what? I'm 80. I don't want to build a new house, I don't want to wait three years to make this happen, or whatever. I'm just going to live where I live, or I'm just going to deal with what comes’.” (KI #10)*

The restriction of fixed or limited income was also consistent with individuals surviving on disability payments or social assistance, as well as residents living pay cheque to pay cheque.

Interviewees noted the increased financial vulnerability experienced in such cases, one interview saying, “they’re folks that don't have that same financial security that other people do” (KI #16).

Such individuals were noted to have had a difficult time finding both interim and long-term housing, though this challenge was experienced by all manner of program participants, regardless of personal capacity or socio-economic status. Several key informants attributed this in part to the already strained housing market in BC. One key informant stated the situation provincially, saying, “the housing crisis in BC, it's massive. One person on minimum wage, working full time, struggles to afford, a one- bedroom apartment, anywhere in the province” (KI #16). Though program participants’ interim and long-term housing data were not gathered, anecdotally, interviewees knew of people living in their RVs, cars, shelters, and family members’ basements while trying to find more permanent solutions (KI #1; KI 10; KI #16).

Lastly, one key informant noted one program participant who felt strongly about procedural justice before accepting an offer, and commented on the need for relationship building to settle the file (KI #1). At the time of my research field visit (August 2021), this property had received a notice of expropriation from the City of Grand Forks.

#### 4.2.2.3.5 Level of perceived coercion

*“[The buyout program] is kind of voluntary, kind of not...” (KI #8)*

Coerciveness in buyout programs is a complex concept in literature and empirical practice. On paper and in many interviews, the Grand Forks buyout program was described as voluntary. However, the DMAF stipulates that funding can be used to acquire land only to develop natural infrastructure (Infrastructure Canada, 2021a), and by applying for this funding the City committed to moving any incompatible development from these areas. Ultimately, the City of Grand Forks decided to turn the bought-out zones into natural infrastructure in the form of re-established floodplain and retention ponds (Infrastructure Canada, 2019), therefore requiring all people and property within the soon-to-be floodplain/ponds to be removed. Additionally, a few interviewees noted that property owners were told that delaying offer acceptance might result in reappraisal of their property, and the risk of even further decreased FMV.

While the Grand Forks buyout program was never described as mandatory, several interviewees acknowledged the lack of clarity about this, and the elements of coercion built into the buyout offers. As said in one interview, “people really don't have a choice, right?” (KI #3). In fact, another key informant described the buyout offer as either “compulsory buy out” (mandatory) or “forced buy-out” (voluntary) (KI #6), alluding to the fact that so-called voluntary programs often include some level of coercion. Elements of voluntary versus mandatory buyout programs mentioned by interviewees are summarized in Table 10.

**Table 10: Elements of mandatory versus voluntary buyout programs mentioned by interviewees**

<b>Mandatory (expropriation)</b>	<b>Voluntary</b>
<ul style="list-style-type: none"> <li>• Offer based on expropriation law</li> <li>• Disputes settled through litigation</li> <li>• Purchases processed immediately</li> <li>• Funds beyond FMV paid primarily by senior levels of government</li> <li>• No public input into program design or operation</li> </ul>	<ul style="list-style-type: none"> <li>• Offer based on a developed formula</li> <li>• Disputes settled through negotiation</li> <li>• Purchases often take extended timelines</li> <li>• Funds beyond FMV paid primarily by local governments</li> <li>• Public input should influence program</li> </ul>

Key informants described the City’s narrative around buyout offer negotiation as focusing on residents’ safety, cooperation, and choice, as opposed to using terms such as “mandatory” or “expropriation”. However, interviewees noted that despite this framing, some property owners still perceived the offers and approach as coercive, and this had a negative affect on both buyout negotiations and the optics of the program as a whole. One interview described the frustration of some property owners, commenting:

*“... there was a group of people that were calling [the buyout program] for what they felt it was and they refused to use the word “voluntary buy-out” and they would use “expropriation” and say, ‘This is exactly what this is.’” (KI #15)*

When asked about the importance of levels of coercion in buyout programs more generally, several interviewees highlighted the importance of developing programs with a high degree of choice built in, mentioning factors including collaborative scenarios, a fair process, and community trust (KI 1; KI #3; KI# 4; KI #6; KI #8; KI # 9; KI #15; KI #17; KI #26; KI #27). At the same time, a few interviewees noted that the Grand Forks property buyout program was always likely to encounter

mandatory expropriation. As one key informant commented, “it’s inevitable that we’ll get one [expropriation]” (KI #4).

#### 4.2.2.4 Enablers of program implementation

Manifest and latent content analysis of interview transcripts unveiled key factors that enabled the implementation of the property buyout program. Most key informants mentioned enablers to some degree in the interviews. This section organizes these factors into the following themes: risk perception and tolerance; expedient expertise; buyout offer formulation; and post-buyout land use.

##### 4.2.2.4.1 Risk perception and tolerance

*“A lot of people have moved on, and a lot of people are actually happy to be out of the floodplain”  
(KI #27)*

Many interviewees identified risk perception and tolerance as factors that encouraged property owners to accept buyout offers. Though Grand Forks and surrounding area experienced flooding regularly, several interviewees commented on how the “scope”, “scale”, and “extent” of the 2018 flood was far beyond what people had seen in decades, in particular, affecting many properties that were not riverfront. As said by one key informant, “never had my father-in-law seen an event like that and he’s lived here for 80 years” (KI #14). Another municipal interviewee noted that this increased risk perception from the 2018 flood has endured, saying, “there’s been some time [three years] passed, and people see that the risk is still there” (KI #12).

The heightened awareness of the flood risk faced by the community was noted to cause significant mental health impacts for affected property owners, described in interviews as experiencing anxiety, grief, angst, and feeling overwhelmed. For many property owners, this in turn resulted in decreased tolerance for the risk posed by their living situation, despite place attachment and property considerations (KI #1; KI #10; KI #12; KI #14-17; KI #21; KI #27). As stated by one key informant, “it’s not fun to get flooded. So the prospect of experiencing future disaster will provide enough incentive for most people to accept the buyout offer and relocate” (KI #5).

Accordingly, interviewees mentioned property owners who accepted buyout offers and were “happy” (KI #27) to be out of the floodplain. One key informant described one property owner’s experience, saying:

*“There’s one of the North Ruckle residents who bought a house about two blocks away from mine, and she walks by her dog every day. And, you know... even though it was difficult, and this was during the [buyout] process, she expressed gratitude at having been out and never having to worry about a flood again.”* (KI #27)

#### 4.2.2.4.2 Expedient expertise

*“I think the key to success of a voluntary buy-out is to make a buy-out team straightaway. It requires quite diverse and creative teams to meet all the needs that you’re going to encounter in such a complex project as acquiring flood damaged properties and all the technicalities of the neighbourhoods.”* (KI #6)

Interviewees highlighted the complexity of buyout programs, and most key informants commented on the need to involve a range of expertise early on to support a smooth program, a concept which is being referred to here as “expedient expertise”. The needed expertise mentioned in interviews included legal, real estate, communications, economics, land use planning, mental health, and social services (KI #1; KI #6; KI #8; KI #9-10; KI #12-16; KI #27). A few interviewees highlighted the importance of timing, explaining that the earlier expertise is brought in, the fewer mistakes will be made in developing and implementing a buyout program. As said by one key informant, “if it [expertise] comes in early, you don’t make the same mistakes that were made, and have been made successively by many local governments” (KI #6).

Key informants reiterated that the size and limited capacity of the City of Grand Forks bureaucracy led the City to work with an external consultant, Keystone Appraisals, which brought in additional expertise related to legal matters, real estate, economics, and land use planning (KI #1; KI #3; KI #6; KI #8-9; KI #15; KI #27). This decision was described favourably by several interview participants, one saying, “I like that we had worked with an external consultant. Hiring a qualified expert on purchasing homes, creating a framework and program around this, because we don’t have these experts on [city] staff, has tremendously helped” (KI #8). In addition to bringing specific expertise, interviewees also mentioned other benefits to working with the consulting firm. These included having someone arms length to make difficult decisions, able to think long-term, having the

capacity to do extensive analyses, and having the capacity to work quickly (KI #1; KI #3-4; KI #6; KI #8; KI #9-10; KI #21; KI #27).

In particular, interviewees highlighted the funding and policy mechanisms used to acquire property as areas that benefited from the support provided by specific expertise, as well as property valuation. A few key informants described the thorough approach taken to value the relevant properties following the flood event, noting the “thorough” and “standardized” process. One consultant explained the importance of this step:

*“It's critical that the valuation team comes up with a standardized way of approaching the valuation techniques. You get these over-the-shoulder comparisons done by neighbours. You've got to expect that they will, or their lawyer will, line up 30 reports and try and find flaws, that one report has treated a certain type of improvement or a certain addition differently, like a \$15,000 adjustment for double garage when another person got \$25,000. You've got to make sure that they're tight enough to avoid or pass the scrutiny of not only the property owners, who know their properties extremely well, but also the professionals that they bring in to review the work.” (KI #6)*

Opinions about whether the expertise needed for successful buyout programs should be arms-length to the community, or local, were inconclusive in this research. As explored in section 5.1.2.3, localized leadership, supports, and decision-making can encourage community trust and therefore open communication. As said by one key informant:

*“I felt like I had a lot of good conversations with individuals because they knew me and they trusted me... very different conversations than what they [might have] with a rep that they've never met before.” (KI #21)*

On the other hand, several interviewees noted the benefits of having part of the buyout team be arms length in order to take some of the pressure and emotion off of city staff. This ties into findings in section 4.2.2.1.1, *Community trauma*.

#### 4.2.2.4.3 Buyout offer formulation

*“[Offer uptake] turned out to be a tremendous success... a lot of it is based on Council's decision to really pay that extra little amount... it really took away the extra costs associated to the expropriation process. And I think people are a lot closer to feeling like they were whole.” (KI #9)*

When Keystone Appraisals was hired to run the property buyout program, they were tasked with designing a program that would have 100% voluntary uptake while staying within the City's

budget (KI #1; KI #6; KI #8; KI #12). In order to meet these criteria, buyout offers were formulated in order to encourage voluntary uptake and thus discourage the need to incur additional costs and efforts associated with expropriation. As noted previously, this was facilitated by a decision from City Council to offer property owners more than post-flood FMV, even though it increased the total cost of the property buyout program. Key informants described how a formula was designed by considering what homeowners would get for their properties if they went through the expropriation process. One key informant explained the approach:

*“It's all about necessity of providing a fair offer to the homeowners that if they would then take [the offer] to a lawyer and say, ‘Can you do better? In the expropriation scenario, could you do better, could I make more money?’, they would turn around and say, ‘You know what, you may get another \$5,000 more but legal costs and all the anguish of going through this is not worth it for you’.” (KI #8)*

City Council’s decision to top up offers was highlighted by several interviewees as the main reason buyout acceptance was high soon after offers were made. A few key informants commended this decision by Council, noting it was “in good faith” (KI #8), “fair” (KI #1; KI #4; KI #6; KI #8-9; KI #14; KI #17-18; KI #21), and “went a long way” (KI #14). In addition to discretionary amounts that are commonly paid in expropriation, the offers included an additional 7.5% of the post-flood fair market assessed value of the properties. According to key informants, on average this resulted in an additional \$7000 to \$10,000 above what expropriation would have provided. As explained in one interview,

*“...that discretionary allowance [7.5% of fair market value], basically was applied to every file, but what it really did is that's the amount over and above what expropriation would have provided. That enabled us to get to the point where we're now, I think, over 90% signed off.” (KI #1)*

The additional compensation formulas were developed out of workshops with property owners, as well as by consulting expropriation law. A few key informants noted that this consultation process had the added benefit of educating affected property owners on what they were eligible for through expropriation and what level of quantum damages (damages awarded to a successful party in a claim) they could get. As said by one key informant,

*“[We educated] them [property owners] as to what their rights were and level of compensation they can expect from [expropriation]. So when we came around to improving and finalizing the compensation levels, they were capable of understanding what they were*

*getting, why they were getting it, and how it might relate to the opposing routes, like, 'If I don't sell it to them and get my compensation, then this is where I can expect, the range of values I could likely expect from expropriation'. And hopefully, if we've done our job well, they realize that the pricing mechanism is at the very least fair, and if really well, that it's slightly above". (KI #6)*

Interviewees noted that voluntary offer acceptance was further encouraged by adding minimum offers and some limited in-kind supports to the program, such as deferred closing. Minimum offers were chosen by Council to support property owners whose properties were severely damaged without any kind of safety net (e.g. insurance) or preparation. One interview noted that around one quarter of properties included in the buyout program fell into this category (KI #1). The most common in-kind support implemented was a 'formal differed closing process' whereby property owners were allowed to stay in their properties until early summer of 2021, no matter when they accepted a buyout offer. A few key informants highlighted the flexibility this approach allowed property owners, who received 70% of the purchase price once the offer was processed and therefore had funds and time to plan their housing transition (KI #1; KI# 6; KI #8-9). As noted by one key informant, "it was a tremendously important piece to the program, in terms of acceptance rates, in terms of the urgent issues that would result in people losing their housing" (KI #6).

#### 4.2.2.4.4 Post-buyout land use

*"You have an opportunity to design a better, more sustainable city." (KI #17)*

Several interviewees noted that the decision to convert the bought-out land into protected, floodable green space made the buyout program more palatable for property owners included in the program, as well as the broader community. For the residents receiving a buyout offer, interviewees described a sense of comfort knowing that nobody would be able to live on 'their' land. Additionally, knowing that the land would have a greater purpose made moving easier to accept. As described by one key informant,

*"...having that, almost, security for people knowing that, 'OK, I can't live there anymore, but neither can anybody else', was a little bit of an easier pill to swallow... you know, as long as it gets turned into a riparian area, I guess that's better than nothing." (KI #15)*



The idea of buyouts as an opportunity to design better communities was identified by key informants as a clear enabler of the program, highlighting the chance to break away from previous settlement patterns that resulted in increased risk. As one key informant said, “you’re sort of starting with a blank slate” (KI #17). A few interviewees noted appreciation in the broader community that taxpayer dollars would be used to create floodable open space with public amenities, creating a greater sense of value for the project. This supported a shift in perceptions about the program, from one of 'it helps a specific group' to 'it benefits the community as a whole' (KI # 1; KI #6; KI #10; KI #15; KI #17). This shift encouraged broad support for the program from the community, minimizing sentiments of resentment regarding the use of taxpayer dollars to benefit a small number of residents (KI #2; KI #6; KI #8; KI #10; KI #14-15; KI #27). Possible future amenities for the rezoned greenspace mentioned by interviewees included picnic areas, dry campground, fields, and ballparks.

#### 4.2.2.5 Elements for future successful risk reduction

Key informants mentioned elements to support successful risk reduction in the future in BC. Due to the timing of this research, some of these considerations may be included in the province’s impending modernized emergency management legislation (anticipated to be introduced by fall of 2022). Elements include increasing capacity and resources, increasing risk data and corresponding targets and standards, moving to a whole of society approach for risk reduction, human-centered planning, strategic communication and messaging, and increasing public education.

##### 4.2.2.5.1 Increased capacity & resources for proactive and reactive managed retreat

*“If you look at managed retreat as being... one tool in the adaptation toolbox... public investment is needed.” (KI #23)*

Most interviewees mentioned the need for increased capacity and resources specific to managed retreat, including funding and guidance for the development and implementation of retreat programs and related activities. Specifically, key informants highlight the need for funding for both proactive and reactive voluntary buyout programs, capacity to support application processes, and resources to explore relocation-related policy mechanisms. All levels of government were referenced, with a heavy focus on resources coming from federal and provincial governments.

A few interviewees highlighted the financial gap between expropriation and voluntary buyout programs as one place to start when determining the amount of funding a community might need to successfully implement a property buyout program. Regarding application processes, key informants mentioned the need for funds, guidance, and capacity, referencing in particular the technical work required to apply for large-scale grants. One federal key informant specifically mentioned the high administrative burden for accessing higher level government funding, which:

*“...further disincentivizes the municipalities and then provinces from putting forward small projects, because it's a pain to administer them... And then the ultimate loser is the small communities that keep getting flooded every year.” (KI #26)*

In addition to funding, most interviewees emphasized the need for more guidance regarding long-term risk reduction options, including managed retreat. Several key informants specifically suggested a provincial or federal team that could come in following a large-scale hazard event to provide information, guidance, data, and messaging regarding ways forward. As explained by one key informant,

*“I personally think that province, or some level of government, should have a dedicated group that that comes into disaster areas like this, and says, you know what, here's all the information [on] we can do. And here's what we think is best.” (KI #10)*

A few key informants noted that having such direction and support could also empower local leadership to champion retreat initiatives (KI #10; KI #15), and educate the local community accordingly (KI #25).

While program implementation is likely to continue to take place following a large hazard event, several interviewees noted that stakeholders, whether it be a flood recovery-specific team, various ministries in government, or local authorities, should work proactively, setting up appropriate programs and mechanisms in advance so they are ready when a hazard event occurs and can be implemented within the disaster window of opportunity. As explained by one federal key informant,

*“...nothing in government that's not pre-thought about moves in that three to six-month timeframe. So there's no choice. If you're going to do it at scale in governments, it has to be something that's done proactively, it can't reasonably be done in the moment... So that's the important takeaway... to engage in those conversations and to set up the mechanisms well*

*in advance of the flooding events, and then as the flooding events occur, be able to help people out right off the bat without having to create a new program.” (KI #26)*

Interviewees mentioned other mechanisms that could be explored proactively to support retreat programs when an implementation opportunity arises. These include: policy and land use planning tools such as land trades, moving houses and development credits; equity loans to support resilient construction on the flood fringe; research and policy regarding the co-benefits of creating or protecting floodable land; and public education to support retreat from high-risk areas (for more see section 5.1.1.5.6). Disaster Financial Assistance was mentioned by many key informants as a logical tool to support retreat from high-risk areas, though at present BC’s DFA is not currently configured to encourage or fund retreat. Interviewees listed possible adjustments to the program, including adding caps on the number of times a property can receive DFA, caps on total compensation (similar to Quebec’s DFA program), and education to ensure residents understand what is approvable through the program (KI #7-9; KI #10; KI #12-13; KI #15-16; KI #21; KI #27).

A few interview participants highlighted the usefulness of knowing not only what is possible in long-term risk reduction scenarios, but also what is not possible. One key informant noted that this information would have helped the Grand Forks staff decide against using resources and time to explore recovery options that were not viable, such as raising houses:

*“It would be much easier in some of these buy-out processes if local government was given a “How to respond to a flood or a natural disaster” from senior government so they [local governments] could learn early on what wouldn’t be available to them in the future.” (KI #6)*

Speaking more broadly to resource and capacity needs, several key informants highlighted the recent trend in BC to transfer more and more risk reduction responsibilities to local governments, and the need for higher orders of government to provide resources accordingly. As said in one interview,

*“The provincial government doesn’t know these communities as well as our local governments do. Local governments need to be the ones to deliver on obligations. But it’s gonna be a capacity issue, because the money and the expertise have to come from somewhere.” (KI #21)*

Interviewees noted the importance of this second step in BC, as many communities faced with high hazard risk are small and therefore lack resources and capacity to both prepare and implement risk-reduction measures at any scale in a timely manner (KI #6; KI #8; KI #11-12; KI #17-

#19; KI #20- 22; KI #24; KI #26-27). Many key informants highlighted increased risk due to climate change as a motivating factor to take expedient action (KI #6-12; KI # 14-17; KI #21; KI #23-25).

#### 4.2.2.5.2 Increased risk data with corresponding targets and standards

*“Good decisions need to start with good information.” (KI #19)*

Most interviewees mentioned data as an important tool in risk reduction. Specifically, key informants highlighted the need for more comprehensive and up-to-date floodplain and risk data, ideally collected to consistent standards and funded more readily. Additionally, many interviewees mentioned using this data to develop risk targets and building standards.

As mentioned in section 4.1.3, floodplain and risk mapping in BC is the responsibility of local governments, is optional, and is funded through a competitive granting program (British Columbia Real Estate Association & University of British Columbia Okanagan, 2021). Many interviewees echoed previously mentioned constraints associated with this approach. Key informants highlighted the risks associated with using old, outdated maps, the competitive nature of the grants available for mapping (which means not all communities can undergo mapping when they want to), as well as limited capacity at the municipal level. One key informant explained this, saying, “there’s varying capacity among local governments even to draft and issue an RFP and hire a qualified professional to do the mapping” (KI #24).

While a few interviewees mentioned that provincially funded floodplain and risk maps must meet provincial standards, many key informants highlighted the limited nature of these standards and the barrier this presents to addressing risk in BC. Mapping inconsistencies were linked to varying flood standards, assumptions, flood type (pluvial or fluvial), and datasets (KI #4; KI #7; KI #11; KI #19). One key informant commented:

*“Because it’s individual communities [doing the mapping], they may do it slightly differently [as compared to another community]. So it makes it a challenge if you wanted to roll it up on a regional or provincial basis, it’s not necessarily easy to do because it’s done to different standard. And what I mean by that is somebody might decide to do it based on a 200-year flood level, versus somebody else might take more of a risk-based approach.” (KI #19)*

Among the key informants who mentioned this lack of provincial direction, six linked the challenge to the fact that flood risk considerations are at the watershed level, not the community

level. As said by one key informant, “it’s not really appropriate for a lot of small municipalities to be doing that type of work at their own scale when they’re within their watershed that has risks that are shared among multiple partners” (KI #4). A few key informants suggested that the province run a dedicated mapping program using the funds already provided for mapping and risk assessment grants, to ensure consistency and avoid “oversubscribed” (KI #12) granting programs. In order to optimize consultant work, funding, and local capacity, a few interviewees suggested developing regionally aligned data projects supported at the provincial level. One key informant shared a best practice from the Okanagan:

*“The Okanagan Basin Water Board has facilitated that major update of their floodplain and geohazard and water quality. Everything right across the board in the Okanagan, and it’s three regional districts and a dozen or so municipalities all working together on that through one watershed organization.”* (KI #4)

In addition to developing comprehensive floodplain maps in BC, interviewees highlighted the importance of then using them to mitigate or adapt to risk via grey and green infrastructure, regulation and policy. One key informant laid out the ideal process of completing a flood risk assessment:

*“Identify what your hazards or what the risks are from those hazards. And then you go on to do flood mapping, ‘Okay, what is the extent the risk, where is the flood zone?’ And then you move on to flood mitigation planning, ‘Okay, based upon all this knowledge, how do we want to go about mitigating for that?’.”* (KI #18)

Key informants noted this third step to be a challenge for some local governments, citing both limited “how-to” knowledge bases and will to integrate the data into land use planning, public education, building standards, mitigation planning, and other policy. When asked about encouraging communities to address their risk, various options were mentioned. One interview described the “carrot” approach of the province, noting that BC prefers to, “get the supports there and try to nudge them [municipalities] in the direction that we want to go” (KI #19). A few key informants mentioned risk-based targets set at the federal or provincial level as one way to encourage local governments to address identified hazard risk in their communities. This approach was explained by one consultant:

*“So, saying, you know, by year X, we expect every community to have less than 0.1% chance of loss of life from real hazard events per capita, or whatever the target is... if we have those*

*risk-based targets then it's up to the local governments to make their local choices on how to best meet those targets... In some cases, that might mean not developing out the avalanche fan, for example. So "avoid" comes to the top. And in other areas it could be having better emergency response plans." (KI #25)*

When asked about providing the necessary funding and capacity to BC communities to meet such targets, one key informant very frankly commented on the high price tag:

*"My suspicion is that the province knows that if they start saying, okay, well, here's what you've got to do, then the local governments will turn around and say, well, it's going to cost this much, you're going to have to pay for that. And they're very worried about the implications of that." (KI #22)*

Regarding applications of floodplain mapping and risk data, several interviewees also brought up the importance of using current information to update floodplain construction standards and levels for new and renovated builds – especially in light of the changing climate. Interviewees noted that many regions in BC with significant flood risk are working with old data – in some cases close to 30 years old – raising questions appropriate flood construction levels and related bylaws (KI #5-6; KI #10; KI #12; KI #15-17; KI #24-25). One interview participant highlighted the risk:

*"Things have changed significantly... even our understanding of the magnitude of flood... I was working with a hydrologist from the Okanagan and he said, you need to take everything that you thought you knew about the watershed and how floods happen before the year 2000, and throw it away, because it's no longer relevant... if we say this is a 1-in-200 year flood, it's probably not anymore, it's probably a 1-in-20 year flood. And that's pretty scary when you think about the potential impact." (KI #12)*

Several interviewees commented on the usefulness of using floodplain data to develop a Canada-wide, publicly accessible, and consistent floodplain map. Key informants cited varying uses for such a resource, including public education, insurance purposes, real estate, and government planning. One interview noted that the Province of BC has undertaken some mapping themselves in order to contribute to a comprehensive province-wide floodplain map (KI #18). However, a few key informants highlighted barriers to developing such a map, including competing interests, the initial cost of flood mapping, and the on-going costs of maintenance and updates. As said by one interview participant from the insurance industry:

*"If [floodplain mapping] is not mandatory, the question becomes who ultimately should hold the purse strings for producing that mapping and maintaining it and updating it. And there's a lot of competing priorities with a number of different organizations." (KI # 11)*

#### 4.2.2.5.3 Whole of society approach

*“We’re trying to encourage a more whole holistic approach... the broader the suite of risks that we look at the more effective I think we’re going to be managing that risk.” (KI #24)*

The latent and manifest content analysis revealed that most key informants supported a systemic shift in addressing risk reduction in BC towards a ‘whole of society approach’ (see section 4.4.1). This concept is consistent with the UN Sendai Framework for Disaster Risk Reduction (UNISDR, 2015), which BC adopted in 2018 and will integrate into the forthcoming modernized emergency management legislation (Province of British Columbia, 2020a). One key informant described the approach as a “logical paradigm shift” (KI #21).

Several key informants echoed principles of the Sendai framework by highlighting the need for more hazard mitigation and ‘build back better’ options to stop cycles of flood and rebuild. One key informant described the shift as moving from disaster response-driven approaches to “disaster risk reduction across the whole map” (KI #21). Seven key informants mentioned the relationship between various levels of government and local authorities in addressing risk, as well as the need to share responsibility. This may include new sectors getting involved in risk reduction. One key informant explained what this might look like from a government perspective:

*“Some of the challenges we ran into earlier, with our response and recovery, were even just, for example, how siloed the different ministries were. So we’re trying to help agricultural producers, but when we talk to Minister of Ag, they don’t have a set of tools in the toolkit, because they don’t have any mandate historically to work with disaster risk. And so, a whole of society approach expands the breadth of that net, basically to say we all have this shared responsibility, let’s figure out how to do it more effectively.” (KI #21)*

Many key informants spoke to the interconnectedness of hazards and the logical need for interconnected risk reduction measures that look at a comprehensive picture. As put by one key informant, “it’s never worth just thinking about flooding” (KI #22). Interviewees mentioned a range of interconnected hazards and considerations, including wildfire, extreme heat, river flooding, coastal flooding, social vulnerability, habitat conservation, economic responsibility, and biodiversity loss. When speaking to addressing such challenges, interview participants mentioned needing an “integrated strategy” (KI #23) and “holistic” approach and vision (KI #23-24). One key informant described BC’s current attempts to address risk as a “multi-jurisdictional stagger forward” (KI #22).

Another key informant highlighted the historic trend of engineers implementing engineering solutions, mentioning the need for multi-disciplinary stakeholder teams to represent various perspectives:

*“If you have an engineering firm make a decision about what flood mitigation should be done, it’ll be an engineered solution, because that’s what they understand best. Whereas if you get planners involved, and then you have a multi stakeholder team of facilitators, biologists, and all of those things, you will almost certainly come out to a different solution.”* (KI #25)

Though interview participants overwhelmingly supported the Sendai Framework, they did mention some concerns and practicalities to be addressed. Several interviewees commented on the importance of broad education in a whole of society approach. As explained by one key informant:

*“[There is] a lot of focus on government, but with this all society approach, people – stakeholders – are woefully ignorant of the hazards and risks.... it would be helpful if people had... increased awareness when they’re making their decisions.”* (KI #19)

A few key informants explicitly mentioned the topic of equitable solutions, and the need to ensure decisions don’t discriminate against certain groups or individuals. One interview participant noted that there are always competing priorities, and ultimately a social or financial cost that someone or some group must pay (KI #11). Lastly, other key informants spoke explicitly to financial cost, and the reality of limited funds. As said in one interview, “we have to weigh what makes sense from an expenditure of public funds” (KI #19).

#### 4.2.2.5.4 Human-centered planning

*“You have to remember that home purchases are probably the biggest purchase that people make. You have all the memories and belongings in your home.”* (KI #10)

Several interviewees called for risk reduction measures that further consider human elements. To some key informants, this involved a “citizen-centric” approach that factors social costs into decision-making processes, in addition to typical financial or engineering analyses. As proposed by one provincial key informant:

*“I can think of a triple bottom line analysis, so not just looking at strictly the financials but ensuring that the environmental and social considerations are factored in in a transparent fashion.”* (KI #17)



No matter what risk reduction measures a community ultimately takes, many interviewees advocated for increased social and mental support for affected individuals, especially in cases of property buyout programs. This might involve social workers or other case workers that can support affected residents until they are relocated and settled. As one interview participant noted, “a big part of this is change management for people.” (KI #17). In addition to supports, key informants noted certain program aspects that can help show compassion and dignity towards affected individuals. These included transparency, face-to-face communication, detailed community engagement, and appropriate platforms to share grievances and “vent” (KI #15). A few interview participants advocated simply for decision-makers to remember and understand, “what it takes for people to get through something like this, to forever lose your home” (KI #15). As said by one interview, “it’s heartbreaking what people are having to go through” (KI #3).

#### 4.2.2.5.5 Strategic communication and messaging

*“None of these people enjoyed having five feet of water in their home or having to leave in the middle of the night worrying for their life. So, I think that the way that you build a successful program is in the communication and in the care.” (KI #15)*

When interview participants involved directly with the Grand Forks program were asked about the advice they would give communities implementing a property buyout program, , all mentioned the theme of communication as key. Overall, most key informants mentioned communication and messaging as a mechanism for a successful risk-reduction program. This primarily referenced communication between decision-makers and community members, with many interviewees also mentioning inter-governmental communication.

As was noted in the narrative account of the flood, the Grand Forks program struggled to communicate effectively with the community throughout the development and implementation of the buyout program. Several key informants highlighted the amount of hardship – to both the community and the buyout team – that could have been avoided with more thorough and strategic communication. While this finding was conclusive, related recommendations were mixed amongst key informants. Of the interview participants who spoke about communication, the majority advocated for sharing as much communication and clarity as possible, especially in periods of uncertainty (KI #8-9; KI #12; KI #15; KI #27). One key informant articulated this perspective, saying,

*"[Actors must be] willing to communicate the entire process to the people that you are changing their lives... even if mistakes are made, and even if people don't know what the next phase is, or even if they have to go back on what they said, to be open and upfront and honest at the first go I think would go a long way." (KI #15)*

Another key informant felt it important to give people the benefit of the doubt:

*"...too often or not, we try to spin stuff and try to parse things in a certain way, and I think if you just present the facts as you know them to be, with the correct caveats that, 'I know what I know today, but I don't know this', then I think people can handle that. I think that's the biggest thing that you can do, is communicate with people, what you know, what you don't know, what you're struggling with. And I think by and large people can get behind that and understand." (KI #9)*

According to key informants, this approach should be accurate and efficient, and would include sharing all the options regarding long term recovery, including what could and could not happen, explaining all options clearly, and sharing regular, consistent updates even if there was no news. Interviewees noted that taking this action can help manage expectations, show compassion, increase transparency, get ahead of theories or gossip, and support traumatized individuals.

On the other hand, a few key informants advocated for effective communication by only sharing confirmed information (KI #14; KI #27). For example, one interview participant said,

*"We needed to wait until we knew exactly what we were going to be able to do that... communities need to know, hundred percent what it is they're going to be able to do for a buyout area before they talk about it." (KI #14)*

Recommendations that were consistent among interview participants included developing a dedicated communications team right away, either internal to government or hired externally; working with case workers to ensure affected residents understand what they are being told; and choosing and sticking with a few communications methods. A few interview participants also noted that effective communication must find a way to be compassionate but honest. One interviewee noted that the sooner you communicate openly with affected residents, the sooner they can start to deal with the realities, whether good or bad:

*"It may or may not be good news to them, but the sooner that process starts the sooner they can work through it, just like the grieving process." (KI #9)*

However, another key informant explained the challenges of this, saying, “it's hard... because you're coming from a place of compassion, you want to tell everybody everything you know” (KI #14).

#### 4.2.2.5.6 Public education

*“We put a lot of weight on individuals and communities making risk-based decisions, and yet nobody is responsible for giving them the risk data on which to base those decisions.” KI #26*

Common in key informant interviews were opinions about the important role education plays in risk reduction, both individual, and as a society. Key informants noted that education regarding personal risk is an important step in both encouraging personal risk reduction activities, as well as pushing for a wide range of risk reduction measures “from the bottom up” (KI #26). Floodplain mapping and modelling are key components of such education, as was noted in section 5.1.5.2, as they can “educate and empower the individual Canadians to reduce their own risks” (KI #11). Interviewees mentioned a range of risk reduction measures that would benefit from increased public education, from small scale flood considerations on personal property (strategic location of drainage spouts, to large scale projects such as buyouts. Regarding buyout program, key informants noted the importance of educating communities about the benefits of such programs, including the opportunity to design better communities with modern knowledge of municipal planning and community development. Other opportunities mentioned include increased amenities in neighbourhoods that would benefit from additional green and recreational spaces, and co-benefits including possible increased biodiversity and emission sequestration through green infrastructure.

In addition to a broad need for improved risk education, interviewees also mentioned instances where education or disclosure might be mandated. One interview explained shared their perspective on the current situation:

*“You can only expect people to make risk informed decisions when you make them aware of the risks. So they bear this responsibility, and yet nobody is responsible for giving them the kind of information they would need to actually exert that responsibility. That seems like a fairly major collective action problem on the behalf of higher orders of government.” (KI #26).*

A few key informants mentioned property transactions as one instance where risk disclosure might be mandated, to ensure that individuals have a clear understanding of the risk they are taking on (KI #7; KI #12; KI #21). This was common issue in Grand Forks, as explained by one key informant:

*“We heard a lot of people that said, ‘Oh, well, we just bought this house in the spring, last year. And the realtor told us, it never flooded’... that would be a gap in my mind, in terms of the kind of regulation... to make sure that those people are buying a home with eyes wide open.” (KI # 21)*

Mandatory disclosure was also mentioned regarding the availability of overland flood insurance. This was another common issue in Grand Forks, with key informants noting that many property owners did not know that they could purchase appropriate insurance, or were reportedly misled by brokers, and were therefore ineligible for Disaster Financial Assistance. One key informant noted a misconception amongst jurisdictions that may worry about increasing liability by making risk data available, saying that law may in fact go the other way, to issues of willful blindness and negligence (KI #26).

### **4.3 Summary**

Climate change is increasing natural hazard risk in British Columbia. Though the Province has policy and land use planning tools that can be used to reduce flood risk, loose guidelines and a lack of floodplain and climate risk data has allowed development to continue in high-risk areas across the province. Additionally, flood governance has been downloaded to local governments who often lack the capacity and resources to effectively know and manage their risk. BC is currently in the process of developing strategies and legislation to address many of the gaps identified in recent disaster recovery and climate risk events, including the Grand Forks flood. This includes a BC Flood Strategy and modernization of the Emergency Management Act. Managed retreat has been identified as a non-structural adaptation option to address flood risk, though specific guidance and funding for BC communities interested in using this tool are lacking. Key informants identified a range of constraints and enablers relating to both the development and implementation of the Grand Forks property buyout program, as well as elements for future successful risk reduction in BC. Many of the findings in the thematic analysis of Grand Forks' buyout program apply to managed retreat measures broadly, especially in the Canadian context. In BC, communities wishing to develop a

property buyout programs face a range of constraints, many of which may only be overcome during the window of opportunity that opens following a large-scale natural hazard event such as the 2018 flood. In such situations, funding may be more accessible to pay for these expensive programs, and community members and politicians more amenable to agree to such a drastic measure. Though interviewees broadly supported a managed retreat approach to hazard risk reduction, they stressed the importance of transparent, human-centric implementation that is guided by high-quality data and public input. As climate change increases and highlights hazard risk in communities across BC, public investments at all levels of government are needed to make managed retreat a viable tool in the adaptation toolbox.

## **Chapter 5**

### **Discussion and Conclusions**

#### **5.1 Synthesis and discussion**

Climate change is likely to continue to increase the frequency and severity of floods in Canada. To increase flood resilience, managed retreat measures may be the right choice for some Canadian communities. This thesis aimed to increase understanding of property buyout programs as a form of managed retreat in Canada and as an element of future successful flood risk reduction measures. Along with a systematic review of managed retreat literature, the project offered a descriptive, exploratory, and actor-centred account of the property buyout program in Grand Forks, BC. Through semi-structured interviews with key informants, the case study research identified and explored constraints and enablers of the development and implementation of managed retreat programs in BC, along with other elements for successful flood risk reduction measures in similar communities. This section synthesizes the research and engages in discussion of the findings.

##### **5.1.1 Understanding property buyout programs as managed retreat in the Canadian context**

The first question of this research related to exploring the current understanding of property buyout programs as managed retreat in the Canadian context. A systematic literature review was used to explore considerations for designing and implementing effective property buyout programs to reduce flood risk (Objective #1), document experiences and program details of previously implemented programs in Canada and comparable jurisdictions (Objective #2), and identify gaps in research related to the design and implementation of more effective property buyout programs in Canada (Objective #3).

The review introduced managed retreat as a tool for urban resilience, and found interconnected themes and best practices broadly related to finance, social equity, emotional dimensions, timing, and participating agents, though the complex nature of buyout programs means these themes are inherently interconnected. Existing literature was found to explore technical aspects of property buyout programs, including financial compensation, program timing, additional

supports, and organizational capacity. Financial compensation was identified as an effective way to encourage uptake of a buyout program, especially if offers were calculated based on pre-flood FMV, dispensed quickly, and included compensation for other relocation costs. The literature strongly noted the importance of involving affected communities in decisions relating to a buyout program, including program suitability and the program's terms and details. Authors are broadly in agreement that effective and comprehensive consultation practices should include vulnerable communities and that context-specific buyout programs, whereby the program terms and details change for a given community, are generally best. Such an approach is in line with literature that posits public participation as the cornerstone of good planning (Jacobs, 1961). Buyout literature acknowledged that increased public participation encourages program uptake, but often requires capacity building: in order to design and implement a carefully consulted and timely buyout program, increased capacity is likely needed at all levels of government.

### **5.1.2 Exploring managed retreat to reduce flood risk in Grand Forks, BC**

The second research question of this project involved exploring how the City of Grand Forks used a government-sponsored managed retreat (property buyout) program to reduce flood risk, and identifying related constraints and enablers. Secondary literature and KI interviews were used to understand the decision-making process that led to Grand Forks buyout program and document its details (Objective #4). The flood event that led to the buyout program took place in May of 2018, and the Grand Forks City Council voted to move forward with the program in September of 2018. Soon after the flood, many affected property owners expressed support for a program that would allow them to move out of high-risk flood areas. It took close to one year to secure funding for the program, which was a cost-share agreement between the Government of Canada, Province of BC, and City of Grand Forks. The federal funds were provided through the Disaster Mitigation and Adaptation Fund, and required the bought-out land to be turned into green infrastructure such as floodable open space. Though the funding for the buyout program was initially insufficient to allow for pre-flood FMV offers on affected properties, the buyout program still saw an uptake of over 90% nine months after its launch. Interviewees attributed this success to the buyout offer formula, which was strategically designed by an external consultant to simultaneously encourage voluntary uptake and discourage the need for expropriation, as well as the unstated but generally-understood

mandatory nature of the program. The mixed public opinion to this approach is not surprising, considering literature that has found decreased support for buyout programs that have perceived coercive elements (Binder et al., 2019).

Though the City of Grand Forks had to issue a small number of expropriation notices, the buyout program was labelled a success by many interviewees, as it has resulted in the relocation of 100% of the at-risk property owners included in the buyouts. When compared again flood resilience literature, the program did indeed accomplish the goal of ensuring that future flooding is unlikely to result in disaster (Liao, 2012). The buyout zones will be turned into floodable open space by the City of Grand Forks, and then protected from future development through the use of land re-zoning, a newly developed land designation and floodplain land use by-law, and land use and policy changes that formalize the importance of floodplain functions, open space, and natural assets. In order to address other climate change risks, other concepts and practices related to resilience can be incorporated into the current OCP update.

Objective #5, to explore constraints and enablers of the development and subsequent implementation of the Grand Forks buyout program, was achieved using key informant interviews. In terms of the *development* of the program, key informants identified several constraints, including trauma experienced by the community, conflicting understanding of recovery goals between property owners and the government, limited risk data, funding restrictions, limited buyout program guidance, limited capacity at the local and regional government levels, flood risk governance constraints, unsuccessful communication between government and the local community, and conflicting municipal priorities. These findings relate to literature that highlights the difficulties of resilience-based solutions, in particular coordination across silos, managing trauma, and dominant framings of societal development (Vitale et al., 2022; Yumagulova & Vertinsky, 2019), of A small number of key enablers of program development were identified and grouped into the themes of windows of opportunity, resource mobilization at all levels of government, and localized decision-making, leadership, and supports. The findings reinforce literature that point to the significance of the disaster window of opportunity following a natural hazard event. During this time period, many of the constraints that would otherwise make it difficult to develop property buyout program can be overcome, including lack of funding or political will, and community hesitancy (Cheong, 2011; de



Koning et al., 2019; Noy, 2020; Song & Peng, 2017; Tanner & Árvai, 2018),. The KI interviews also highlighted the importance of local decision-making, leadership and support in making some adaptation options possible, especially in BC. These findings link strongly with buyout literature which encourages the involvement of local actors (Bronen & Chapin, 2013; Hayward, 2008; Kick et al., 2011; Kousky, 2014; E. Zavar & Fischer, 2021).

When it came to the *implementation* of the Grand Forks property buyout program, key constraints were identified, including the lengthy timeline to arrive at program implementation, property owners' place attachment, funding limitations, the diversity of program participant in terms of technical and personal characteristics, and the level of perceived coercion to accept a buyout offer. Regarding the lengthy timeline, the findings were consistent with literature on disaster windows of opportunity, which notes that individuals tend to forget about the scale and realities of risk if initiatives take too long to be implemented and life has returned to 'normal' (Braamskamp & Penning-Rowsell, 2018; D. de Vries, 2017; Tanner & Árvai, 2018), and that vulnerable individuals tend to be more negatively impacted by longer program timelines (Mach et al., 2019; Munoz & Tate, 2016; Weber & Moore, 2019). The findings relating to place attachment validate literature that notes the impact emotional dimensions have on relocation decision-making (Agyeman et al., 2009; Alexander & Ryan, 2012; de Koning et al., 2019; Seebauer & Winkler, 2020a).

Though the identified constraints made implementation of the buyout program more difficult, it was ultimately completed thanks to a combination of increased risk perception and decreased risk tolerance in the community, expedient expertise to lead program implementation, strategic buyout offer formulation, and the decision to use the bought-out land for green infrastructure that benefited the community. Though the Grand Forks community had experienced flooding previously, the findings point to a threshold of risk, over which many property owners no longer wanted to stay, regardless of place attachment (Agyeman et al., 2009; Alexander & Ryan, 2012; de Koning et al., 2019; Seebauer & Winkler, 2020a).

Key informant interviews and secondary literature were also used to address Objective #6, to map policy and planning tools relevant to the Grand Forks program (Objective #4). I found that there are a range of tools to reduce flood risk in BC, primarily at the local planning level. The Province of BC provides some guidance regarding flood risk reduction and management, but actions are

generally downloaded to local governments. While this allows for communities to make their own context-specific decisions to address their flood risk, limited resources, flood risk data, and guidance often means these communities lack the understanding and capacity to address the risk, and so development often continues in high-risk areas across the Province. BC is currently in the process of modernizing their Emergency Management Act and developing a BC Flood Strategy to address many of the gaps and insufficiencies highlighted by recent disaster recovery and climate risk events, including the Grand Forks flood. For communities that are interested in managed retreat as a flood risk adaptation tool, ad hoc funding and guidance can be found, but there remains little formalized support from either the provincial or federal governments.

Lastly, the case study research aimed to identify elements for successful risk reduction measures in similar communities (Objective #7). These elements included increasing capacity and resources for risk reduction measures, increasing the availability of risk data and corresponding targets and standards, moving to a whole-of-society approach for risk reduction, human-centred planning, strategic communication and messaging regarding risk reduction measures, and increasing public education and understanding of risk and risk reduction measures. These findings were reflected closely in the literature review, which identified organizational involvement/capacity and public participation in decision making as key mechanisms for successful program, as well in concepts of resilience that encourage systems approaches and considerations for reflective planning practices. Interviewees expressed hope that some of these elements may be formally addressed in BC's impending modernized emergency management legislation, which is slated to be introduced in the fall of 2022.

## **5.2 Implications and recommendations**

### **5.2.1 Implications for academia**

The scholarly contributions of this research relate to corroborating and expanding on understandings of managed retreat, resilience, and flood planning, including best practices, and program considerations. Empirical research on managed retreat programs in Canada is limited due to the emerging nature of retreat approaches to reduce flood risk in Canadian communities, and the lack of ongoing funding and support programs for retreat. This study has expanded the empirical

research on property buyout programs in Canada by documenting and exploring a recent, novel, and generally successful instance of managed retreat in BC. It has established a number of themes which will continue to build on the theoretical and empirical base of managed retreat literature (see section 5.3, *Avenues for future research*).

This research project made unique contributions to academia on several fronts. First, the systematic scoping literature review qualitatively synthesized literature on property buyout programs within the larger context of managed retreat. As little managed retreat research has focused on Canada, the review explored literature relevant for the Canadian context. It provided an overview of key messages and themes, including a non-comprehensive survey of implemented property buyout programs in relevant jurisdictions. At the time of writing, no Canadian-focused scoping review on property buyout programs had been published in a peer-reviewed journal.

Other unique contributions came from the qualitative case study research. While buyout programs to reduce flood risk have taken place across Canada, the Grand Forks program is the first on record in the Province of BC. More broadly, little research – especially in the Canadian context – has explored a mandatory property buyout program set up as voluntary. Likewise, few managed retreat/buyout programs have attempted to use post-flood FMV as a basis for offers, leading to interesting insights into homeowner considerations when accepting a buyout offer, buyout program offer formulation, and other program elements.

### **5.2.2 Implications and recommendations for communities/municipalities**

This research resulted in a range of information and findings relevant for communities – especially Canadian communities – considering adaptation options such as buyouts to address their flood risk. First, it provides an empirical overview of a managed retreat program, clarifying the concept and detailing the decision-making process and program parameters. More significantly, it identified a range of constraints and enablers for both the development and implementation of a managed retreat property buyout program, as well as elements for future successful risk reduction in BC. While every community and hazard are different, a number of recommendations have been developed from the Grand Forks experience for communities interested in reducing flood risk now or in the future, whether through managed retreat or other risk reduction measures.

**Recommendation #1: Identify flood risk by updating floodplain and risk mapping.**

As noted in the key informant interviews, good decisions are guided by data. In order to ensure an accurate understanding of flood risk, it is important that communities engage in high quality floodplain and risk mapping. These data can then be used to manage development in high-risk areas by updating flood construction levels, floodplain bylaws, and other planning and policy tools as applicable. They can also be used to develop appropriate and localized risk reduction plans and activities.

**Recommendation #2: Engage in public risk education.**

This research highlighted the lack of awareness and understanding communities have of their level of flood risk, and what can be done about it. Carrying out education and consultation with at-risk communities will help them understand their risk, what they can do about it, and what governments can do about this risk, and this will initiate a dialogue regarding perspectives and preferences for long-term risk reduction options. Such education could be integrated into community plans or other strategies, and done in partnership with other community organizations with similar goals or target audiences.

**Recommendation #3: Advocate for resources and policy changes from higher levels of government and industry.**

The Grand Forks case highlighted the policy limitations and lack of resources available to local governments interested in reducing risk through the use of managed retreat. Additional funding, guidance, and human resources would all have supported a smoother process developing and implementing the Grand Forks buyout program, as well as policy and insurance rules that facilitated retreat over rebuilding. It is important that local governments advocate and push for more resources and policy changes from provincial government, federal government, and insurance companies in order to make managed retreat a financially viable and practical adaptation option.

**Recommendation #4: Proactively develop a risk reduction plan.**

As was demonstrated in this research, timing can be crucial when moving forward with drastic and expensive risk reduction measures such as managed retreat. For many Canadian communities, leveraging a disaster window of opportunity or other such strategic circumstance may be the only way to overcome the constraints that come with managed retreat activities such as property buyouts, as often, more funding becomes available and there is political and community will for significant change. Therefore, in cases where local communities decide that such activities are their best option to reduce risk, it is important to have a plan ready to implement in the event of an appropriate window of opportunity. Such a plan might proactively engage residents in consultation, include buyout zone delineation based on recent flood risk data, identify possible consultants and other relevant expertise to support program development and implementation, develop a communication strategy, conduct research and consultation regarding local funding options, and explore in-kind compensation options.

**Recommendation #5: Proactively develop or enable out-of-the-box planning and policy tools.**

One key finding from the Grand Forks case study was the need for creative planning and policy tools to support and enable managed retreat activities. In particular, interviewees commented on the need for more in-kind compensation options, many of which were considered cost-prohibitive or simply not developed in the Grand Forks case. In order to facilitate programs such as property buyouts, local governments can proactively explore, develop, and enable in-kind planning and policy options that could be used as needed, including land swaps, development credits, and equity loans.

**Recommendation #6: Facilitate resilience-based planning practices.**

This research demonstrated the increased uncertainty regarding flood risk across BC. In order to address this uncertainty, municipalities can facilitate resilience-based planning practices by integrating adaptation considerations into planning tools and policy. This can include high level guidelines and strategies in RGS's and OCPs, as well as specific applications of zoning bylaws (e.g. for hazardous lands), risk-sensitive setbacks, DPA's (e.g. for hazardous conditions or to protect natural water courses), restrictive covenant measures, and building permitting (e.g. tie floodplain permits to a land covenant).

**Recommendation #7: Engage in capacity building around trauma-sensitive and reflective planning practices.**

The Grand Forks case highlighted the impacts of trauma on individuals and communities. Appropriate capacity building and training can support planning practitioners to engage in reflective planning practices that are sensitive to both the impacts of trauma on individuals and the risk of re-traumatization. This can include education around types of trauma, physical and emotional symptoms and impacts, trauma-sensitive communication and engagement, and building self-reflective capacity.

**5.2.3 Implications and recommendations for higher levels of government**

Responding to and recovering from floods and other climate risk events are increasing financial and human costs in Canada. In order to address increased risk and cost to Canadians' health, livelihoods, and essential infrastructure, provincial and federal governments have a vested interest in ensuring a wide range of successful risk reduction measures. In some cases, this may include managed retreat approaches. This research highlighted the important role higher levels of government play in successful risk reduction at the local level, including allocating funding, providing guidance, and determining the powers and jurisdiction of local governments. Accordingly, gaps in proactive and reactive risk reduction policy, programming, and governance at the provincial and federal level will affect on-the-ground risk reduction measures. I have developed a series of recommendations to address these gaps and better support a wide range of adaptation tools for Canadian communities, especially those that can be used proactively.

**Recommendation #1: Allocate funds for both proactive and reactive managed retreat programs.**

Property buyout programs are expensive, and local governments have limited revenue streams. In order to enable managed retreat as an adaptation tool, dedicated funding is needed for both proactive and reactive managed retreat programs.

**Recommendation #2: Develop managed retreat resources and guidance**

Guidance and resources for managed retreat activities such as property buyouts are necessary to enable local communities to explore such programs. Guidance could pertain to: best practices

for public consultation and transparency, social supports for program participants, trauma-sensitive planning and public engagement practices, funding options from all levels of government and ways to access them, relevant policy and planning tools, and considerations when designing buyout programs. Interviewees noted the benefits of a team that could support communities considering or moving ahead with proactive or reactive managed retreat programs.

**Recommendation #3: Consider strategic partnerships to develop best practices for managed retreat in Canada.**

As was demonstrated by this research, property buyout programs are complex, and their considerations inherently connected. In order to efficiently develop thoughtful, comprehensive, and data-based best practices for retreat activities, provincial and federal governments can explore partnerships with organizations and individuals exploring various facets of managed retreat. Possible partnerships include academia, industry (e.g. consulting and insurance), and non-governmental organizations with expertise in real estate, insurance, land development, social work, and flood risk reduction.

**Recommendation #4: Revise DFA and DFAA to encourage a retreat mindset.**

Currently, BC's DFA arrangement does not encourage or fund retreat from high-risk areas. Adjusting DFA to include compensation caps and limits to the number of times a property can receive DFA would encourage a retreat mindset, and help avoid repeat rebuilding. In cases of extreme damage, a DFA could be used to help fund retreat as opposed to rebuilding. Such changes can also be done at the federal government level through DFAA guidelines for eligible expenses.

**Recommendation #5: Formally require, prioritize, or encourage risk reduction measures.**

Risk reduction measures can be emotional for communities and highly political – especially when they are as drastic as a property buyout program. In order to support activities that effectively reduce the flood risk faced by Canadian communities, provincial and federal governments can formally require, prioritize, or encourage such activities in high level strategies, legislation, political agendas, communications, and recommendations. This can

include measures such as risk targets for local communities and regions to encourage or require context-specific risk reduction approaches, and 'build back better' requirements in building acts and codes.

**Recommendation #6: Provide additional resources for local flood and risk data.**

As was noted through this research, many Canadian communities do not know the degree or locations of their flood risk. Additional funding is needed to comprehensively facilitate updated flood plain and risk mapping across the country. This could be provided through existing arrangements or grants, or the federal government could revisit the previous model of provincial-federal partnerships, most of which expired between the 1990s and early 2000s.

### **5.3 Avenues for future research**

This thesis explored managed retreat as a risk reduction and climate change adaptation strategy within the Canadian context, providing considerations and insight into the design and implementation of property buyout programs as managed retreat. Such retreat activities are still limited and novel in Canada, and therefore there are opportunities for research on many of their aspects, including their effectiveness, short and long-term affects, their relationship with government agendas and responsibilities, and explorations of them as tool for urban resilience.

Both the systematic review and qualitative interviews highlighted coercion as an issue within managed retreat programs. Though the literature conclusively recommended voluntary versus mandatory retreat, the Grand Forks case demonstrated that naming a program "voluntary" does not ensure a lack of coercion. Therefore, further research is needed to define and identify coercion within managed retreat programs, and property buyouts in particular, develop best practices to reduce coercive actions and program elements, and evaluate the short and long-term affects of coercion on bought-out residents. Some research has explored possible negative affects of voluntary programs, namely that partial uptake of a program that can result in a checkerboard community that is still at risk and also expensive for a municipality to maintain. Knowing this is a possibility, research that undertakes financial, social, and psychological cost-benefit analyses of mandatory programs would help communities decide on the best level of coercion to employ, based on their goals. As was demonstrated through the key informant interviews, many interviewees saw the



Grand Forks program as a success in spite of its coerciveness, as it removed people and property entirely from the at-risk areas.

Another best practice identified in managed retreat literature is to base financial buyout offers on pre-flood FMV. While I explored the reasoning behind Grand Fork's use of post-flood FMV numbers to develop financial offers, the effects of this decision on the bought-out residents remains to be seen. Research regarding the social and financial well-being of these residents, overall quality of life, and location would help to further understanding of buyout program effects and to provide guidance for future programs.

Many of the recommendations from the key informant interviews relate to communication, both in terms of proactively communicating flood risk to residents, and communicating with residents following a hazard event, including communication surrounding buyout programs. In the first instance, research regarding innovative and best practices to communicate with residents about their flood risk would extend understandings of risk perception, communication strategies, and place attachment. It would also help communities looking to engage in this communication and education with their residents, and could encourage support for managed retreat activities. To the second point, there are opportunities for research that explores both how individuals communicate and process information following a traumatic event, as well as the best communication practices in such a situation. Such research would further theoretical understandings of the affects of hazard events on individuals and communities, and empirically support communities that experience a hazard event. Developing best practices for communication in these situations would be invaluable for communities that engage in risk reduction measures in the post-hazard window of opportunity.

More broadly, though some of the existing research has explored Return on Investment (ROI) of managed retreat, cost-benefit analyses remain non-comprehensive, and the real costs of non-adaptation thus remain unseen and unknown. In the case of Grand Forks, the ROI calculation which helped to justify the Flood Mitigation Program did not consider loss of life, ecological damage, lost income, lost business revenue, social stress, or damage to infrastructure. Further research that quantifies such considerations would help to understand the full costs of climate change and hazard events, and might further justify adaptation activities such as managed retreat which are currently seen as 'too expensive' by municipalities.

Lastly, more empirical research on managed retreat – especially in the Canadian context – would further both theoretical understandings of managed retreat and urban resilience, and best practices for program implementation. This is the case for both proactive and reactive programs, as both are likely to occur. As climate risks grow, it will be important for all manner of adaptation options to be well-researched and explored so that government at all levels can move forward with informed decision and actions.

#### **5.4 Concluding remarks**

Climatic and hazard risk events are growing more frequent and extreme, and their effects more and more devastating. The increased risk to physical, psychological, social, and economic systems continues to grow, and recent hazard events in Canada have resulted in unprecedented recovery costs. As climate impacts are expected to intensify in unexpected and unpredictable ways, it is becoming more and more important to address risk across the whole of our society, and take the necessary actions to protect our communities. In some cases, the best course of action is to consider resilience-based actions such as removing people and property from high-risk areas. While managed retreat is increasingly considered a serious option for disaster risk reduction, it remains unpopular and unrealistic in many communities. It is therefore useful to explore the circumstances under which such a program has been developed and then implemented, as well its constraints and enablers. The Grand Forks property buyout program offers important insights for those interested in undertaking or supporting managed retreat programs in BC generally, and property buyout programs specifically. It also offers insight into resilience planning more broadly, including risk reduction options in planning and policy practice and considerations for reflective planning practice. This research contributes to bodies of literature relating to climate adaptation, managed retreat, resilience, planning practice, and flood planning. As more communities explore options to reduce their flood risk, research on and guidance derived from managed retreat cases will help to hone this tool for use in the Canadian adaptation toolbox.

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## Appendix A: Interview Recruitment Letter

[Date]

Dear [participant name],

I am contacting you in the hopes that you will agree to a brief interview related to our research project entitled “Home buyout programs and post-flood decisions to retreat: creating resilience in a changing climate”. This project is funded by the University of Waterloo/The Social Sciences and Humanities Research Council Robert Harding/Lois Claxton Humanities and Social Sciences Endowment. This project is also carried out under the auspices of the Department of Geography & Environmental Management at the University of Waterloo, Ontario.

The question guiding the project is:

“To what extent and how effectively are government-sponsored managed retreat (buyout) policies leading to a reduction in flood risk?”

We expect our research will help to meet the following objectives:

1. Understand the decision-making process leading to property buyout programs.
2. Understand the organizations involved and their roles in property buyout programs.
3. Determine the drivers and results of land use change attempts in flood-prone areas.
4. Offer recommendations about how to strengthen property buyout/managed retreat programs for flood risk reduction and climate change resilience.

The team that has been assembled for this research includes:

- Dr. Doberstein (Team Lead/PI, Associate Professor, University of Waterloo Geography and Environmental Management): [bdoberst@uwaterloo.ca](mailto:bdoberst@uwaterloo.ca)
- Ms. Melissa le Geyt (Master’s student, University of Waterloo School of Planning): [mjlegeyt@uwaterloo.ca](mailto:mjlegeyt@uwaterloo.ca)

We are contacting you in order to invite you to participate in a short semi-structured interview of approximately 30-45 minutes in length, to be conducted over the phone or online using MS Teams. Examples of themes we may explore in the interview include the following:

- Awareness of and details about home buyout or flood damage compensation programs that might lead to non-rebuilding in case study sites
- Factors that influence homeowners when considering buyouts/ non-rebuilding
- Opinions about programs needed in the future/under future climate change scenarios

If you feel that you are not the most appropriate person to participate in this interview, feel free to forward this email to a more appropriate person. With your permission, the interview will be audio recorded to facilitate accurate collection of data, and later transcribed for analysis. After the interview has been completed, you may request a copy of the transcript to give you an opportunity to confirm the accuracy of our transcription, and to add or clarify any points that you wish. You may decline to have



your interview recorded if you wish.

At the end of this project, our research team will generate a 10-12 page summary research report consisting of interview opinions, overall results and our conclusions. If you would like a copy of this report, please let us know either during the interview or via email.

We would like to assure your organization that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. If you have questions for the Committee contact the Office of Research Ethics, at 1-519-888-4567 ext. 36005 or [ore-ceo@uwaterloo.ca](mailto:ore-ceo@uwaterloo.ca).

If you are interested in participating you are invited to contact Melissa Le Geyt, or me, Brent Doberstein, to discuss participation in further detail. If you would like additional information to assist you in reaching a decision about your participation, please contact me at [519-888-4567 x.33384] or by email at [bdoberst@uwaterloo.ca](mailto:bdoberst@uwaterloo.ca)

We hope that the results of our research study will be beneficial to the scientific and scholarly communities, and flood recovery agencies. We very much look forward to speaking with you and thank you in advance for your assistance with this project.

Yours sincerely,

Dr. Brent Doberstein, Associate Professor  
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## Appendix B: Interview Information Letter

[Date]

Dear [participant name],

I previously contacted you about possibly participating in research I and a student team are conducting on home buyouts in flooded communities. This follow up letter is an invitation to participate in this research. I would like to provide you with more information about this project and what your involvement would entail if you decide to take part.

The research is entitled “Home buyout programs and post-flood decisions to retreat: creating resilience in a changing climate”. This project is funded by the UW/SSHRC Robert Harding/Lois Claxton Humanities and Social Sciences Endowment. This project is also carried out under the auspices of the Department of Geography & Environmental Management at the University of Waterloo, Ontario.

**Project description:** ‘Managed retreat’ (i.e. buying out and demolishing flood-damaged homes, and then disallowing reconstruction in the area) is gaining considerable attention as a component of flood risk reduction and climate change adaptation/resilience. In a flooding context, the objective of managed retreat is to reduce the exposure of people and assets to flooding, by retreating from these threats in a planned fashion. Longer term, retreat from hazards is seen as a promising means by which to build resilience to the changing hazards expected under climate change.

Managed retreat was an important component of post-2017 National Capital Region flood recovery in multiple Quebec communities near the Ottawa River. Homes in several communities were demolished after owners accepted compensation (e.g. informal Quebec Government compensation, Red Cross and contents insurance compensation) to move to a safer location.

Our research aims to explore to what extent and how effectively government-sponsored managed retreat (buyout) policies reduce flood risk in Canadian communities. We will aim to understand the decision-making process leading to property buyout programs, trace timelines for homeowner compensation post flooding, explore changes in land rezoning related to flooding, and identify possible barriers. We hope to offer recommendations about how to strengthen home buyout/managed retreat programs for flood risk reduction and climate change resilience.

Your participation in this study would entail a short semi-structured interview of approximately 30-45 minutes in length, to be conducted over the phone or virtually using MS Teams or Zoom. Examples of themes we may explore in the interview include the following:

- Awareness of and details about home buyout or flood damage compensation programs that might lead to non-rebuilding in case study sites;

- Awareness of and details about land rezoning and post flood and factors that influence rezoning;
- Factors that influence homeowners when considering buyouts/ non-rebuilding; and
- Opinions about programs needed in the future/under future climate change scenarios.

Participation in this study is voluntary, and you may decline to answer any of the interview questions if you so wish by requesting to skip the question, or end the interview session at any time by communicating this decision to the researcher. With your permission, the interview will be audio recorded to facilitate accurate collection of data, and later transcribed for analysis. After the interview has been completed, you may request a copy of the transcript to give you an opportunity to confirm the accuracy of our transcription, and to add or clarify any points that you wish. You may decline to have your interview recorded if you wish.

Identifying information will be removed from the data that is collected and stored separately. If you do not wish to be identified, your participation will be considered confidential and neither your name nor your organization's name will appear in any paper or publication resulting from this study. However, with your permission, quotations from your interview may be used and you will only be referenced by a coded interviewee number and whether you belong to a public, private or local resident group (e.g. "Interviewee #5, Community Representative"). Alternatively, you may choose to be identified by name and have your quotations directly attributed to you and your organization in study results."

Collected data will be securely stored in a locked office and on a password protected server for a minimum of 7 years. You can withdraw your consent and request that your data be removed from the study by contacting the researchers within this time period. Please note that it will not be possible to withdraw your consent once the results have been submitted for publication. There are no known or anticipated risks to participants in this study. All data will be destroyed according to University of Waterloo policy.

The team that has been assembled for this research includes:

- Dr. Doberstein (Team Lead/PI, Associate Professor, University of Waterloo Geography and Environmental Management): [bdoberst@uwaterloo.ca](mailto:bdoberst@uwaterloo.ca)
- Ms. Melissa le Geyt (Master's student, University of Waterloo School of Planning): [mjlegeyt@uwaterloo.ca](mailto:mjlegeyt@uwaterloo.ca)

We would like to assure your organization that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE #41934). If you have questions for the Committee contact the Office of Research Ethics, at 1-519-888-4567 ext. 36005 or [ore-ceo@uwaterloo.ca](mailto:ore-ceo@uwaterloo.ca).

Participation in this study may not provide any personal benefit to you. However, the results of this study may help to better inform the scientific and scholarly communities, and flood recovery agencies. We very much look forward to speaking with you and thank you in advance for your assistance with this project.

Yours sincerely,

Dr. Brent Doberstein, Associate Professor  
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## Appendix C: Interview Consent Form

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### CONSENT FORM

*By signing this consent form, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.*

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I have read the information presented in the information letter about a study being conducted by Dr. Brent Doberstein and Melissa Le Geyt of the Department of Geography at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

I am aware that I have the option of allowing my interview to be audio recorded to ensure an accurate recording of my responses.

I am also aware that with my permission, excerpts from the interview may be included in papers and publications with the understanding that the quotations will be anonymous unless I explicitly agree to be identified by name.

I was informed that I may withdraw my consent without penalty by advising the researcher.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#41934). If you have questions for the Committee contact the Office of Research Ethics, at 1-519-888-4567 ext. 36005 or [ore-ceo@uwaterloo.ca](mailto:ore-ceo@uwaterloo.ca).

For all other questions contact Dr. Brent Doberstein at [bdoberst@uwaterloo.ca](mailto:bdoberst@uwaterloo.ca).

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

YES  NO

I agree to have my interview audio recorded.

YES  NO

I agree to the use of anonymous quotations in any paper or publication resulting from this research (e.g. "Interviewee #5, Community Representative"). (NOTE: if you prefer to have your name associated with your quotations please check "NO" here, and then check "Yes" in the question below).

YES  NO

I agree to the use of quotations directly attributed to me and my organization in any paper or publication resulting from this research.

YES  NO

Participant Name: \_\_\_\_\_ (Please print)

Participant Signature: \_\_\_\_\_

Witness Name: \_\_\_\_\_ (Please print)

Witness Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## Appendix D: Interview Guide

### Interview Guide:

*“Home buyout programs and post-flood decisions to retreat: creating resilience in a changing climate”*

#### **Introduction**

1. Can you please share your name, organization, and your role, and a little about what your organization does?
  - Organization/department’s role in/relationship to flood retreat
  - Mandate
  - Role in/relation to property buyout programs?

#### **Context of flood recovery and property buyouts**

2. Can you tell me about any disaster recovery or flood compensation programs that exist in BC/Canada?
  - I. Information about existing programs
  - II. Overarching policy framework
3. Can you explain your understanding of home buyouts and flood compensation programs?
4. What organizations are involved in property buyouts in BC/Canada and what are their roles?
5. What are the challenges & benefits of a property buyout program?
6. What were the main considerations when weighing structural measures versus buyouts to reduce food risk?
7. From your perspective, what were the main factors that pushed a community to consider a property buyout program?
8. From your perspective, what factors influenced property owners when considering a buyout offer?
  - I. Length of time in home/community
  - II. Disaster declaration (i.e. some programs only kick in once a disaster has been declared by a Provincial or Federal authority)
  - III. Existence of/exposure to flood buyout programs

- IV. Behaviour of others in the community
  - V. Funds available for reconstruction vs. buyout
  - VI. Risk perception
  - VII. Previous experience with flooding/flood damages
  - VIII. Other
9. What are the main considerations when designing a property buyout program?
- IX. Compensation (property valuation, etc.)
  - X. Level of coercion
  - XI. Timelines
  - XII. Funding bodies
  - XIII. Types of properties
  - XIV. Land use
  - XV. Organizations involved
10. What costs are involved in buyouts and who should pay for them?
11. What typically happens to land uses in the flood/buyout zones?
- XVI. Will the bought-out areas be re-zoned? If so, for what use?
  - XVII. What is the process for rezoning in the area?
  - XVIII. What factors influence land rezoning in the area?
    - i. Stakeholders
    - ii. Timelines, etc.
  - XIX. What were the previous long-term use plans for the area?
  - XX. What policies/plans/ministries influence land use in flooded areas?
12. Are there any flood events that you know of that chose not to use a property buyout program?
- XXI. Why do you think that is?
13. Do you think voluntary property buyout programs are an effective way to reduce flood risk for property owners?
- XXII. Thoughts on mandatory programs

### **Case Study Details**

14. Can you tell me about the Grand Forks property buyout program?
- XXIII. Program details
  - XXIV. Organizations/departments involved



- XXV. Timing of program
- XXVI. Eligibility
- XXVII. Compensation
- XXVIII. Uptake
- XXIX. Other supports
- XXX. Voluntary? Incentives to encourage participation
- XXXI. Perception of program
- XXXII. Public engagement
- XXXIII. Effective? Why or why not?
- XXXIV. Land use changes

15. Is there anything you think should have been done differently?

**Future success**

16. What other options do property owners have to protect themselves and their property from increased flood risk?

- XXXV. What would you like to see in the future?

17. What programs are needed to adapt to future flooding scenarios?

- XXXVI. Themes
- XXXVII. Organizations involved

**Conclusion**

18. Anything you'd like to add, or anything I have missed that you think would be important?

- XXXVIII. Documents that would aid the research
- XXXIX. Can I follow up later with questions if needed?