Taking Complexity Seriously in International Law: A View from the Arctic

by

Tahnee Lisa Prior

A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Doctor of Philosophy
in
Global Governance

Waterloo, Ontario, Canada, 2020

Examining Committee Membership

The following served on the Examining Committee for this thesis. The decision of the Examining Committee is by majority vote.

External Examiner	Dr. Klaus Dodds Professor Department of Geography Royal Holloway University of London +44 1784 443580 K.dodds@rhul.ac.uk
Supervisor(s)	Dr. Neil Craik Professor Balsillie School of International Affairs; and School of Environment, Enterprise and Development 226.772.3022 ncraik@uwaterloo.ca Dr. Thomas Homer-Dixon Professor Faculty of Environment University of Waterloo tad@homerdixon.com
Internal Member	Dr. Simon Dalby Professor Balsillie School of International Affairs; and Geography & Environmental Studies Wilfrid Laurier University (226) 772-3150 sdalby@gmail.com
Internal-external Member	Dr. Dan McCarthy Associate Professor School of Environment, Resources, and Sustainability University of Waterloo 519-888-4567 ext. 43065 dmccarth@uwaterloo.ca
Other Member(s)	Dr. Whitney Lackenbauer Associate Professor & Canada Research Chair Department of History Trent University 705 748 1011 ext. 7390 pwhitneylackenbauer@trentu.ca

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

Over the past three decades, the Arctic system has undergone significant, large-scale transformational change – a shift which has profoundly altered human-environment interactions and feedbacks within the system. What was once described as a relatively closed area, both in terms of its material and social reality, has become increasingly open and complex.

I am interested in the capacity of international law, as an instrument of governance, to manage this rapidly changing Arctic system. More specifically, this project seeks to answer a central research question: Is the emerging material reality of the Arctic system fundamentally incommensurable with the functional requirements of the law that seeks to govern it? I conclude that that is the case, and, in the conclusion of this dissertation, I argue that a complex systems ontology might be able to help us identify how to build a better governance structure for the Arctic.

Contrary to existing scholarship, which often defines the Arctic based on geography or issue area, I begin by drawing on a complex systems ontology to introduce what we seek to manage: an increasingly open and tightly coupled Arctic system. This is followed by an overview of current governance approaches and their response to the nature of change in the Arctic system, where I draw on three case studies to point to a disjuncture between the emerging material and social reality of the Arctic system and current governance responses, which can give rise to governance failure. I argue that a significant part of the problem is an insistence on law and formality as one of the primary responses.

Then, I highlight how the theoretical underpinnings of current approaches, specifically legal positivism, make it difficult for us to envision alternative methods of Arctic environmental governance which can account for complexity and change. I argue that there is a fundamental incommensurability between the demands of legal positivism – defined by characteristics like predictability, closed boundaries, and formal legal rationality – and the demands of the complex systems it seeks to govern – defined by characteristics like thermodynamic openness, heightened non-linearity, and connectivity. In search of an alternative theoretical underpinning, I turn to non-positivist legal theories including research on Transnational Legal Process and Interactional Legal Theory and find that both theories are insufficient because they give little focus to the co-evolution of various systems including the human-environment nexus.

Recognizing a shortfall between the rapidly rising need for legal innovation and its inadequate supply in both current Arctic environmental governance and Arctic scholarship alike, I point to research in Earth systems science, on social-ecological systems, and Earth system governance which increasingly draws on a complex systems ontology to think about the ways in which different components of a system fit together, interact with one another, and respond to change. More precisely, I make note of a call to action for the juridical sciences to embrace a complex system ontology and *vice versa*.

Finally, having diagnosed the problem and seeking to respond to this call to action, I outline a prospective research agenda for a complex systems ontology and Arctic environmental governance. Specifically, I propose a set of three complexity tools – the WIT framework, the energy landscape metaphor, and the law of requisite variety – which can help us re-imagine the Arctic system and explore the role of international law in anticipating and responding to critical transitions therein.

Acknowledgements

I have come to recognize that a doctoral journey is best not undertaken alone. So, I feel particularly fortunate to have had supervisors, colleagues, friends, and family who have cheered me on along the way. The paragraphs below will do no justice to the encouragement and love shown to me.

A sincere thank you to my external examiners, Dr. Klaus Dodds and Dr. Dan McCarthy for their thoughtful questions and feedback during my dissertation defence.

My deepest thank you to my supervisors, Dr. Neil Craik and Dr. Thomas Homer-Dixon, who gave significant time and energy to what felt like a never-ending conversation on law and complexity, and whose insights will surely inspire work for years to come.

Neil has shaped my academic work since he first became the supervisor of my Major Research Project, in pursuit of my Masters in Global Governance, in 2011. Over the past decade, he has significantly contributed to my understanding of law, so much so that I was enticed to spend my postdoctoral research at a law school. Over the course of my doctorate, he stopped over in Helsinki to review draft chapters with me on his way from one conference to another, encouraged me to always dig deeper, introduced me to a network of legal scholars with whom I continue to collaborate, and has never failed to show great patience and support for all of my pursuits, my Ph.D. and beyond.

Tad's research and books significantly inspired my thinking prior to him become my co-supervisor. I am ever grateful to him for having introduced to me to complexity theory during the first year of my Ph.D. as it continues to provide me with an academic vocabulary and toolkit to explore the world in the way that I experience it. Thank you, Tad, for always being encouraging when I felt unsure of my research and for leading with big ideas.

A tremendous thank you also goes out to my committee members, Dr. Whitney Lackenbauer and Dr. Simon Dalby. Whitney's deep knowledge of the North has broadened my understanding, while his enthusiasm and support for my work has made me feel invincible. Simon was kind enough to join my committee near the end of the Ph.D. process. Nevertheless, it was his insights that helped me see the forest for the trees.

A sincere thank you to everyone at the Balsillie School of International Affairs who provided support and friendship over the years. A special thank you to Rupinder Mangat, Tracey Wagner-Rizvi, Phoebe Stephens, Karolina Werner, and Anastasia Ufimtseva. Thank you also to Dr. Jasmin Habib, Dr. Andrew Thompson, Joanne Weston, Maha Eid, and Tiffany Bradley for making the behind-scenes-process of a Ph.D. as seamless as possible and for always being so kind and patient.

This project is both directly and indirectly shaped by the contributions of previous supervisors and scholars. My colleagues, collaborators, and friends at the Arctic Centre in Rovaniemi, Finland, have provided both inspiration and guidance over the past decade. A heartfelt thank you goes to Dr. Timo Koivurova, Dr. Kamrul and Dr. Shahnaj Hossain, Dr. Tanja and Dr. Juha Joona, Dr. Leena Heinämäki, Dr. Dorothee Cambou, Dr. Nikolas Sellheim, Dr. Stefan Kirchner, Sebastien Duyck, Adam Stepien, Joelle Klein, Leena Rantamaula, Susanna Pääkola, and Joonas Vola. A warm thank you also goes out to Dr. Morris Mottale, Dr. Melvin Schlein, and Dr. Marcus Pyka, all of whom contributed to the foundation of my academic pursuits during my time at Franklin University Switzerland. Dr. Mottale, in particular, set me on the path to studying the Arctic in his class on War & Contemporary Politics during the final year of my undergraduate studies.

This project would not have been possible without the generous financial support of the Pierre Elliott Trudeau Foundation. I am particularly grateful to Josée St- Martin, Program Director, Scholarships, whose ability to listen to scholars and grasp the intricacies of their research allowed many of us to pursue avenues that would not have been possible otherwise. The world of research would be much more thoughtful if every funding agency had someone like Josée. A gracious thank you to Jennifer Petrela, Director of Fellowships, Mentorships, and Public Interaction, whose energy and eye for precision taught me to think big without losing sight of the details. Thank you also to my wonderful Trudeau Foundation mentor, Barbara Doran, who took me under her wing, imparted her decades-long wisdom on working on women's issues, showed me the beauty of Newfoundland and Labrador during our self-styled writing retreat, and continually encouraged me to forge ahead.

A warm thank you also goes out to my fellow Trudeau Foundation scholars – Erin Aylward, Samara Brock, Avi Denburg, Marie-France Fortin, Bailey Gerrits, William Hébert, Jennifer Jones, Andréanne Lebrun, Caroline Lieffers, Rebeccah Nelems, Jennifer Peirce, Benjamin Perryman, Meghan Thumath, Ben Verboom, Anelyse Weiler, Chiara Camponeschi, Ali Hamandi, and Melanie Doucet – who kept my eyes and mind wide-open. You're an inspiration in every way possible. An extra special thank you to Jen and Jen for keeping me accountable in our writing group; to Ali, Ben, and Melanie for joining me on my first trip to Alaska; to Rebeccah for hosting Will, Bailey, Ben, and I for a productive and awe-inspiring writing retreat on Pender Island; and to Chiara and Ben who supplied ample care packages and calls to keep me motivated.

Music plays an integral part in my work process, so no acknowledgement would be complete without also recognizing some of the artists who provided the soundtrack to this project. Thank you to Afie Jurvanen, Jason Charles Beck, Justin Vernon, Leif Vollebekk, Leslie Feist, Maggie Rogers, Norah Jones, Paul and Fritz Kalkbrenner, Taylor Alison Swift, Tim Baker, and Jeremy Dutcher, among many others.

A warm thank you to the Atlin family – Cole, Noah, Tracee, and Andrew – who provided happy distractions, perspective, and a home away from home in Ontario, during both my Masters and Ph.D.

A big thank you to my Billa Gang – Emily Avelar, Katy Jones, Nico Luchsinger, Marcus Kuhn, Eva and Max Mohr, Thierry Blancpain – which formed the first year of my Ph.D. and provided many necessary escapes, in-person and in-text. You've been the source of so much light and laughter! Special thanks to Emily Avelar, one of my oldest and closest friends, whose knitting has kept me warm in the Arctic, whose ears have listened to all of my challenges and met them with sound advice, and whose friendship continues to take me on adventures near and far. And to Dr. Katy Jones, who imparted all of her wisdom on being a woman in academia. Your excitement for research and perseverance provided boundless motivation for me, from when we first met at "Falling Walls" in Berlin to the last few minutes before my defence – thank you, thank you!

A deep thank you to Chris Mosiadz, Dana Decent and Tania Cheng, and Sara and Cameron Taylor, who have lived with me (and worked with me!) through parts of the Ph.D. and even watched me devour the entire comprehensive exam list on our couch over the course of a summer. They have never known me outside of the Ph.D. process and I can't wait for that to change!

A boundless thank you to many other friends – Ceilidh Milligan, Jay Dort, Kyra Maya Phillips, Melissa Armbruster, Nastaran Tavakoli-Far, Philippa Young, Dr. Rhea Mehta, RJ Taylor, Scott Shigeoka, Shaira Khemlani, Stephanie Muehlethaler, Tara Yip-Banniq – who provided adventures and support in various forms along the way.

A mighty high-five and thank you to Gosia Smieszek, whose academic brilliance I cited throughout this dissertation, whose friendship has withstood various time zones and impossible deadlines, and whose partnership in *Women of the Arctic* has brought me both comfort and strength over the past three years.

To Lindsay Smith, one of my dearest and oldest friends, who has had a front-row seat to my evolution as a person and academic. Lindsay has been on the other end of the phone every single day since I started this process, and her generosity of spirit and fierce loyalty have encouraged me to push through barriers, seen and unseen. My trips to NYC to visit her provided much needed respite over the years.

An ecstatic thank you to Filipa Pajevic, my best friend, sister, and partner-in-Ph.D. who has kept me motivated and inspired every step of the way. Your curiosity, drive, and zest for life are unparalleled, and I can't wait for what awaits both of us – hopefully closer postal codes!

A heartfelt thank you to Hannu Viika, my extended family, whose excitement and support of my accomplishments continues to fill my heart with joy. Thank you for connecting me to Finland forevermore.

A loving thank you to my partner, Clay Dasilva, who has turned out to be the greatest gift of our Masters and Ph.D. in Global Governance. Thank you for always reminding me of what's most important, for taking care of me when I couldn't take care of myself, and for understanding in your bones just how tough this process can be. I can't wait for you to finish, too. I'm rooting for you!

Lastly, the biggest thank you goes to my parents, Adriana and Gary, who have always been my greatest source of inspiration and unwavering support. Their passion to see and understand the world in all of its complexities, their sacrifices, and their unconditional love have shaped me in every way imaginable.

Funding Acknowledgement

This research was funded with the support of the Pierre Elliott Trudeau Foundation, the Social Sciences and Humanities Research Council, and the Balsillie School of International Affairs.

Dedication

To my parents, my unwavering champions.

Statement of Positionality

I am a white, settler, straight woman engaging in research on the Arctic. My heritage is mixed, and I am of Slovak, Hungarian, and Yugoslav descent on my mother's side and of Irish and English descent on my father's side. My mother was born and raised in Czechoslovakia, marrying my father and leaving for Finland in 1986. My father's ancestors are of Irish and English heritage, having arrived in Canada around the 1880s. I was born in Finland, 30 km from the Russian border. Over the past 31 years of my life, I have lived in different parts of Austria, Canada, Finland, Italy, Norway, Slovakia, and Switzerland. In these places, I have lived in both rural and urban settings, learning the local language and attending local schools. As an adult, I have lived both at, and south of, the Arctic Circle in Finland. This opportunity has afforded me particular insights into how the Arctic, including its environment and people, is perceived by those who live north and south of the delineation. I have also had the privilege of traveling extensively, including in various parts of the Arctic (i.e., Alaska, northern Finland, Iceland, northern Norway, northern Sweden, and the Yukon in northern Canada).

I am the only child of two university educated parents, one of whom is a professional. My education has been supported by them, as well as by generous scholarships and fellowships from academia, private foundations, and the Canadian government. I received my Bachelor of Arts in International Relations, Economics, and Germanic Studies from Franklin College Switzerland, a private American university in Lugano, Switzerland, with a year of my studies spent at the University of Helsinki in Helsinki, Finland. Following my graduation, I moved to Waterloo, Canada, where I completed my Master of Arts in Global Governance at the Balsillie School of International Affairs, University of Waterloo, with a semester spent at the Hertie School of Governance in Berlin, Germany. The Major Research Project (MRP) component of this degree was supervised by Dr. Neil Craik, who also co-supervised my doctoral research. My MRP focused on the governance of Persistent Organic Pollutants, which is also a case study in this project.

As a part of my Master's program, I completed an internship at the Northern Institute for Environmental and Minority Law at the Arctic Centre, University of Lapland, in Rovaniemi, Finland. I was subsequently hired as a researcher, working under the supervision of Dr. Timo Koivurova. In total, I worked at the Arctic Centre for just over two years (in two separate stints). During this time, I was introduced to a network of scholars – notably, Dr. Timo Koivurova, Dr. Leena Heinamäki, Dr. Tanja and Dr. Juha Joona, Dr. Kamrul & Dr. Shahnaj Hossain, Adam Stepien, Sebastien Duyck, Dr. Nikolas Sellheim, Dr. Dorothee Cambou, Dr. Emilie Beaudon, Joonas Vola, Leena Rantamaula– who significantly shaped my academic and non-academic understanding of the Arctic.

Following my time there, I returned to the University of Waterloo in pursuit of a Ph.D. in Global Governance at the Balsillie School of International Affairs. My project was again supervised by Dr. Neil Craik, who provided substantial guidance on, and shaped my understanding of, the law. Dr. Thomas Homer-Dixon introduced me to complex systems theory over the course of two reading courses, subsequently becoming my co-supervisor. Dr. Whitney Lackenbauer joined my dissertation committee following our reading course on Arctic governance, where he provided a welcome and necessary overview of the North American literature and discourse on the Arctic as a complement to the Nordic lens imparted on me at the Arctic Centre. Together, these two lenses continue to shape my understanding of the Arctic. I am also aware that deeper insight into the context of the Russian Arctic remains missing from my understanding, something which I hope to change over time.

For this research, my position in life shaped how I engaged with the topic at hand. My worldview is significantly shaped by a life lived across boundaries, without grounding in a particular place. As a

consequence, my understanding of place remains fluid and my focus instinctively global, then local. What is more, my specific understanding of the circumpolar North – including its environment and communities, as well as the relationship between them – is formed by my own experiences living south of the Arctic for the majority of my life. I also recognize that the relatively short amount of time I spent in northern Finland is not necessarily reflective of experiences across different Arctic communities and their members.

This interdisciplinary project, in part, traces my own journey as I seek to bring together two disparate fields of research – international law and complex systems theory – in my examination of Arctic change. My understanding of law builds on my work with the Northern Institute for Minority and Environmental Law, as well as my participation in the International Law Summer Institute, hosted by the Centre for International Governance Innovation and led by Dr. Neil Craik and Dr. Sara Seck. In 2017, my conception of the law shifted with my participation in the Norwegian Centre for Advanced Studies workshop on Indigenous Law and Methodology, organized by Dr. Margherita Paolo Pota of the UiT The Arctic University of Norway and led by Dr. Val Napoleon and Dr. Rebecca Johnson of the Indigenous Law Research Unit at the University of Victoria. Following this workshop, I felt a greater sense of awareness of the ways in which my own project reified, as well challenged, dominant understandings of the law. My thinking on complexity science is, in part, a product of the collective learnings of the Complexity Working Group of the University Waterloo, led by Dr. Thomas Homer-Dixon. My understanding of the application of some of these methodologies in science policy was shaped by a research fellowship at the International Institute for Applied Systems Analysis and in my contribution to the 2016 *Arctic Resilience Report*.

Many of the elements of this projects that focus on the Arctic are an extension of my time spent at the Arctic Centre, where I had the opportunity to delve into deeper conversations on the legalization of Arctic governance with Dr. Timo Koivurova, whose work has significantly shaped the field of Polar Law. Building on these conversations, I have also had the opportunity to engage with academics, policymakers, Indigenous peoples, activists, business leaders, and more at international and local conferences and workshops on the topics of law, complexity, and Arctic environmental governance. I was offered these opportunities thanks to the generosity of my network of scholars many of whom have built strong bonds and trust with various northern communities and their members over time. For instance, Timo Koivurova asked me to contribute as an author to the 2016 *Arctic Resilience Report*, the scientific product of the Arctic Resilience Assessment under the Swedish Chairmanship of the Arctic Council. This project, and the interactions stemming therefrom, provided me with a different perspective on both the Arctic Council and its processes, as well as the practical application of resilience and complexity concepts in policymaking. As another example, my connection to Dr. John Higginbotham, a former Senior Fellow at the *Centre for International Governance Innovation*, an independent, non-partisan think tank and one of the collaborating institutions of the Balsillie School of International Affairs, gave me access to various Arctic-related events, including some related to the U.S. Chairmanship of the Arctic Council in both the U.S. and Canada. What is more, many of these opportunities were afforded to me by the status of, and generous travel funding awarded by, the Pierre Elliott Trudeau Foundation. This work is written under this context.

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List of Acronyms and Abbreviations

AAC	Arctic Athabaskan Council
ACAP	Arctic Contaminants Action Program
AIA	Aleut International Association
ACIA	Arctic Climate Impact Assessment
ACS	Arctic Council Secretariat
AEC	Arctic Economic Council
AEPS	Arctic Environmental Protection Strategy
AHDR	Arctic Human Development Report
AMAP	Arctic Monitoring and Assessment Programme
ATS	Antarctic Treaty System
ARR	Arctic Resilience Report
BAT	Best Available Techniques
BEAC	the Barents Euro-Arctic Council
CAFF	Conservation of Arctic Flora and Fauna
CAO	Central Arctic Ocean
CIEL	Center for International Environmental Law
CLCS	Commission on the Limits of the Continental Shelf
CLRTAP	UN Economic Commission for Europe Convention on Long-range Transboundary Air Pollution
COP	Conference of the Parties
DDT	Dichlorodiphenyltrichloroethane
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EPPR	Emergency Prevention, Preparedness and Response
E.U.	European Union
FPIC	Free Prior and Informed Consent
GCI	Gwich'in Council International
GHG	Greenhouse Gases
GIS	Greenland Ice Sheet
GMP	Global Monitoring Plan
IACHR	Inter-American Commission of Human Rights
ICC	Inuit Circumpolar Council
ICCPR	International Covenant on Civil and Political Rights
ICESCR	International Covenant on Economic, Social and Cultural Rights
ILO No. 169	the International Labor Organization's Convention concerning Indigenous and Tribal Peoples in Independent Countries
IMO	International Maritime Organization
IO	International Organizations
IPCC	Intergovernmental Panel on Climate Change
IPS	Indigenous Peoples' Secretariat

LOS	Law of the Sea
LoRV	Law of Requisite Variety
MEAs	Multilateral Environmental Agreements
MARPOL	The International Convention for the Prevention of Pollution from Ships
NASA	National Aeronautics and Space Administration
NGO	Non-Governmental Organization
NORDREG	Northern Canada Vessel Traffic Services Regulations
NSR	Northern Sea Route
NWP	Northwest Passage
NWT	Northwest Territories
OAS	Organization of American States
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
OPRC	International Convention Oil Pollution Preparedness Response and Cooperation
PAME	Protection of the Arctic Marine Environment
PCB	Polychlorinated Biphenyl
POPs	Persistent Organic Pollutants
RAIPON	Russian Arctic Indigenous Peoples of the North
RCP	Representative Concentration Pathway
RFMO	Regional Fisheries Management Organizations
SAAO	Senior Arctic Affairs Officials
SAO	Senior Arctic Official
SAR	Search-and-Rescue
SDWG	Sustainable Development Working Group
SOLAS	The International Convention for the Safety of Life at Sea
SWIPA	Snow, Water, Ice, and Permafrost Assessment
TDC	Thematic Data Centres
UDHR	Universal Declaration of Human Rights
UN	United Nations
UNCBD	United Nations Convention on Biodiversity
UNCLOS	United Nations Convention on the Law of the Sea
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WG	Working Group
WIT	Worldviews, Institutions, and Technologies
WWF	World Wide Fund for Nature (also known as the World Wildlife Fund)

Illustration 1: Map of Arctic topography and bathometry[1]
(Source: Hugo Ahlenius, UNEP/GRID-Arendal)

[1] Accessed at http://www.grida.no/resources/7147.

Chapter 1: Introduction

In June 2015, I boarded a plane to Washington D.C. for a workshop hosted by the U.S. Department of the Interior and the steering committee of the Arctic Resilience Assessment, a report produced by the Stockholm Resilience Centre and Stockholm Environment Institute. The meeting was held at the House of Sweden in Foggy Bottom, a modern building housing both the Swedish and Icelandic embassies. Sandwiched between an industry leader and policymaker, I sat on my sleek chair, eagerly listening to presentations on Arctic resilience.

It was an exciting time; one of the first times that U.S. government representatives officially acknowledged climate change and the need for Arctic states to maintain the resilience of their northern communities. Months later, in September 2015, then U.S. President Barack Obama would go on to be the first sitting U.S. president to cross the Arctic Circle and highlight that, not only was climate change real, but that it was already happening in the Arctic.

Although I was a contributing author to the Arctic Resilience Assessment, specifically to one of its chapters focused on "Shaping Future Change in the Arctic," I was struck by the title of the workshop: One Arctic, Multiple Possible Futures. The global challenges facing the Arctic were evident both in my previous research and in the presentations at this meeting; I could understand how they warranted a holistic solution. Still, the vast differences in terms of flora and fauna, access to the Arctic Ocean, and variation in economic development, made me question the concept of One Arctic; my curiosity was piqued. I hoped that the range of rights- and stakeholders at this workshop – policymakers, academics, Indigenous representatives, and industry leaders – would provide novel insight into how we understand and, indeed, how we seek to shape change within the Arctic.

Factors relating to a changing Arctic are profoundly impacting the evolution of Arctic norms and worldviews, the moral grounding and anchor of legitimacy of authority in the region. As the changes become more profound, it becomes increasingly evident that some Arctic norms and worldviews are evolving more rapidly than others, leading to tension.

The argument strung throughout this workshop spoke directly to these tensions: the Arctic is a constructed region, consisting of multiple systems with multiple possible futures, and it is in our best interest to maintain the resilience of such systems. When we broke into smaller discussion groups, however, resilience as a concept became vague, as did the conversation on how to ensure resilience, or shape change, across One Arctic, the Arctic system as a whole. We had fruitful exchanges on the role of traditional knowledge and science; on reindeer husbandry; and on matters relating to increased shipping. However, a clear disconnect between the local and the global remained. When asked to line-up across the room based on how hopeful we were for the future of the Arctic – with one end of the continuum being hopeful and the other not – Indigenous peoples and scientists mostly stood at one end of the spectrum, while many policymakers and industry leaders stood hopeful. The tension of norms and worldviews became physically evident. When asked for their reasoning, the former group spoke of the changes which they were already experiencing and adapting to at the community-level and the irreversible changes they were seeing in climate models. The latter group was hopeful, noting that the acknowledgement of climate change was only the first step in developing better environmental and economic policies for northern communities.

As a scholar of global governance, I was captivated by the difference in understandings of, not only, what the Arctic *is* and how we see its future(s) play out, but also in how we hope to manage such change. One thing became evident both in this workshop and in the final output of the 2016 Arctic Resilience Assessment: there was minimal conversation on how law contributes to transformation within a system, like the Arctic. Given that international law is one of the most pervasive sub-systems of our social system, I wondered: *why*?

***

Past decades have witnessed both an ontological and epistemological shift in the scale and complexity of global environmental problems, as well as in how humans seek to manage them (Andonova and Mitchell 2010, 35: 255). For a variety of reasons, the Arctic serves as one of the most salient case studies of these shifts.

First, because the Arctic is undergoing significant, large-scale social and environmental change. Second, because it mirrors a set of interconnected crises — including climate change, the peak and decline of non-renewable resources, and biodiversity loss — which threaten the sustainability of our Earth system. As a consequence, the Arctic has become a barometer (Watt-Cloutier 2015), a "canary in the coal-mine" (Young 2009), and a harbinger of change (Carmack et al. 2012) for many. If we further consider the argument that "massive social or environmental failure in one region can threaten the entire system" (Costanza, Graumlich, and Steffen 2007, 3; see also Beddoe et al. 2009; Galaz 2014, 42; Homer-Dixon et al. 2015, 7), then the tightening links between the Arctic system and our global system become of particular concern. Third, given the nature of change in the Arctic system, some scholars and policy-makers argue that current governance approaches are insufficient in managing non-linear, abrupt, and typically irreversible shifts or flips in the Arctic system, "generating early indications of the growing need for innovation in governance systems worldwide." (Corell et al. 2010).

In other words, if we (as humanity) can develop institutions to manage and cope with such change in the Arctic system, we are likely to also contribute to our ability to manage similar, complex issues at a global scale (Carmack et al. 2012, 56).

I am interested in the capacity of international law, as an instrument of governance, to manage this rapidly changing Arctic system. More specifically, this project seeks to answer a central research question: Is the emerging material reality of the Arctic system fundamentally incommensurable with the functional requirements of the law that seeks to govern it? I conclude that that is the case, and in the conclusion of this dissertation, I argue that a complex systems ontology might be able to help us identify how to build a better governance structure for the Arctic.

Largely stemming from the natural sciences, I draw on a complex systems ontology because it provides a more nuanced and rich understanding of human-environment interactions, including the co-evolution of various system components (see Schellnhuber et al. 1997).[2] Epistemologically, it is helpful because it

[2] There is no coherent, all-encompassing theory of complexity. Numerous research traditions share the assumption that diverse real-world phenomena emerge out of complex interactions between various parts across scales. Complex systems theory is increasingly applied to research in the social sciences, to better understand the structures and dynamics of political, economic, and legal systems. See Galaz (2014, 17); see also Mitchell (2009); Murray, Webb, and Wheatley (2019). In the context of the Arctic, natural and social scientists alike have drawn on complexity theory to better understand the geophysical and social-ecological components of the Arctic system (Arctic Council, Stockholm Environment Institute, and Stockholm Resilience Centre 2013; Arctic Council and Stockholm

eschews various disciplinary categories and allows me to draw on elements of complex systems theory, including concepts and analytical tools. The latter can provide an alternative understanding to current, dominant theoretical debates in Arctic environmental governance and to the study of international law more broadly.

In this chapter, I briefly introduce the structure and content of this research project. First, I draw on a complex systems ontology to introduce *what* we seek to manage: a rapidly changing Arctic system. This is followed by an overview of current governance approaches and their response to the nature of change in the Arctic system, where I point to a disjuncture between the emerging material and social reality of the Arctic system and current governance responses, which at times give rise to governance failure. I argue that a significant part of the problem is an insistence on law and formality. Then, I highlight how the theoretical underpinnings of current approaches make it difficult for us to envision alternative methods of Arctic environmental governance that can account for complexity and change. I subsequently turn to literature in Earth systems science, on social-ecological systems, and Earth system governance for potential answers. Finally, once I have diagnosed the problem, I return to my research question and introduce a prospective research agenda for bringing together a complex systems ontology and Arctic environmental governance.

1. The Arctic: A Complex System

Current scholarship on Arctic environmental governance is often imprecise in its description of change and complexity in the Arctic system. My work is thus unique in that it begins by drawing on a complex systems ontology to define the Arctic.

The term *ontology* generally refers to a set of assumptions by which people characterize or perceive phenomena (Libarkin and Kurdziel 2006, 408) – in this case what constitutes the material and social reality of the Arctic. Although it is difficult to prove or disprove these assumptions, it is nevertheless important to make them explicit if we consider that empirical questions are tightly bound to how we answer questions like "what is there?" and "how should we study it?" (Wendt 1999, 5). A complex systems ontology serves as an alternative problem-solving paradigm to a more conventional mechanistic ontology which underpins a significant part of the existing literature on Arctic environmental governance. A mechanistic ontology assumes that a system has easily discernible or closed boundaries, that its behaviour is an additive consequence of the behaviour of its parts, that cause and effect are directly proportional, and that it is possible to discriminate between multiple causes to identify a single, necessary and sufficient cause for a particular phenomenon (Homer-Dixon 2007; 2008). Instead, a complex systems ontology assumes a system of connected entities that exhibits constitutive characteristics (cause) like (Homer-Dixon 2020b):

1. Thermodynamic openness
2. Feedbacks
3. Synergistic causation
4. Diversity
5. Competition
6. Connectivity
7. Decentralization

Environment Institute 2016; Arctic Monitoring and Assessment Programme 2017). However, we know significantly less about how governance institutions, including the law, manage change and complexity therein.

And assumes behavioural characteristics (effect) including:

1. Emergence
2. Self-organization
3. Non-linearity
4. Unpredictability
5. Multiple equilibria
6. Path dependency
7. Sensitivity to initial conditions

Based on a complex systems ontology, the Arctic is an open, integrated, dynamic and complex system consisting of a multiplicity of individual entities, components, or parts which interact in a synchronized manner leading to the emergence of a single, tightly coupled system with multiple equilibria, or stable states (Strogatz 2004). This system is open and permeable to both energy and mass, thereby making it particularly difficult to define its boundary.

The complexity of the Arctic system *per se* arises out of a dense web of causal connections and recursive interactions between its individual system components including its complex non-adaptive systems, like its geophysical systems, and its complex adaptive systems, such as its biological, social, political, economic, and legal systems. While these two components share many common features, including constitutive and behavioural properties (such as non-linearity, path dependency, and synergistic causation), complex adaptive systems are distinct in that they have a living component, as well: individual agents or groups with internal representations of the external environment and heuristics for how a system should respond to change. Often, they are far from optimal and subject to selection pressures.

Over the past three decades, the Arctic system has undergone significant, large-scale transformational change – a shift which has profoundly altered human-environment interactions and feedback within the system (Nilsson and Koivurova 2016). This transformation is contingent on both known and unknown factors within its non-adaptive and adaptive systems, making prediction particularly difficult. “No other region on Earth shows a trend of [such] potential long term [sic] change.” (Finneran and Lynch 2014).

What was once described as a relatively closed area, both in terms of its material and social reality, has become increasingly open and complex. As I highlight in Chapter 2, one of the most significant geophysical changes to date is an increase in the rate of solar radiation absorbed by the Arctic Ocean which heightens the variance of behaviour within the Arctic system. Geophysically, this boost in material energy contributes to the rapid transition of old, multi-year Arctic sea ice into younger, thinner and more mobile ice. Since the late 1980s, sea ice volume on the Arctic Ocean has declined by at least half (Steffen et al. 2018), leaving the Arctic Ocean darker and more exposed, readily absorbing solar energy which was once reflected back into the atmosphere. Changes like this interact with our climate, carbon, and freshwater systems to produce potentially serious consequences for social-ecological systems, as well. A decline in multi-year sea ice — including prolonged open water and changing light conditions — is linked to biodiversity loss in the central Arctic Ocean which poses further challenges for species — fish, walruses, Arctic seals, and polar bears — and humans whose life cycles and livelihoods are intimately linked to Arctic sea ice (Rosen 2017, 153). It also introduces significant opportunities for resource extraction, fishing, and tourism.

There is also little isolation of these changes. Tightening links between the Arctic system and our global system mean that protracted periods of open Arctic waters contribute to ocean heat fluxes which can impact global precipitation patterns and ocean currents, thereby impacting the lives of individuals who live far from the Arctic (Carmack et al. 2012). For example, scientists observed clear links between the reduction

of Arctic sea ice and the persistently cold winters experienced by eastern North America in 2013/2014 and 2014/2015 (Francis and Vavrus 2012). At the same time, geophysical phenomena like global climate change increasingly open the Arctic Ocean to new shipping opportunities thereby further drawing the Arctic into global markets (see Keskitalo and Nuttall 2015, 179–80; Khan 2019, 681).

By drawing on a complex systems ontology to define the Arctic, as opposed to simply delineating a geographic area, it becomes more evident that various components of the Arctic system are increasingly linked, thus presenting new governance challenges, such as a lack of predictability and a plurality of competing worldviews related to both what the Arctic is and what it should be.

Understanding this reality is crucial as I begin to investigate the role of international law in managing such transformational change in the Arctic system. After all, the ability of complex adaptive systems to anticipate and manage the emerging material and social reality of the Arctic system raises both ontological and epistemological concerns, as well as important questions related to stability and change.

2. Current Governance Approaches & Responses to the Nature of Change in the Arctic System

In Chapter 3, I outline current approaches to Arctic environmental governance and institutional responses to increasing change and complexity in the Arctic system. To clarify, I choose to focus on Arctic environmental governance, as opposed to other areas of Arctic governance, for two reasons: first, because there is already a rich descriptive and normative debate on the role of Arctic environmental governance in managing ongoing and significant, large-scale shifts in the Arctic system; and second, because a better understanding of Arctic environmental governance could provide key insights into a relatively nascent research agenda on the juridical dimension of Earth system governance, outlined below. I devote limited attention to social governance (security, political economy, health, etc.) beyond the direct impacts experienced as a result of environmental change. And, although I recognize that the institutional landscape of Arctic environmental governance is polycentric, operating across multiple scales, I home in on two particular scales of governance: the pan-Arctic and the global, where much of the current theoretical discourse surrounding Arctic environmental governance takes place. I do not place a focus on national, sub-regional, or local scales as such. I also forego a detailed study of various sub-systems of regulation such as search and rescue, shipping and navigation, fishing, oil and gas, or others. Instead, I seek to gain specificity from the depth of my engagement with analytical concepts and tools from complexity science in the following chapters.

I begin this chapter by defining the notion of governance and international law, as a tool thereof. In the context of this research project, governance broadly refers to social institutions — rules that define social practices, assign roles and guide interactions among actors — with the capacity to resolve conflict, facilitate cooperation, or alleviate collective action problems in an increasingly interdependent world (Hurrell 2007; Young 1994; North 1990). International law, as a pervasive sub-system of our social system, comprises a set of formal rules and customary practices which together define the legal rights and obligations, as well as govern the interactions of international legal subjects (traditionally states, but increasingly also international organizations, sub-national groups, and peoples).

I then go on to argue that the current approach to Arctic environmental governance, in many ways, reflects broader trends in global governance. It is formal and informal, disaggregated across multiple levels of governance — local, regional, national, and pan-Arctic — with a variety of state and non-state actors.

More specifically, I cite Anne-Marie Slaughter (2004) in arguing that sovereignty and autonomy are increasingly embedded into a more complex system of governance (Cerny 2010; Held 1995) where the authority of the state is disaggregated in three directions: upward to supra- and international actors and organizations; downward to cities and communities; and outward to civil society and non-state actors (Scott and VanderZwaag 2015, 726–27).

Generally, there are two approaches to Arctic environmental governance: geographical and sectoral (based on issue area). When defined geographically, formal and informal Arctic environmental governance span the Arctic Ocean, formed by several seas and a deep central basin flanked by continental shelves, and its surrounding land which falls under the jurisdiction of eight Arctic states: Canada, the Kingdom of Denmark (through Greenland and the Faroe Islands), Finland, Iceland, Norway, Russia, Sweden, and the United States. Within these jurisdictions the southern boundary of the Arctic is often delineated using three criteria: above the Arctic Circle in northern Europe and northwest Russia; the areas down to 60 degrees north latitude in North America, Iceland and eastern Russia; the marine boundary; and the July Isotherm. The area can be further delineated by the coastlines of five Arctic coastal states – Canada, Denmark, Norway, Russia, and the U.S. This geographical approach often underpins local governance, such as co-management agreements; regional intergovernmental fora like the Barents Region Council; national-scale northern policy strategies and frameworks; bilateral cooperation (such as along the Alaska-Yukon border); intergovernmental fora such as the Arctic Council; transnational Indigenous organizations and networks, such as the Inuit Circumpolar Council; non-governmental organizations like the *World Wide Fund for Nature*; business networks, such as the Arctic Economic Council; and scientific networks like the International Arctic Science Committee.

Arctic environmental governance can also be defined by issue area – from climate change, to biodiversity, to oceans governance. The law of the sea, for instance, provides the fundamental framework for the governance of the Arctic marine environment, even though only a small part of its abundance of law and regulation is specific to the Arctic (Durfee and Johnstone 2019, 221; Koivurova 2008a, 15).

Over the course of this third chapter, I provide a descriptive overview of current formal approaches – including treaties, principles, rights-based approaches – and informal approaches to Arctic environmental governance. In terms of the former, I place a particular focus on international legal norms and regimes including the law of the sea; various international environmental regimes, including their respective multilateral environmental agreements and principles of international environmental law; international human rights instruments and Indigenous peoples' rights; as well as Arctic-specific agreements. This is followed by a more detailed overview of current informal approaches to Arctic environmental governance, specifically focusing on the development and evolution of the Arctic Environmental Protection Strategy (AEPS) and the subsequent Arctic Council. I briefly introduce other, informal governance responses, as well.

The behaviour of these various elements and the interactions between them drive the response to ongoing changes in the Arctic system. Many of these responses are underpinned by a more conventional mechanistic ontology, as opposed to a complex systems ontology (I highlight their differences in Table 1).

Conventional		Complex Adaptive
Mechanistic	Ontology	Complex
Discernible/Closed	Boundaries	Fluid/Open
Vertical	Hierarchy	Horizontal
Centralized	Decision-making	Distributed/Interactional
State	Power & Legitimacy	State & Non-State Actors
Formal Legal Rationality	Rules	Informal Legal Rationality
Stability/Predictability/Precision	Goals	Reflexivity/Adaptability
Singular/Technocratic	Knowledge	Mixed/Experiential

Table 1: Differentiating points of Two Problem-Solving Paradigms (adapted from Homer-Dixon 2007)

Similar to other scholars, I make note of an increasing turn toward the legalization of Arctic environmental governance over the past two decades, or so (see Koivurova 2014). Legalization, in this case, means the hardening of current approaches along the dimension of precision, obligation, or delegation (Abbott and Snidal 2000). At the same time, there is a re-commitment to formal governance institutions like the Law of the Sea (Ilulissat Declaration 2008) and the development of internal rules by informal governance institutions like the Arctic Council in an effort to meet the needs of an evolving Arctic system (Smieszek 2020).

However, by turning to a rules-based approach to provide stability and manage change, elements of the current system of Arctic environmental governance are becoming increasingly rooted and complex (Loukacheva 2013, 23), and not necessarily well-suited to maintain coherence within the system of governance or to govern the nature of ongoing change in the Arctic system. In Chapter 4, I examine three cases with a focus on the broader implications of a mismatch between the characteristics of ongoing change in the Arctic system and current governance approaches and responses. I conclude that the legalization of Arctic environmental governance might be well-suited to the governance of some issue areas, like the governance of Persistent Organic Pollutants, which are more linear. However, it is proving to be less effective in managing the synergistic effects of climate change on the well-being and livelihoods of Arctic Indigenous peoples. At times, the discrepancy between the conventional mechanistic problem-solving paradigm and the emerging material and social reality of the Arctic can lead to tension, even governance failure. In other words, the emerging material reality of the Arctic system is fundamentally incommensurable with the functional requirements of the law which seeks to govern it. This mismatch points to the need for an alternative approach to Arctic environmental governance. If this is the case, then why do actors continue to turn to positivist conceptions of law for solutions?

3. Theoretical Underpinnings of Current Governance Approaches & Responses

In 2014, Timo Koivurova published a piece in the *American Journal of International Law Unbound*, titled "The Increasing Relevance of Treaties: The Case of the Arctic." In it Koivurova reflects on the dramatic transformational consequences of climate change for the Arctic and wonders why the negotiation of new treaty agreements, like the 2011 *Agreement on Cooperation on Aeronautical and Maritime Search*

and Rescue in the Arctic, is taking place. After all, had Kal Raustiala (2002) not argued nearly two decades ago that "the golden age of the treaty as the central tool of international cooperation is ending"?

Koivurova (2014, 56) reasons that "this view of the importance of treaties is, of course, very comforting for international lawyers: when things get serious, international legal instruments, treaties, are needed." In Chapter 5, and in line with this assessment, I argue that the shift toward the legalization of Arctic environmental governance – or the increasing relevance of treaties – should not be all that surprising given the conceptual underpinning of current governance approaches and two long-standing, dominant theoretical debates surrounding alternative approaches to Arctic environmental governance: the first, on the idea of an Arctic Treaty System; and the second on the idea of an integrated Arctic regime complex. Other, smaller and less-dominant debates include proposals for an Arctic regional seas agreement and a focus on the Arctic as a common heritage of humankind (Koivurova 2008a).

The two dominant theoretical debates are descriptive, focusing on how best to characterize and understand the Arctic, and normative, in terms of their proposal for how the Arctic should be governed. In addition to this, both are underpinned by a legal positivist understanding of the law.

Legal positivism, the lingua franca of many international lawyers, can be summarized as a range of theories that describe the law "as it is" (Ratner and Slaughter 1999); international law is not more, nor less than the rules to which states have agreed to through treaties, custom, or other forms of consent (Ratner and Slaughter 1999). Legal positivists, with a preference for precision and formality, make a dichotomous distinction between hard and soft law (between legal and illegal, between binding and non-binding). However, there is also a more nuanced gradation along three dimensions of obligation, precision and delegation, along what Goldstein et al. (2000) describe as the legalization continuum.[3] On one end of the continuum, hard law like the *United Nations Convention on the Law of the Sea* (UNCLOS) maintains high levels of obligation, precision, and delegation. It includes formal, precise legally binding obligations which delegate authority to state-sanctioned institutions for interpreting and implementing the law. Located at the other end of the continuum, soft law like the declarations of the Arctic Council consist of informal, non-binding norms, procedures, and instruments weakened in various combinations along one or more of the three dimensions of legalization (Goldstein et al. 2000; Abbott and Snidal 2000, 422; Sands 2003, 124).

Building on this, the first debate, stemming from the field of international law, understands the current landscape of Arctic governance as a fragmented (non-) system, proposing an Arctic Treaty (System) – an overarching, legally-binding agreement applicable to five coastal or all eight Arctic states, covering several regional policy areas and a substantial geographic part of the Arctic area (Koivurova 2008a, 20). The second debate, building on regime theory in international relations scholarship, understands the landscape of Arctic governance as a regime complex consisting of various elements including formal international legal regimes, such as the UNCLOS, and informal intergovernmental fora like the Arctic Council, many of which are already in place but whose interplay we do not fully understand (Young 2012, 404). Scholars within this second debate argue for the stronger integration of existing elements.

However, neither debate has yielded sufficiently prescriptive proposals, and both lack an understanding of the capacity of law to manage system-wide change; including how the law can contribute to the accelerated transformation of a system (Olsson et al. 2006b; Rosa and Scheuerman 2009), or lock it into an unsustainable pathway instead (Carpenter and Brock 2008; Downey, Bonds, and Clark 2010).

[3] Although I recognize that there is a rich theoretical debate surrounding the concept of legalization itself, this research project, like other projects within the field of Arctic governance and Polar Law, builds on the definition used in the Special Issue of *International Organization* (2000) on "Legalization and World Politics." See Goldstein et al. (2000).

What remains missing from legal positivist theory is an engagement with questions related to stability and change. Built on a mechanistic, Newtonian ontology of linear change and equilibrium, it is insufficient at explaining how the law interacts and co-evolves with other systems – geophysical, biological, and economic. Instead, the law, as an instrument of governance, maintains a general acclaim of being able to provide stability by imposing order on complexity (Ruhl 1997). As such, it seeks to provide regular, continuous, and generally coherent international relationships, spanning large areas and long durations of time (Hathaway and Koh 2006, 22–23) by stabilizing expectations, constituting institutions, centralizing power, harmonizing norms, and reducing transaction costs (Ruhl 1997, 941; Abbott & Snidal 2009). There is also some recognition of law's capacity to change through legislative change, interpretive change, as well as administrative and contextual decision-making.

At the same time, though, there is no general theory of change in international law; no theory that can explain normative variability (as a critical system feature) in the Arctic system – and the tensions that arise therefrom – in a manner that is similar to ongoing discussions of the emerging material and social reality of the Arctic system, as referenced in regional and international scientific assessments (see for example ACIA 2004; Conservation of Arctic Flora and Fauna Working Group 2015; Arctic Monitoring and Assessment Programme 2017), in scholarship (see for example Carmack et al. 2012; Steffen et al. 2018), in policy-documents, and even by the media (see for example Rosen 2017).

Instead, dominant theories of international law, including legal positivist theory, often circumvent a focus on the structures and processes that promote stability *and* facilitate change, solely emphasizing the ability of law to promote the former (Brunnée and Toope 2010, 7; Finnemore and Sikkink 2008, 888). Even a significant part of constructivist theory in International Relations and International Law takes this approach, putting forward claims that actors conform to *logics of appropriateness* without necessarily focusing on how this logic might evolve over time (March and Olsen 1989, 160–62; Finnemore and Sikkink 2008, 888; see also Habermas 1996).[4]

However, a subset of constructivist scholars in International Relations and International Law take a different approach in recognizing that the legal system is embedded within other social processes that can maintain or hinder its own reproduction. International Relations theorists like Martha Finnemore and Kathryn Sikkink (2008, 894) are interested in explaining change. Their work on international norm dynamics and political change examines where norms — as standards of appropriate behaviour — and institutions — the ways in which behavioural rules are structured together and interrelate — come from, how they change, and the ways in which they change other features of the political landscape (Finnemore and Sikkink 2008, 888). In a similar vein, Jutta Brunnée and Stephen Toope's interactional legal theory (2010) understands the law as an emergent and dynamic process where shared legal understandings – embedded in the practices, beliefs and traditions of societies – must be developed, maintained and modified in a practice of legality (widely associated with the "rule of law").

Other non-positivist legal scholars, like Gunther Teubner (1993), point to the cognitive and administrative limits of law in managing complex systems, like the Arctic, or complex challenges, such as climate change.[5] Teubner argues that while legal characteristics like reductionism, linearity, and prediction

[4] I am specifically referencing the work of Slaughter, Tulumello, and Wood (1998) on the "dual agenda" of International Law and International Relations Theory in the *American Journal of International Law.*

[5] Seeking to overcome the limits of law, Niklas Luhmann and Gunther Teubner developed a theory of legal autopoiesis which does not assume that law can force change. Instead, it bases itself on the premise that the legal system is one of many social systems.

can foster some trust for adaptation to change, they can also lead actors to (falsely) believe that they can manage complex systems and challenges through piecemeal change, through the isolation of different parts of what is essentially an irreducible system. His argument coincides with a broader debate in International Relations and International Law scholarship on the fragmentation of international law — into human rights law, environmental law, trade law, etc. — and its consequent limitations as a tool of governance. It is "the epiphenomenon of real-world constitutional conflicts," Fischer-Lescano and Teubner (2004) argue, "as legal fragmentation is — mediated via autonomous legal regimes — a legal reproduction of collisions between the diverse rationalities within global society." As an example, Oran Young (2016c, xx) points to the fragmentation of Arctic Ocean governance directly:

> …the IMO is the lead agency regarding commercial shipping; each of the coastal states handles offshore energy development within its own EEZ, and efforts are currently underway to put in place some sort of issue-specific international regime capable of dealing with the possible development of commercial fishing. In many cases, the resultant interactions are dealt with on an ad hoc basis with the outcomes arising in specific cases determined as much by bureaucratic politics and the distribution of bargaining power among the key players as by principles of rational management or stewardship…

With no comprehensive plan, this approach leaves much to be desired and proves ripe for tension as the Arctic Ocean increasingly opens up and the worldviews of key actors begin to diverge.

These tensions are not just speculative; they are technical as well. A legal system is technically the conjunction of primary and secondary rules, the nuts and bolts of law. Primary rules tell us how to act; they are rules of obligation that bear directly on international legal subjects, at times requiring them to abstain from particular actions. Secondary rules are "rules about rules," conferring powers to "create, extinguish, modify, and apply primary rules" (Goldstein 2000, 403; Teubner 1993, 41). These foundational rules — surrounding legal personality, international law-making, the law of treaties, state responsibility, and the settlement of international disputes — provide a self-regulating mechanism (Teubner 1993, 41); a common set of legal and institutional concepts and ordering rules on which international lawyers rely when advising governments, negotiating treaties, or litigating cases. Yet, the horizontal structure of international law — where parallel international legal regimes have different internal logics embodying their respective normative biases — leaves ordering rules more unclear, thereby weakening positivist understandings of the law as a hierarchically-ordered imposition of social control, emanating from a sovereign state (Brunnée and Toope 2008).

Achieving coherence in the international legal system, in turn, means coordinating the preferences of horizontal international legal regimes based on context. In some cases, this process can distort our understanding of the international legal system (Young 2012, 10–11), obscuring legal pluralism by essentializing multiple conflicting worldviews (Roberts 2017) — including heuristics for how to respond to change — into a single set of ideas which may be far from optimal (Koskenniemi 2011, 27; March and Olsen 1989, 37–38; Young 2012, 113).

Current approaches as well as the two dominant, alternative proposals for Arctic environmental governance, outlined above, often disregard these foundational rules of law, thereby not accounting for the international system of law (Young 2012, 113). In addition to this, they fail to account for the vast array of laws, practices, customs, and traditions of Arctic Indigenous peoples (see for example Borrows 2017). In other words, I argue that they provide neither a solution nor a conceptual underpinning that can unpack the normative variability that arises out of the emerging material reality of the Arctic system. This mismatch gives rise to the question: do our current ways of thinking about the law and/or the structures of law need to change?

4. Law & Governance for Transformational Change

Scholars can turn to other areas of study to bridge the ingenuity gap (Homer-Dixon 2002, 7) between the rapidly rising need for legal innovation and its inadequate supply in Arctic environmental governance and Arctic scholarship alike. For instance, research in Earth systems science, on social-ecological systems, and Earth system governance all increasingly draw on a complex systems ontology to explore how different system components fit together, interact with one another, and respond to change. Earth system science, for one, maintains a greater awareness of the links between physical and biogeochemical processes (Weart 2008; Kotzé 2020), while a social-ecological systems framework (Ostrom 2005) provides scholars with the necessary concepts and tools – including theories of resilience and transformational change – to reflect on interdependent and co-evolving human-environment interactions within a system (Berkes, Folke, and Colding 2002). The concept of *resilience* – generally understood as the capacity of a social-ecological system to absorb or withstand perturbations, or other stressors, so that the system can essentially maintain the same structure, function, feedback, and identity (Gunderson and Holling 2002; Walker et al. 2006) – has garnered particular normative appeal in Arctic scholarship and policymaking. It reflects the degree to which a system has the capacity to self-organize, learn, adapt, and transform when necessary (Holling 1973; Gunderson and Holling 2002; Walker et al. 2004). System transformation is defined by a profound shift, triggered by endogenous and exogenous drivers, that alters human-environment interactions and feedback within a system (Walker et al. 2004). Law has a pervasive influence on both endogenous and exogenous drivers of change.

Together, these research frameworks provide a complementary understanding of stability and change (Blaikie et al. 2003; Cornell and Jackson 2013; Walker et al. 2004; Holling 1973; Anderies et al. 2013). Most importantly, though, they recognize that even relatively stable systems can become vulnerable when multiple stresses combine in a manner that magnifies and propagates their synergistic impact across different temporal and spatial scales (Costanza, Graumlich, and Steffen 2007, 269). They also point to alternative, competing stable states to which we, as a society, can choose to navigate to by adapting our behaviour, human values, equity, institutions, economies, and technologies and by removing barriers to change (Steffen et al. 2018, 8258; see also Walker et al. 2004; Westley et al. 2011; Westley and Antadze 2010; Olsson and Galaz 2012; Rockström et al. 2017; Geels et al. 2017; O'Brien 2018). Navigating to an alternative state stable state requires national and international institutions to fundamentally re-orient and restructure themselves (Biermann et al. 2012, 1306–7; Steffen et al. 2018, 8257; Kotzé and Kim 2019; Kotzé 2020) to cope with accelerating, non-linear change and increasing complexity. However, uncertainty and debate remain with regard to how this can be done – technically, ethically, equitably, and economically – which may explain the seeming reluctance of Arctic scholarship and scientific reports to extend their application of a complex systems ontology to assess the role of law and governance in the ongoing transformation of the Arctic system (see Nilsson and Koivurova 2016, 180).

Research on Earth system governance aims to take on this challenge by focusing on the role of organized human response – specifically institutions and agents – in steering the co-evolution of human-environment systems (Biermann 2007, 328). Even so, there is no "explicit, systematized and comprehensive research agenda focusing exclusively and comprehensively on the juridical dimensions of earth system governance." (Kotzé and Kim 2019). As a consequence, there is an increasing call for the inclusion of a juridical dimension in the study of Earth systems governance (see Kotzé and Kim 2019; Burch et al. 2019; Kotzé

2020) and for juridical science to embrace a complex systems ontology (Murray, Webb, and Wheatley 2019, 5; see also Ruhl 2008b).

Nascent legal scholarship at the nexus of law and resilience *already* embraces elements of this call to action. For instance, by applying a complex systems ontology to the regulatory system itself, thereby giving scholars like J.B. Ruhl (1997) concepts and tools to argue that the legal system, as a complex adaptive system, exhibits many of the same constitutive and behavioural properties of the complex systems it seeks to manage.[6] The literature also recognizes that a resilient whole (the Arctic system, for instance) is not necessarily defined by resilient components (such as a resilient legal system) (Ruhl 2008b, 908; 2011, 1382–83).

Generally, the law takes a normative approach to social resilience (Ebbesson and Hey 2013) by seeking to isolate the "good" from the "bad" through concepts, rules, procedures, and institutions (see also Ruhl 1997; 2008; 2012; Arthur 1994). In this case, social resilience is "the ability of human communities to withstand external shocks or perturbations to their infrastructure, such as environmental variability or social, economic, or political upheaval, and to recover from such perturbations" (Timmerman 1981). As I write in Chapter 4, the feedback generated from the limitation and prohibition of particular chemicals through the development of the *Stockholm Convention on Persistent Organic Pollutants* prevented their emission, as well as their negative impacts on the Arctic social-ecological system (Prior 2013; Fenge 2003).

At the same time, characteristics for which the law is often revered — including order, certainty, and predictability (Ruhl 1997; Ebbesson and Hey 2013) — can be of limited help when anticipating system transformation (Holling 2012, 37) and may, in fact, hinder the resilience of the system as a whole (Chapin 2010; Biggs, Westley, and Carpenter 2010). As I outline in Chapter 2, the ability of northern residents in Disko Bay, Greenland, to adapt their hunting and fishing practices to changing sea ice conditions — a practice which they have already acquired — is limited, even impeded, by current government regulations (related to hunting license distribution, quotas, harvesting regulations, etc.) (Arctic Council and Stockholm Environment Institute 2016, 107). Precisely because of instances like this, the law often appears to be conservative to change, making it difficult for various actors to envision how law could contribute to, or manage, change (Kotzé and Kim 2019; Kotzé 2020).

While Kotzé and Kim's (2019) call to action – for juridical science to embrace a complex systems ontology and *vice versa* – is promising, most of the research to date remains descriptive and theoretical, as opposed to empirical and prescriptive (Ruhl and Katz 2015, 23; Ruhl and Katz 2019, 150; see also Katz and Bommarito 2014; Murray, Webb, and Wheatley 2019; Kotzé 2020), and provides few insights on the application of complexity science to international law or to transboundary cases like the Arctic (Prior 2017). My research specifically seeks to respond to this call.

5. Engaging a Complex Systems Ontology to understand Arctic Environmental Governance

[6] Unlike Luhmann and Teubner's work on legal autopoiesis (see footnote 5), which takes a qualitatively different approach by removing the person from the system of law, scholarship at the intersection of law and resilience understands the legal system as emergent, comprised of a multitude of interacting and co-evolving actors, ideas, rules, and institutions — rights, obligations, and responsibilities — which lay the foundation for a self-organized structure that gives rise to complex systems dynamics like non-linearity, feedback loops, and path dependency.

With Earth system governance turning a blind eye to the role of legal doctrine until recently, and legal scholars' disparate involvement with a complex systems ontology, key elements have yet to be explored, including an in-depth engagement with specific tools and heuristics from complex systems theory. This leads me to the following lines of inquiry, earmarked for future research: Can a complex systems ontology – which is increasingly used to describe and understand Arctic geophysical and social-ecological systems – be usefully applied to the study of Arctic environmental governance? If so, what might it tell us about the capacity of law, as an instrument of governance, to manage change?

In my concluding chapter, I outline a prospective research agenda for a complex systems ontology and Arctic environmental governance. I argue that, unlike the dominant theoretical approach which currently underpins the study of Arctic environmental governance, a complex systems ontology provides a unique set of analytical concepts and tools that capture and exhibit a noteworthy comfort with many of the constitutive and behavioural characteristics of the Arctic system; including emergent phenomena, multiple agents, non-linearity, material social systems (composed of individuals) and natural systems. As such, a complex systems ontology provides both descriptive and normative insights by way of new vocabulary; by shifting the focus from the substance of law to how the law interacts with other systems; and by contributing to theories of change and transformation. For instance, it can help illuminate why international law, as a mechanism of governance, may contribute to sclerosis in the Arctic system and can help identify potential alternatives to the current system of governance.

Specifically, I propose a set of three complexity tools, two descriptive and one prescriptive – the WIT framework, the energy landscape metaphor, and the law of requisite variety – that can help us re-imagine the Arctic system and explore the role of international law in anticipating and responding to critical transitions therein (see Scheffer et al. 2012, 344).

5.1. WIT Framework

First, I introduce the WIT framework, an analytical framework originally developed by Rachael Beddoe et al. (2009) to identify coherent sets of interconnected and interdependent worldviews, institutions, and technologies – or WIT sets – which can act as barriers or openings to a "realignment of the way we view and interact with our surroundings" (2483).

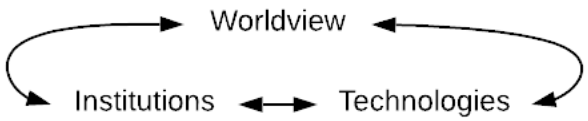

Figure 1: Interdependent, reinforcing WITs

Worldviews are mental networks of concepts, beliefs, and values that allow individuals and groups to interpret the world around them. While worldviews are neither normatively good, nor bad, they do provide boundary conditions, thereby guiding actions in response to selection pressures. In other words, they choose which institutions or technologies are used, which then feed back onto the system as a whole (Davidson 2010, 1142). For instance, they can privilege economic growth while postponing actions to mitigate and adapt to climate change (see Beddoe et al. 2009).

Institutions function as a normative expansion of our worldviews and are thereby central in maintaining stability within a system (see Pierson 2000, 256; North 1990, 3). Broadly speaking, they are both the formal and informal rules which guide our interactions; they range from complex international laws like the UNCLOS to unwritten cultural norms. They help reinforce particular worldviews and help determine how and when technologies are adopted by setting standards (Beddoe et al. 2009, 2484). By this logic, *technologies* – the knowledge, tools, and techniques that humans use to mediate their environment (Arthur 2009, 27; see also Lin 2013, 1–4; Galaz 2014, 133; Beddoe et al. 2009) – function as a material expansion of different worldviews, feeding back onto these worldviews and their respective institutions.[7]

Scholars can draw on this descriptive tool to identify dominant and alternative Arctic WIT sets and the ways in which they interact with the emerging material reality of the Arctic. While I introduce this tool in greater depth as a part of a prospective research agenda in Chapter 6, I make note of the co-evolution of Arctic norms and worldviews in relation to the rapidly changing material environment of the Arctic – across time and space – over the past three decades in the first five chapters of this dissertation.

I also include a discussion of how individual WIT variants may undergo *structural deepening*, a process whereby variants – worldviews, institutions, technologies – become steadily more complex by adding new functions, such as conditional sets of rules, and sub-systems in an effort to bring depth, improve performance, provide design sophistication, work around limitations, and enhance reliability within a competitive and co-evolutionary environment (Arthur 1994; 2009, 131-143; see also Homer-Dixon 2002, 105). As Brian Arthur (1994: 71) argues, "The steady pressure of competition causes complexity to increase as functions and modifications are added to a system to break through limitations to handle exceptional circumstances, or to adapt to an environment itself more complex." Structural deepening is, perhaps, most evident in relation to technological innovation with examples including the evolution of jet and automobile engines over the past half a century (Arthur 2009: 134; Homer-Dixon 2002, 105) or the evolution of shipping technologies designed for the Polar regions. However, this process is also visible in institutions, including legal arrangements where elaborations for special cases exist (see Chapter 3 discussion on Article 234; see also Kuhn 1962; Arthur 2009, 138), and in relation to worldviews, too. This process is important to observe, as structural deepening can lead a WIT set to become sclerotic over time.

In conjunction with the following tools, the WIT framework can also contribute a more nuanced analysis of the competition and co-evolution of Arctic norms and worldviews – in relation to the Arctic material environment (across time and space) – to a vibrant, ongoing discourse on Arctic governance.

5.2. Law of Requisite Variety

The ultimate test of the robustness of a WIT set is whether it can thrive and reproduce itself in relation to its material environment – does it fit or is there a mismatch? I argue that the adaptive capacity of a WIT set can be defined by a second, prescriptive complexity tool called the *law of requisite variety*. As I outline in greater detail in Chapter 6, the *law of requisite variety* (LoRV), a principle developed by cyberneticist Ross Ashby, proposes a positive correlation between the complexity of a problem (in this case, accelerating, non-linear change in the Arctic system), the complexity of the actors who are generating solutions to the problem (in this case, both state and non-state actors in and outside the Arctic), and the complexity of the

[7] Scholarship on causality in complex systems allows us to further unpack the combinatorial nature and synergistic causation of WIT sets, including how the three components interact and *feedback* on one another (Mahoney 2008; Mackie 1965, 246).

solutions themselves (in this case, current approaches to Arctic environmental governance) (Homer-Dixon 2006, 358; see also Klir 1992, 7:405; Ostrom 1995, 34; Bar-Yam 2004, 37).

The LoRV applies to any system that performs a regulatory process like our institutions, including international law (Raadt 1987, 517; see also Duit et al. 2010; Ruhl 1997; 2008b; Kim 2013). As a principle, it proposes that variety in a system must be controlled in order for regulation to be achieved successfully (see also Beer 1966; Jordana and Levi-Faur 2004, 164).[8] While it recognizes the impulse of actors to increase the variety in the regulatory system (Umpleby 1990; 2009), Ross Ashby argues for the reduction of the maximum possible variety to match the variety observed within the environment (Umpleby 2009, 232; see also Conant and Ashby 1970). Each WIT set must coordinate a variety of valid behaviours matched to the scale of each external condition (Bar-Yam 2004, 38–41). The simplest example given by Umpleby (1990, 231) is the need to match production capacity to customer demand. I outline the process in greater detail in Chapter 6.

The principle of the LoRV is useful in three regards: as a concept, as a measure, and as a guide. First, as a concept, the LoRV "links variety to regulation, adaptation, intelligence, and evolution" (Krippendorff 2009, 38), key concepts highlighted in my discussions of the WIT framework and the energy landscape metaphor. I am not the first scholar to observe its utility in relation to governance; the idea that institutional and organizational diversity and decentralization could improve society's adaptive capacity to complexity is now well-established (see for example Raadt 1987; Beer 1966; Duncan 1972; Downey and Slocum 1975; Miles, Snow, and Pfeffer 1974; Leifer and Huber 1977; Tushman 1979; Osborn 1977; Aulin 1982; Klir 1992; Ostrom 1995; Gadgil and Rao 1994). Second, as a measure, the LoRV can define the *adaptive capacity* of a WIT set; its ability to maintain an internal repertoire of valid possible (If-THEN) behaviour that corresponds with its surrounding environment. As such, this tool could help answer questions like: Does the current system of governance satisfy the LoRV? Why are we witnessing sclerosis in the Arctic system? Or, what happens when there is no LoRV? Third, it might point to a more effective regulatory response.

5.3. Energy Landscape Metaphor

For normative insight, I propose another complexity tool: the energy landscape metaphor. In simple terms, an energy landscape is a three-dimensional map of the spatial positions of all interacting entities within a system where the low points are *basins of attraction* – places of local stability or equilibrium – where a system is more likely to settle and stay because it requires less energy to be there. A system has multiple basins of attraction, some deeper than others. The high points are zones of instability from which a system is likely to move away from toward nearby basins. In search of a global optimum, even sub-optimal moves can improve the solution, jumping into another basin and settling into a new global optimum.

Widely used in the natural sciences (Gillespie 1984; Kauffman, Weinberger, and Perelson 2018; Weinberger 1991; Holland 1992), this metaphor paints a landscape familiar to many of us – including valleys, mountains, plateaus and cliffs (Homer-Dixon 2020a, 308) – and is thus easily transposed onto Beddoe et al.'s WIT framework. It highlights that WIT sets will gravitate toward a comfortable, deep basin

[8] Some scholars, like American physicist Yaneer Bar-Yam (2004), use *variety* and *complexity* interchangeably, essentially establishing the *law of requisite complexity* where a complex adaptive system must maintain and coordinate an internal repertoire of valid, possible (if-then) behaviors that correspond with the complexity of their surrounding environment across scales. In practice "this requires a balance between predictability and adaptability of the controller to face both the emergence and self-organization of the controlled" (Gershenson 2013).

(the valley) on the landscape while high points (or mountains) reflect unstable, incoherent WIT sets which eventually move into a basin. Deep basins of attraction surround stable, coherent, dominant WIT sets where dominant worldviews are reinforced by dominant institutions and technologies – it is essentially where interactions predominantly occur.

I argue that this metaphor can help define, understand, and visualize the co-evolution of dominant and alternative Arctic WIT sets over time. It provides a tool to (1) analyze the relative authority of competing WIT sets; (2) consider whether particular components of a WIT affect its stability; and (3) consider which practices and mechanisms may introduce instability, thereby contributing to transformational change within the system. Within the context of this research project, I am particularly curious to understand the role of institutions (the I), or current approaches to Arctic environmental governance. A note of caution, however: the energy landscape metaphor cannot necessarily tell us which WIT set – or individual WIT variants – to choose, moving forward.

6. Theoretical Contribution & Methodological Approach

This project is interdisciplinary, sitting at the intersection of three fields of research: complex systems theory, legal theory, and the study of Arctic (environmental) governance and Polar Law. As such, it seeks to contribute a set of findings to inform all three areas of research. Substantively, the project is a theory-building framework that seeks to elaborate and add testable dimensions to the intersection of complex systems theory and international law. It is particularly relevant due to a combination of governance challenges including multiple state and non-state actors, jurisdictions, and overlapping mechanisms for decision-making.

Empirically, this project is interesting due to the immediacy of the challenge and because there is a dearth of case studies on the role of law in transformational change (Ruhl and Katz 2015; Kotzé and Kim 2019; Kotzé 2020). Specifically, it responds to a call to action put forward by Kotzé and Kim (2019) for juridical science to embrace a complex systems ontology and *vice versa* by proposing a research agenda that will bring together a complex systems ontology and Arctic environmental governance through three specific complexity tools.

I draw on the Arctic as my overarching case study to illustrate numerous arguments and highlight instances where concepts and tools from complexity science could provide additional insight. As mentioned, the Arctic system provides a salient example because it is undergoing significant geophysical and social-ecological change, as well as a notable evolution in Arctic norms and worldviews. While I presume that the findings of this project will be useful beyond the Arctic, I do not make broader empirical claims about the ability of international law to manage change and recognize that further empirical work must occur in this regard.

Methodologically, a complex systems ontology seeks to move beyond reductionism in order to seek out complex patterns. In this way, it raises important questions about the implications of novel approaches to understanding international law and their utility moving forward. Instead of functioning as a testable theory, though, a complex systems ontology drives the method of a research project by first establishing the characteristics of the system (Davis, Sumara, and Sumara 2006; Marchand and Hilpert 2018, 32). This project is unique in bringing together both the natural and social sciences to define the Arctic system. Chapter 2, in particular, draws heavily from key scientific assessments and reports produced by intergovernmental bodies like the Intergovernmental Panel on Climate Change (IPCC) and the Arctic Council, as well as research published in the geophysical sciences.

In Chapters 1, 2 and 6, I identify concepts and methodological tools from complexity science which seek to unpack barriers and openings to change within systems. In doing so, I draw on literature from a variety of fields – including physics, cybernetics, biology, economics, and more – to define a complex systems ontology.

Chapters 3 through 6 build on a comprehensive literature review of scholarship in the fields of Polar Law and Arctic governance; policy documents; scientific assessments and reports; and publications produced by intergovernmental and non-governmental organizations. I define dominant descriptive and normative debates surrounding Arctic environmental governance by tracing terms, delineations, and debates through published literature and documents following salient references to other references, especially those of key civil servants and prominent academics to encompass the relevant discourse area. For the discussion of what remains missing, I primarily draw on literature in international law (including legal pluralism, transnational legal process theory, interactional legal theory, and legal autopoiesis), in

international relations theory (including international norm dynamics and political change), as well as research on Earth systems governance.

Chapter 2: The Nature of Change in the Arctic System

I first drafted this chapter in the Summer of 2018, as Europe experienced an excruciating heatwave (see McSweeney 2018). Perched in front of an electric fan in Austria, I would begin my days scanning the news for headlines related to the Arctic, an increasingly uncomfortable and disheartening practice. On most days, the news is unprecedented or unexpected, although I recognize that there are plenty of positive stories, as well. Many of those stories relate to human kindness and ingenuity, or to the vast, expansive beauty of the Arctic environment – neither of which are unprecedented, nor unexpected.

That summer, there was a steady stream of alarming headlines: Sweden was battling eleven wildfires above its Arctic Circle delineation (Anderson and Cowell 2018) while smoke plumes of aerosols – released by fires in eastern and northern Russia – traveled across Alaska into central Canada and onto the south of Greenland (NASA Earth Observatory 2018). Meanwhile, the village of Innaarsuit, Greenland, with a population of 169 hoped – with bated breath – that an 11-million-ton iceberg grounded on its coast – 650 feet wide and 300 feet tall – would not break apart and send a flood wave over its settlement (Adalbjornsson 2018). In both Sweden and Greenland, residents were evacuated from their homes. The satellite images were startling, highlighting the synergistic effects of environmental and anthropogenic stresses on an imperative part of our Earth system, what is essentially our planet's barometer.

One year later, sitting at my desk at the University of Waterloo on an uncharacteristically cold summer's day, the news surrounding the emerging material and social reality of the Arctic remains unprecedented and unexpected; for the first time in forty years, a hungry polar bear is spotted walking through the city of Norilsk, Russia, in search of food (Balmforth and Adasheva 2019), while a new study provides evidence that permafrost in the Canadian Arctic is thawing seventy years sooner than predicted (Farquharson et al. 2019). Hundreds of wildfires are ravaging parts of northern Siberia, northern Sweden, Alaska, and Greenland, leading to a significant decrease in air quality (BBC News 2019) and releasing an estimated 50 megatons of carbon dioxide into the atmosphere during the month of June (the equivalent of Sweden's annual emissions) (World Meteorological Organization 2019). Meanwhile, the Greenland ice sheet is in the middle of its biggest melt season (Holthaus 2019; Rising 2019); more than 10 billion tons of ice were lost by surface melt in one day on July 31st, 2019.[9] For scale, one billion tons of ice is the equivalent of 400,000 Olympic size swimming pools.

I think back on the policy-makers and industry leaders who stood hopeful at the Arctic Resilience Assessment workshop in Washington D.C. in 2015; I wonder how hopeful they are today, whether their worldviews of what the Arctic *is* are shifting, and whether this impacts how they seek to manage these unprecedented and unexpected changes.

***

Over the past three decades, the Arctic has undergone significant, system-wide change; "[t]oday's Arctic is a new environment, evolving rapidly and in unexpected ways" (Arctic Monitoring and Assessment Programme 2017, ix). Locally, Sheila Watt-Cloutier (2015, viii) has seen "what seemed permanent begin

[9] This added to a net mass ice loss of 197 billion tons for the full month of July. See Rising (2019).

to melt away. The Arctic ice and snow, the frozen terrain that Inuit life has depended on for millennia, is now diminishing in front of our eyes." Meanwhile, tightening links between a rapidly changing Arctic and our global systems — environmental, economic, and more — are raising various concerns, including for Arctic environmental governance.

First, I introduce a complex systems ontology which I then use to define the Arctic system as an open, integrated, dynamic and complex system. Once defined, I focus more specifically on the nature of change in (1) Arctic non-living systems, and (2) Arctic living systems, and how they are linked. Drawing on a complex systems ontology, I unpack the emerging material reality of the Arctic system, as it shifts from a relatively closed environment to one which is increasingly open for extended periods of time (particularly during the summer months). I also examine some causal feedback mechanisms within its geophysical system, including phenomena like Arctic amplification and the circumpolar vortex. Following this, I explore the emerging social reality of the Arctic system as its living systems, including its biological and social systems, interact with a rapidly changing material environment within a tightly coupled system. I provide specific examples of shifts in human-environment interactions, some of which are opening the Arctic to new risks and opportunities. I focus on five areas in particular: marine and terrestrial access, human land-use, extreme weather hazards, biodiversity and marine ecosystems, as well as industrialization and development.

Finally, I point to the area which I am most interested in exploring; how the emerging material and social reality of the Arctic is reshaping, or transforming, how we understand the Arctic and, in turn, how we seek to manage it. I argue that while our research frameworks increasingly embrace elements of complexity science to explore variation in the Arctic environment (and some social systems), these frameworks rarely extend to the study of normative variation in Arctic environmental governance. Over the course of the following chapters, I seek to change this.

1. The Arctic: A Complex System

As noted in the introductory chapter, few research projects on Arctic environmental governance begin here. Often, they reference that the Arctic is changing rapidly but rarely, if ever, does this research provide a more nuanced understanding of how accelerating, non-linear change within the Arctic system takes place. There is good reason for this; for one, because scholars often lack the necessary vocabulary to describe the nature of this change; and second, because the Arctic is most-often defined by geography or sector, in terms of issue area. By engaging with complexity science, I seek to provide an alternative understanding of Arctic environmental governance.

1.1. Engaging Complexity Science

What is complexity science? Over the past several decades, complexity science has emerged as an inter-discipline composed of numerous research traditions with diverse methodological agendas including mathematics, physics, systems engineering, cybernetics, and meteorology. More recently, research in ecology, economics, political science, and the law have employed its analytical tools, theories, concepts, and methods to contribute insights on the behaviours of a variety of systems ranging from marine ecosystems, to the U.S. tax system, to our global financial markets, phenomena like the 2008 global financial crisis, and most recently the Coronavirus pandemic.

I draw on complexity science precisely because it eschews various disciplinary boundaries, thereby allowing me to employ its unique set of analytical tools, theories, concepts, and methods which capture and exhibit a remarkable comfort with many of the constitutive and behavioural characteristics of the Arctic system. At its ontological core, complexity science provides a more precise understanding of causation which makes it particularly valuable in studying the co-evolution of various components, as well as sclerotic behaviour, within the Arctic system (see Schellnhuber et al. 1997).

So, what is a complex system? Thomas Homer-Dixon et al. (2015, 7) define a *system* as a "set of causally connected entities that can be considered as a whole and has sufficiently strong homeostatic mechanisms to persist as an identifiable whole over an extended period of time." A system is complex, in a technical sense, when it exhibits several key features.[10] These include constitutive characteristics like thermodynamic openness, feedbacks, synergistic causation, diversity, competition, connectivity, and decentralization. A complex system also exhibits behavioural characteristics, such as emergence, self-organization, non-linearity, unpredictability, multiple equilibria, path dependency, and sensitivity to initial conditions (Homer-Dixon 2020b). I highlight these features in my description of ongoing changes in Arctic non-living and living systems below.

More precisely, complex systems consist of various individual entities, components, or parts (Homer-Dixon 2007).[11] A system's complexity, in turn, arises out of a dense web of causal connections and recursive interactions between these individual elements.[12] Generally, they show a high degree of combinatorial interaction and synergy, as well as causal feedback across temporal and spatial scales (Berkes, Folke, and Colding 2000, 6), emerging into a whole which is greater than the sum of its parts.[13] Within such a complex system, positive feedback amplifies an initial change and creates a self-reinforcing spiral, often leaving the system unstable, while negative feedback is homeostatic, counteracting the initial change and thereby helping to maintain stability in the system (Stacey 1995). The greater the connections, the greater the complexity of the system. The emergence of a single, tightly coupled human social-ecological system of planetary scope serves as a salient example of such a complex system (Homer-Dixon et al. 2015: 6).

At times, complex systems exhibit non-linear behaviour, where a change in one part of the system can have a disproportionate effect on the whole, either reinforcing continuity or generating change. A small change can produce a large effect, or a large change can produce a small effect, or no effect at all (Pierson 2000, 251). Non-linear behaviour within a system is highly contingent on known and unknown factors – which makes prediction difficult – and can accrue over time, eventually reaching and crossing an unseen, often unexpected threshold (or tipping point) that can be difficult to reverse. In addition to this, it is crucial to note that complex systems are not self-contained leaving them open to outside events (Homer-Dixon 2011, 2).

Complex systems can be further broken down into complex non-adaptive systems, like our geophysical systems, and complex adaptive systems, such as our social systems. As noted in Chapter 1, complex non-adaptive and complex adaptive systems share many common features including constitutive properties,

[10] Although there is neither a common definition, nor a commonly accepted way of measuring complexity, various scholars have identified several distinct characteristics. See, for example, Mitchell (2009, 4); Bar-Yam (1997, 10); Holland (1992, 21); Holland (2014); see also Westley, Patton, and Zimmerman (2007, 7); Homer-Dixon (2011).
[11] While necessary, the multiplicity of these parts is insufficient to make a system complex.
[12] This constitutive property is what differentiates a complex system from a complicated one.
[13] In other words, this system exhibits novel properties which cannot be explained by the properties of its individual components.

such as synergistic causation, and behavioural properties, like non-linearity (Homer-Dixon 2020b). In addition to this, complex adaptive systems have a living component: individual agents or groups with internal representations of the external environment and heuristics for how a system should respond to change. These heuristics often inform the creation and implementation of law. While these internal representations are often robust and persistent, they can be far from optimal and are subject to selection pressures.

1.2. Defining the Arctic System

Based on a complex systems ontology, the Arctic is an integrated, dynamic and complex system. As such, the Arctic system comprises various individual components which interact in a synchronized manner leading to the emergence of a single, tightly coupled system with multiple equilibria (Strogatz 2004). This system is open and permeable to both energy and mass, which makes it difficult to define its boundary.

In fact, there is widespread recognition of this reality; one can hardly attend an Arctic-related event or read an Arctic-focused report, academic article, or even the news media without hearing the phrase "What happens in the Arctic doesn't stay in the Arctic."

More specifically, though, the complexity of the Arctic system stems from its dense web of causal connections and recursive interactions between individual system components including its complex non-adaptive systems like its geophysical systems, and its complex adaptive systems such as its biological, social, political, economic, and legal systems. These components interact and feed back onto the Arctic system. Like other complex systems, the Arctic system also exhibits characteristics like non-linearity.

As noted earlier, there is also a general recognition that the Arctic system has undergone significant, large-scale transformational change – a shift which has profoundly altered human-environment interactions and feedbacks within the system – over the past three decades (Nilsson and Koivurova 2016). This transformation was contingent on both known and unknown factors within its non-adaptive and adaptive systems, making prediction particularly difficult. Understanding this reality is crucial as we begin to investigate the role of international law in managing such transformational change in the Arctic system.

To provide a more fine-grained overview, I highlight some significant changes in both Arctic non-living (or complex non-adaptive system) and living systems (complex adaptive systems) below.

2. Changes in Arctic Non-Living Systems

The emergent Arctic geophysical system maintains a dense web of causal connections between its geological, hydrological, cryospheric and climatic components (Khalil 1995). The connectivity and nature of interactions between these components can either reinforce stability or generate change in the Arctic system as a whole.

One of the most significant changes in the Arctic geophysical system to date — and a salient example of positive feedback in the Arctic system — is the transition from old, multi-year Arctic sea ice to younger, thinner, and more mobile ice (see Appendix 1). Since the late 1980s, the volume of ice floating on the Arctic Ocean has declined by at least half (Rosen 2017, 152; see also Meier et al. 2014; Francis, Vavrus, and

Cohen 2017; Steffen et al. 2018).[14] In March 2017, the Arctic sea ice maximum extent was at a record low at 14.42 million square kilometres – the lowest maximum extent since satellite records of sea ice were first collected in 1979 (see also Figure 2 for minimum sea ice extent, September average). This shift from multi-year Arctic sea ice to thinner ice is substantial, contributing to a reorganization of the internal dynamics and feedback mechanisms of the Arctic system (Arctic Monitoring and Assessment Programme 2017).

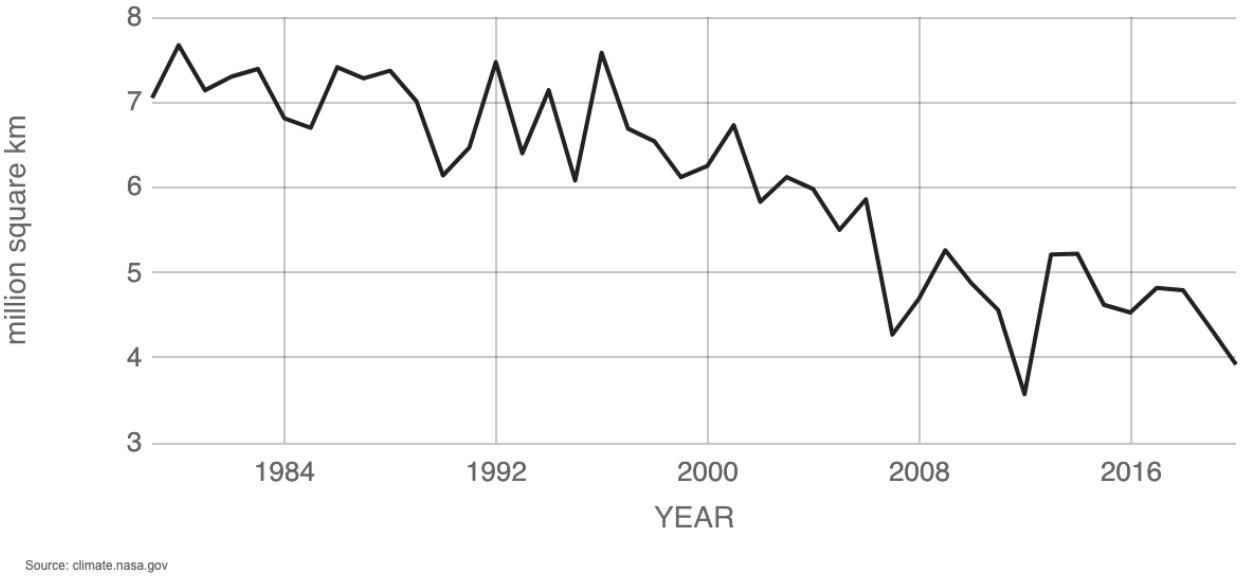

Figure 2: Arctic Sea ice Minimum Extent (September Average).
(Data Source: Satellite observations, Source: NSIDC/NASA)

The phenomenon of Arctic amplification – the critical, self-reinforcing feedback generated by a combination of (unabated) greenhouse gas emissions and positive ice albedo feedback – is particularly important in explaining why and how this transition from older to younger sea ice occurs. Over past centuries, the whiteness of Arctic sea ice reflected much of the sun's energy back into the atmosphere, thereby keeping the Arctic atmosphere cold by physically insulating it from the heat of the Arctic Ocean (National Snow and Ice Data Center 2009).

[14] Evidence provides that, between 1975 and 2012, the sea thickness of the central Arctic Ocean declined from 3.6 metres to 1.3 metres, a change of 65 percent (Arctic Monitoring and Assessment Programme 2017, 10, 12). Between 1979 and 2013, the average number of days with sea ice cover in the cold, northern-most parts of the Arctic Ocean declined by ten to twenty days per decade within the same approximate time frame (1979-2013) (Arctic Monitoring and Assessment Programme 2017, ix). During this same time period, between 1979 and 2012, the annual mean Arctic sea ice extent decreased (very likely) by 3.5 to 4.1% per decade and 9.4 to 13.6% for the summer sea ice minimum (perennial sea ice) (Intergovernmental Panel on Climate Change and IPCC 2013). More recently, the nine years between 2007 and 2015 saw the nine lowest sea ice extents (Arctic Monitoring and Assessment Programme 2017, 10, 12).

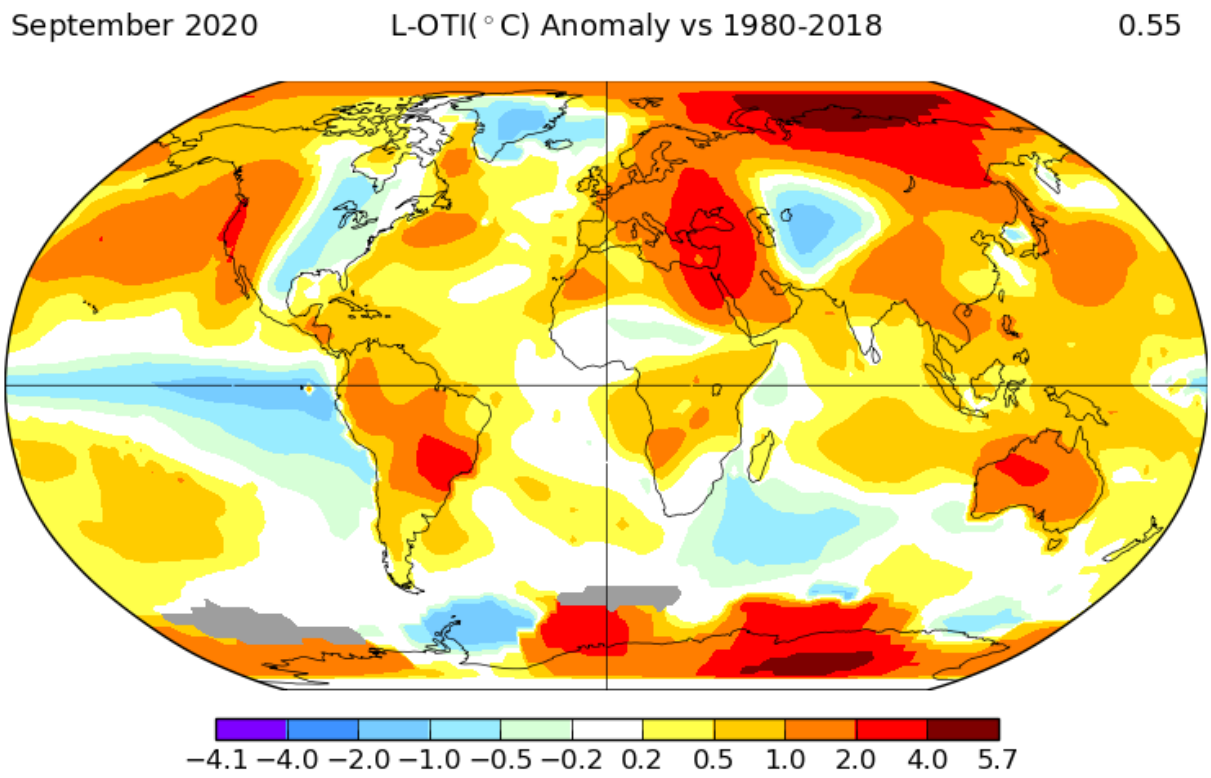

Figure 3: Linear trends in annual mean surface air temperature, 1980-2018 based on the National Aeronautics and Space Administration Goddard Institute for Space Sciences (NASA GISS) temperature analysis. The inset shows linear trends over the 37-year analysis period averaged by latitude.[15]

However, with a decline in Arctic sea ice and more of the dark Arctic ocean exposed, the energy of the sun is readily absorbed during the summer months – this thermodynamic process heats the ocean and causes sea ice to melt even more (see Figure 4).[16] First-year sea ice is proving to be particularly volatile and inefficient, absorbing up to fifty percent more solar heat in the ice-ocean system than older, multi-year sea ice.[17] The energy created therefrom remains concentrated near the Earth's surface, contributing to the warming of the Arctic, as well as wide-spread, rapid but non-uniform acidification of parts of the Arctic Ocean like the Chukchi Sea (Durfee and Johnstone 2019, 28; AMAP 2013; Cheek 2014).[18] Beginning in

[15] GISTEMP Team, 2020: *GISS Surface Temperature Analysis (GISTEMP), version 4*. NASA Goddard Institute for Space Studies. Dataset accessed 2020-11-12 at data.giss.nasa.gov/gistemp/.

[16] At this time, there are three processes which are reducing the albedo effect of Arctic sea ice: dark supraglacial lakes form on top of the ice as it melts, thereby absorbing more of the sun's heat; black carbon due to the incomplete combustion of fuels which darkens the surface of sea ice; and darker-coloured algae and bacterial bloom which grow in crevices and holes in the ice. See Leeson et al. (2015); see also Durfee and Johnstone (2019, 31).

[17] Arctic sea ice is dependent on inter-annual variability, growing in autumn and the winter months, only to melt in spring and summer.

[18] The Arctic Ocean is more susceptible to ocean acidification than other oceans because CO_2 is more soluble in cold water than in warm water, thereby making it easier for the Arctic Ocean to take up more CO_2. What is more, as sea ice retreats, open water will allow for more direct CO_2 uptake into the ocean, thus lowering the ocean's pH level. An

the 1980s, the *synergistic causation* of this warming period is attributed to natural atmospheric variability with substantial contributions from anthropogenic forcing,[19] ultimately culminating in a striking change in the near-surface air temperature of the Arctic, averaging out at two to four times the global average rate over the past fifty years (Screen and Simmonds 2010).[20]

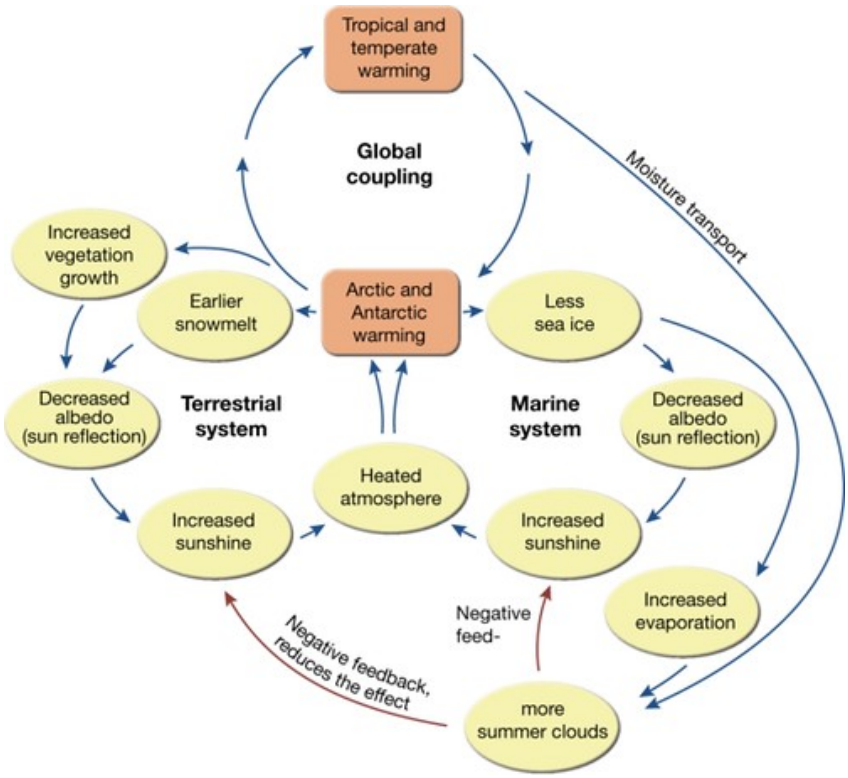

Figure 4: Climate change - ice and snow and the albedo effect (Source: Grid-Arendal)[21]

influx of freshwater from rivers emptying into the Arctic Ocean further contributes to a lowering of the ocean's pH level. See Cheek (2014); Assessment (2013).

[19] A significant focus is placed on the current period of Arctic warming, beginning in the 1980s. However, this is not the first time that the Arctic has experienced significant warming; the noteworthy difference being that today's warming is attributed to anthropogenic forcing in addition to natural atmospheric variability. Previously, between the 1920s and 1940s, the Arctic experienced warming in its higher latitudes – reaching 1.7°C – comparable to the warming experienced across all latitudes in the Arctic today (Yamanouchi 2011; Johannessen et al. 2004; Overland et al. 2004; Jones, New, and Parker 1999; Serreze and Francis 2006; Polyakov et al. 2008; Polyakov et al. 2003). The area witnessed a concurrent decline in Arctic sea ice. Causal factors are attributed to intrinsic internal natural climate variation combined with positive feedback that amplifies radiative and atmospheric forcing (Yamanouchi 2011). This period was followed by an intense build-up of sea ice during the first half of the 1960s (Kauker et al. 2008).

[20] Uncertainty remains as to whether this warming period is the result of regional forcing, or global forcing with a regional impact (Yamanouchi 2011; see also Shindell and Faluvegi 2009).

[20] Forests, fisheries, hydrologic cycles, atmospheric and terrestrial sinks are all experiencing enormous strain (Homer-Dixon et al. 2015).

[21] Hugo Ahlenius, UNEP/GRID-Arendal, 2008. Access at: http://old.grida.no/graphicslib/detail/climate-change-ice-and-snow-and-the-albedo-effect_1597.

Understanding these phenomena is important because recent changes in thermodynamic processes like the exchange and transport of material energy within the Arctic, as well as between the Arctic and the atmosphere (this process is defined as *thermodynamic openness*), exceed projections (Arctic Monitoring and Assessment Programme 2017; see also Overland 2020). Since 2000, NASA has observed a significant increase – five percent compared to a flat rate globally – in solar radiation absorbed by the Arctic Ocean in June, July, and August (see Figure 5). Averaged out across the Arctic Ocean, the rate absorbed amounts to 10 watts per square meter during the summer. Sub-regionally, areas like the Beaufort Sea have seen an increase of 50 watts per square meter; as I mention in my introduction, "No other region on Earth shows a trend of [such] potential long term change." (Finneran and Lynch 2014).

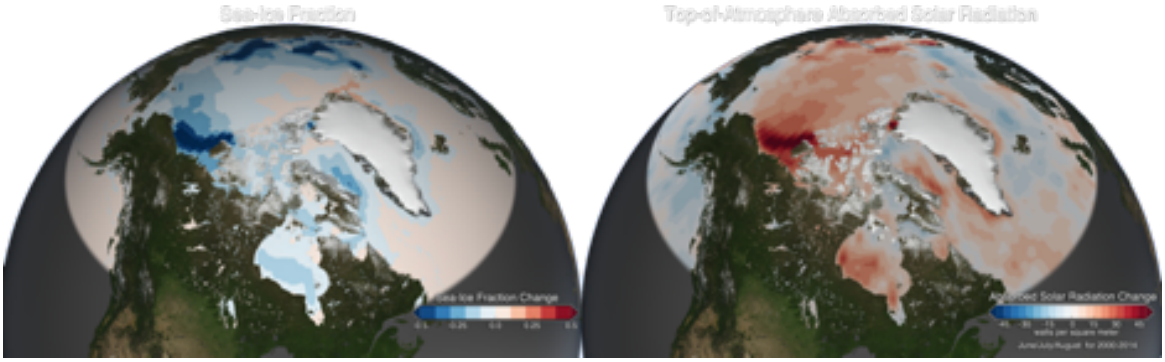

Figure 5: Side-by-side comparison, Sea Ice Fraction and Top-of-Atmosphere Absorbed Solar Radiation Change (Source: NASA's Scientific Visualization Studio, The Blue Marble data is courtesy of Reto Stockli (NASA/GSFC))[22]

This boost of material energy has significant implications for polar ecosystems, ice-sheet mass balance, and human activities in the North (Arctic Monitoring and Assessment Programme 2017, ix–x; see also Screen and Simmonds 2010; Rosen 2017; Overland 2020). For one, the Arctic hydrological system – the entire cycle of water movement – is hyper-energized. Protracted periods of open Arctic waters contribute to ocean heat fluxes in the Atlantic Ocean and ice albedo *feedback* in areas like Hudson and Baffin Bay (Arctic Monitoring and Assessment Programme 2017, 104). These ocean heat fluxes further feed back onto the global system with potential impacts on global precipitation patterns and ocean currents, contributing to greater winds (Carmack et al. 2012; AMAP 2018). Both minor and major variations in water temperature and geothermal heat flux further influence permafrost melt – a sensitive indicator of climate change – and the release of mercury and methane into our atmosphere (Portnov, Mienert, and Serov 2014, 2082).[23]

Increased *connectivity* between the Arctic system and the global system is noticeable in other areas, too. Arctic warming has consequences for snow cover, land-based ice, and weather – other sensitive indicators of climate change – outside of the Arctic, as well (Mann et al. 2017; Arctic Monitoring and Assessment

[22] See https://svs.gsfc.nasa.gov/4245 (last accessed: January 13, 2021).

[23] Methane and water vapour, both powerful greenhouse gases, feed back onto the Arctic system causing further warming (Arctic Monitoring and Assessment Programme 2017, x). See also Francis, Vavrus, and Cohen (2017); Francis and Vavrus (2012).

Programme 2017). A reduction in snow cover, which strongly affects thermodynamic ice growth, has reached record low levels in North America and Eurasia (Shi et al. 2013); the accelerated loss of land-based ice from ice caps and glaciers is expected to impact global sea-level rise (Arctic Monitoring and Assessment Programme 2017, 267); and numerous studies connect Arctic amplification to extreme weather (Francis, Vavrus, and Cohen 2017; Francis and Vavrus 2012).[24]

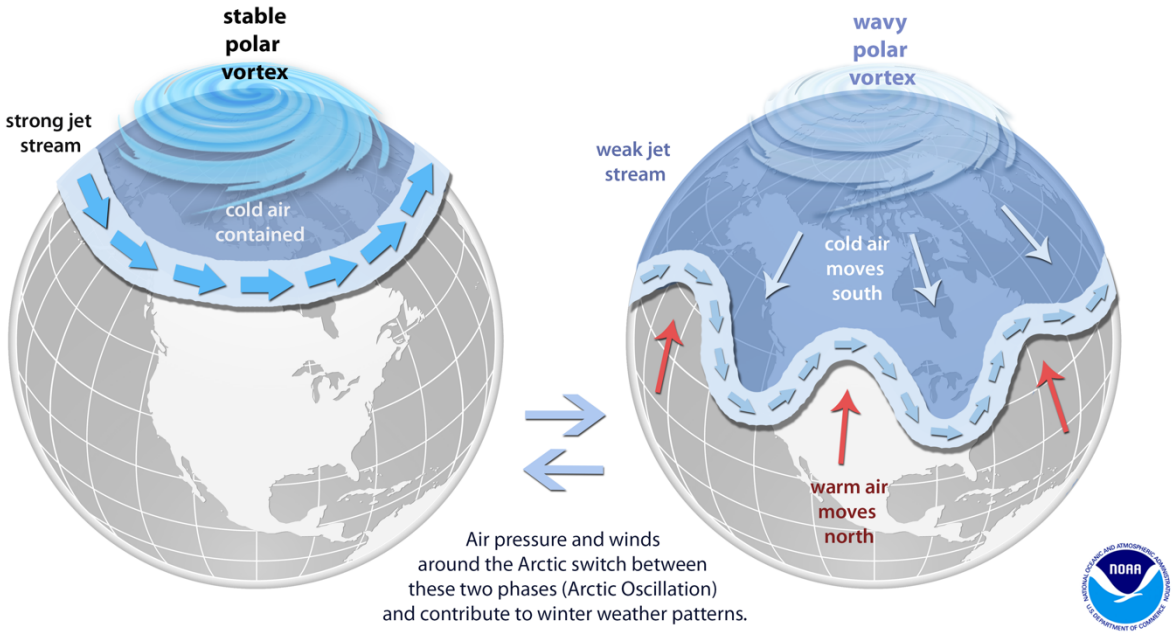

Figure 6: Illustration of the Circumpolar Vortex (Source: National Oceanic and Atmospheric Administration 2016)

Phenomena like the circumpolar vortex (see Figure 6) – a fast-moving high-altitude river of air, steering storm systems across the northern hemisphere – interact with reduced sea ice in both North America and Eurasia to alter and, at times, produce extreme and *unpredictable* weather events – droughts, flooding, cold spells, and heat waves — both locally and in lower altitudes (Stroeve et al. 2012; Francis, Vavrus, and Cohen 2017).[25] For instance, scholars observed clear links between sea ice reduction near Alaska and persistently cold winters in eastern North America during the winters of 2013/14 and 2014/15 (Francis, Vavrus, and Cohen 2017; Lee, Hong, and Hsu 2015; Kug et al. 2015).

[24] For instance, a melting Greenland ice sheet, together with melting ice caps in Iceland, Canada, Russia, and Norway's Svalbard Islands, is substantially contributing to global sea-level rise (Durfee and Johnstone 2019, 31).
[25] The vortex is stable when cold air is contained by a strong jet stream in the North; meanwhile, it is weak when the jet stream is wavy with cold air moving south and warm air moving north (National Oceanic and Atmospheric Administration 2016).

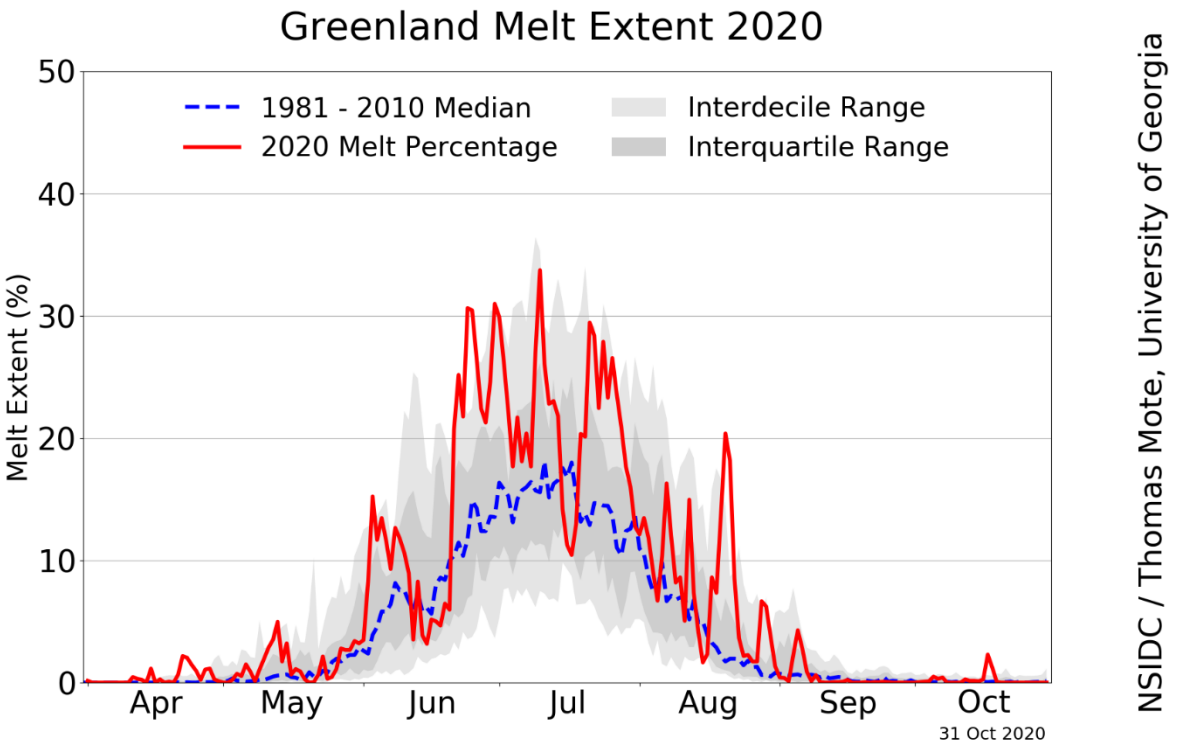

Figure 7: Greenland Melt Extent 2019, shows ice melt in Greenland 2020 versus 1981-2010 median (Source: National Snow and Ice Data Center (US)/Thomas Mote, 2020)

Future outlooks for the Arctic system paint the picture of a starkly different geophysical area even from today. James Overland at the U.S. National Oceanic and Atmospheric Administration expects a future best-case scenario with an Arctic temperature rise of 4-5°C (Rosen 2017, 153). Experts are also fairly certain that, by 2030, the Arctic Ocean is on course to being ice free during the summer months (Wang and Overland 2009; Massonnet et al. 2012; Overland and Wang 2013; Rogers et al. 2015; Arctic Monitoring and Assessment Programme 2017).[26] By the end of the 21st century, Arctic warming will exceed thresholds for the stability of both Arctic sea ice and the Greenland ice sheet, which is already melting at an accelerating rate and could contribute to *non-linear* climate change (see Figure 7; Steffen et al. 2018; Francis, Vavrus, and Cohen 2017; Rignot 2008; Pritchard et al. 2009).[27] Meanwhile, notable uncertainty

[26] A sub-set of Representative Concentration Pathway (RCP) scenarios (RCP 8.5) – greenhouse gas concentration pathways developed by the IPCC – project *(medium confidence)* a nearly ice-free Arctic Ocean in September before mid-century (IPCC 2014). Recently observed data suggests that the Arctic Ocean will be largely ice-free in summer by the late 2030s, although precise predictions are impossible due to natural variability and the limitations of climate models (Arctic Monitoring and Assessment Programme 2017, vii–viii; Larsen et al. 2014). For instance, natural variability might compensate for anthropogenic GHG forcing leading to multi-year periods without ice loss. Nevertheless, long-term forcing is set to dominate. Climate model limitations include: (1) an incomplete understanding of the climate-cryosphere system; (2) different ways of representing the world; (3) in-built natural variability in climate models producing different results; and (4) uncertain future emissions. See Arctic Monitoring and Assessment Programme 2012.

[27] According to Hamilton et al. (2016), "Cascades could be formed when a rise in global temperature reaches the level of the lower-temperature cluster [1-3°C], activating tipping elements such as loss of the Greenland Ice Sheet or Arctic sea ice." Ice sheets constitute very large areas of land spanning a minimum of fifty thousand square miles. Greenland's

remains as to what will happen to ocean currents as the Arctic changes (Durfee and Johnstone 2019, 31). Most strikingly, though: at its current rate, and based on current predictions, the Arctic will not return to previous conditions and is likely to further compromise the resilience of the Earth system as a whole (Rosen 2017, 152).[28]

3. Changes in Arctic Living Systems

In addition to significant, large scale change in the Arctic geophysical system, existing research draws on a social-ecological systems framework to explain ongoing shifts (understood as secondary effects) in human-environment interactions, including in biological, social, political, and economic systems. Reports and assessments including the 1997 Arctic Monitoring and Assessment Programme *Arctic Pollution* report, the 2004 *Arctic Climate Impact Assessment* (ACIA), the 2007 and 2014 *Intergovernmental Panel on Climate Change* (IPCC) *Assessments*, the 2004 and 2014 *Arctic Human Development Reports* (AHDR), the 2016 *Arctic Resilience Report* (ARR), and the 2017 *Snow, Water, Ice, and Permafrost Assessment* (SWIPA) all highlight how changes in the Arctic geophysical system can lead to major changes in ground hydrology, vegetation, and marine production (including fisheries); more wildfires and permafrost thaw; and the conversion between terrestrial and aquatic ecosystems (Arctic Monitoring and Assessment Programme 2017, 259). These "interactions add further confidence to a self-consistent story of continuing Arctic change…" (Arctic Monitoring and Assessment Programme 2017, 21) and pose challenges for the lifestyles, cultures, and socio-economic well-being of northern communities.

Below, I provide a concise overview of how the emerging material reality of the Arctic system is impacting and increasingly linking human-environment interactions, as identified in the 2017 SWIPA (Arctic Monitoring and Assessment Programme 2017, 258). These include changes in marine and terrestrial access, human land-use, extreme weather hazards, biodiversity and marine ecosystems, as well as industrialization and economic development.

ice sheet covers approximately 656,000 square miles, flowing from the centre outward through its glaciers. Between 2011 and 2014, "the balance tipped dramatically…when satellite data and modeling suggested that 70% of the annual 269 billion tons of snow and ice shed by Greenland was lost through surface melt, not calving. The accelerating surface melt has doubled Greenland's contribution to global sea level rise since 1992–2011, to 0.74 mm per year." See Kintisch (2017).

[28] Our ability to predict future changes in the Arctic require a better understanding of feedbacks in the Arctic cryosphere, and more confidence in how we predict interactions between the Arctic and global systems (Arctic Monitoring and Assessment Programme 2017, xiii). Still, RCP scenarios (RCP 8.5) provide evidence of a substantial refreezing of the Arctic Ocean in the late 21st century (Collins et al. 2013; Intergovernmental Panel on Climate Change and IPCC 2013; see also Steffen et al. 2018; Rosen 2017, 154). Further research suggests that the threshold is dependent on GHG concentrations and how long the region has been ice-free in summer (Rosen 2017, 154). Chapter 12 (p. 12) of the 2013 IPCC report on "Long-Term Climate Change: Projections, Commitments and Irreversibility" notes that "there is little evidence in global climate models of a tipping point (or critical threshold) in the transition from a perennially ice-covered to a seasonally ice-free Arctic Ocean beyond which further sea ice loss is unstoppable and irreversible." See Barnosky and Hadly (2016); Barnosky et al. (2012); Francis, Vavrus, and Cohen (2017) for a better understanding of how it could compromise the resilience of the Earth system as a whole.

3.1. Marine and Terrestrial Access

Changes in Arctic sea ice, snow cover, and land ice can have significant consequences for marine and terrestrial access in the Arctic. On the one hand, an increasingly open Arctic Ocean provides novel opportunities for resource development, tourism, commercial shipping, and sub-Arctic fishing.[29]

On the other hand, in pursuing these opportunities, the same geophysical dynamics that open the Arctic can often present governance challenges as well. For instance, research by Steinberg, Kristoffersen, and Shake (2020) shows that sea ice cover on the Barents Sea has declined more than in any other part of the Arctic. Although future projections remain uncertain (Blanchard-Wrigglesworth et al. 2017; Serreze and Stroeve 2015), there is certainty that many of the phenomena outlined above, including ice-albedo feedback, have contributed to its current state which includes increasingly open waters and cascading impacts on local biota (Arrigo et al. 2014; Barber et al. 2015). At the same time, the Barents Sea contains significant undiscovered hydrocarbon deposits (Norwegian Petroleum Directorate 2018) and is designated a "workable Arctic" by Norway's state oil company *Equinor* (Steinberg, Kristoffersen, and Shake 2020). Making this part of the Arctic workable, though, requires the Norwegian state to identify the ice edge as the Norwegian Lofoten-Barents Management Plan prohibits exploration in environmentally sensitive zones, including "areas along the edge of the marginal ice zone and the polar front" (Nowegian Ministry of Environment 2011, 137). Yet, as Steinberg, Kristoffersen, and Shake (2020, 90) write, this seemingly simple task remains elusive as the ice edge becomes increasingly dynamic and so, "Making the Arctic workable…occurs at specific moments, when certainties and simplifications are applied to complex biogeophysical processes, reducing them to bounded spaces that can then be used to sanction human activities (most notably, resource extraction).".

Meanwhile, changing land-ice can hinder marine and terrestrial access to remote, northern communities in Alaska and Canada – only accessible by ice roads – with direct implications for their food and economic security, as well as their health and general well-being (Emmerson, Lahn, and Lloyd's 2012, 15; see also Steffen et al. 2016; Lenton 2011).[30]

3.2. Human Land-Use

Human land-use in the Arctic is changing, as well. A warming Arctic, thawing permafrost, reductions in terrestrial snow cover, and freshwater ice affect overland transportation for community resupply, industrial transport, foraging and winter subsistence hunting (Arctic Monitoring and Assessment Programme 2017, 264). Thawing permafrost not only releases methane into the atmosphere, thereby contributing to Arctic warming, but also destabilizes infrastructure – roads, bridges, and pipelines – which requires significant financial resources (in the realm of billions of US dollars) for maintenance and/or replacement (Arctic Monitoring and Assessment Programme 2017).[31] In Norilsk, Russia's largest Arctic

[29] The long-term synergistic effects of resource development, tourism, and commercial shipping remain largely unknown.

[30] Based on the 2014 IPCC report, "Impacts on the health and well-being of Arctic residents from climate change are significant and projected to increase – especially for many Indigenous peoples (high confidence). [28.2.4]" (Larsen et al. 2014, 1571)

[31] The Auditor General of Canada to the Northwest Territories (NWT) estimates approximately CAD$51 million worth of damages to infrastructure annually due to thawing permafrost (National Round Table on the Environment and the Economy 2009) and a cost of CAD$230 million to adapt vulnerable buildings in the NWT moving forward (Beers 2017). Meanwhile, the estimated cost of moving an Alaskan community in the face of such challenges was

city, sixty percent of its buildings are already sinking and disintegrating (Luhn 2016). In Iqaluit, Canada, melting permafrost is exacerbating existing housing shortages leading the city into a full-on housing crisis (Schreiber 2018). The realities of melting permafrost – a consequence of climate change – are highlighted in a petition presented to the *Inter-American Human Rights Commission* by Sheila Watt-Cloutier, with the support of the Inuit Circumpolar Council and 62 hunters, in 2005 (see Watt-Cloutier and Inuit Circumpolar Conference 2005). In Chapter 4, I note some of the increasing linkages between living and non-living systems highlighted in the Petition and examine some of the governance challenges that arise when non-state actors, such as the Inuit, draw on regional human rights mechanisms in their attempt to hold a state – in this case the U.S. – accountable for their contribution to rising global greenhouse gas emissions and the negative impacts experienced by the Inuit as a result thereof.

3.3. Extreme Weather Hazards

Extreme weather, such as storm surges and wildfires, can severely damage property and infrastructure, affecting billions of people in- and outside the Arctic, thereby also pointing to heightened connectivity between Arctic and global systems (Arctic Monitoring and Assessment Programme 2017, 261; Francis, Vavrus, and Cohen 2017; Francis and Skific 2015). At least 12 Alaskan coastal communities have become a paradigmatic example in discussions on climate migration as they become increasingly uninhabitable due to a loss of critical infrastructure and services – a consequence of increasing storm damage and coastal erosion linked to reduced sea ice cover (Rosen 2017, 153; Arctic Council and Stockholm Environment Institute 2016, 106; see also Hamilton et al. 2016).[32] The coastal community of Newtok, Alaska – population 320 – is furthest along in its relocation plans. Although the Yup'ik people have lived on the coast of the Bering Sea for at least 2000 years, the community supports this relocation in the face of environmental change (Atkinson 2011; Bronen 2018; Bronen and Chapin 2013). Still, these efforts are halted by the high cost of building a new village; cultural, financial and jurisdictional conflicts; and a desire to avoid the repetition of historical injustices, such as the forced relocation of Indigenous communities (Arctic Council and Stockholm Environment Institute 2016, 106).

As with the Inuit Petition, noted above, climate migration raises important questions about the degree to which existing governance instruments, such as the United Nations Framework Convention on Climate Change (UNFCCC), provide effective mechanisms that recognize the vulnerability of the Arctic *and* can respond to the impacts of climate change across the circumpolar North (see Chapter 3).

3.4. Arctic Biodiversity and Marine Ecosystems

While large areas of the Arctic remain relatively undisturbed, thereby providing an opportunity for some Arctic biodiversity conservation, a decline in both multi-year Arctic sea ice and snow cover is having significant consequences for other forms of biodiversity and marine ecosystems (Arctic Monitoring and Assessment Programme 2017). For instance, prolonged open water and changing light conditions are linked to biodiversity loss in the central Arctic Ocean which poses challenges for species – fish, walruses, Arctic seals, and polar bears – whose life cycles are intimately linked to sea ice (Rosen 2017, 153; Eamer et al. 2013; CAFF 2013). At the same time, sub-Arctic species across all trophic levels are migrating northward,

pegged at USD $200 million in 2016 (Goode 2016). Even still, these costs do not account for loss of culture, and more.

[32] See Hamilton et al. (2016) for a discussion on climate migration (or climigration) in Arctic Alaska.

significantly altering the Arctic marine ecosystem. This can have cascading effects on areas of high productivity – places where fish, seabirds, and marine mammals converge – thereby impacting both traditional and commercial harvesting and thus also the lifestyle, culture, and socio-economic well-being of northern communities (Arctic Council and Stockholm Environment Institute 2016).

As an example, after three decades of warming (by 3.5°C) and a fifty percent decline in sea ice, Disko Bay, Greenland, is one of the many communities facing these shifts, where the late formation of sea ice leaves the harvesting of walrus and seal in a particularly precarious state (Holm 2010). The ability of northern residents in Disko Bay to adapt their hunting and fishing practices to changing sea ice conditions — a practice which they have already acquired — is further limited, even impeded, by current Greenlandic government regulations. The centralized nature of decision-making related to resource management in Greenland (following the establishment of the Greenlandic Home Rule in 1979) shifted away from a more decentralized approach based on local customs and control over harvesting (Ford and Goldhar 2012) and "elevated the role of biologists and international/regional management commissions in setting quotas and access rights with limited integration of local knowledge (Sejersen 2001; Cuyler 2007; Nuttall 2009)." This shift has had significant consequences for hunters as they seek to respond to the emerging material and social realities in Greenland, and the Arctic more broadly. While hunters were traditionally able to harvest in other regions, current regulations impose geographic limits, thereby failing to reflect changes in species availability. Specific tensions have also arisen between occupational hunters, who face restrictions on money-earning from non-harvesting activities, and non-occupational hunters. What is more, existing regulations fail to reflect the increasingly tightening links between global climate change, shifts in regional and local ecosystems, and the socio-economic well-being of Arctic inhabitants. Sejersen (2001) is more succinct in arguing that these regulations are eroding "the moral economy of harvesting and have weakened social networks, increasing vulnerability to projected future changes in climate."

Highlighting these interconnections, one of the 17 policy recommendations of the 2013 *Arctic Biodiversity Assessment* notes that: "The challenges facing Arctic biodiversity are interconnected, requiring comprehensive solutions and international cooperation." (CAFF 2013 Key Finding 9). However, as becomes evident over the course of the following chapters, there is no clear roadmap on how to do so at an international and pan-Arctic scale.

3.5. Industrialization and Infrastructure Development

Climate change, non-climate environmental stressors and socio-economic drivers, like global commodity prices, increasingly interact to influence trajectories of industrialization and development in the Arctic. As I already noted, a decrease in Arctic sea ice opens the Arctic to resource development, the implications of which are potentially serious when we consider that the area is rich in hydrocarbons.[33] Norway and Russia are already developing their oil fields while Canada and the United States have imposed a moratorium on offshore drilling for the foreseeable future.[34]

[33] In 2009, the U.S. Geological Survey estimated 83 billion of oil and 44 trillion cubic meters of natural gas (Gautier et al. 2009). More recently, McGlade and Ekins (2015, 190) estimated 100 billion barrels of oil (including natural gas liquids) and 35 trillion cubic meters of natural gas in fields within the Arctic Circle. Although, it must also be noted that scholars like Homer-Dixon (2008) argue that much of the excitement surrounding the release of the US Geological Survey report is misplaced, given its "very poor track record predicting petroleum discovery with the kind of probabilistic methodology it used for the Arctic basin."

[34] In 2016, Canadian Prime Minister Justin Trudeau and then-U.S. President Barack Obama announced a ban on offshore oil and gas activity in the Arctic (Office of the Press Secretary 2016). Through the *United Sates-Canada Joint*

The Arctic is also home to large quantities of minerals – including phosphate, iron ore, copper, uranium, and nickel – whose extraction underpins a substantial industry in Russia, Canada, the Nordic states, and Alaska (Arctic Monitoring and Assessment Programme 2017, 264). In northern Finland, where there are immense reserves of diverse raw minerals, a changing climate could result in shorter winters and more cost-efficient mining operations which would encourage an increase in mining while driving further environmental change.

At the same time, a decline in multi-year sea ice opens northern shipping routes – the Northwest Passage (NWP), the Northern Sea Route (NSR), and the Transpolar Route – to commercial shipping, cruise ships, and fishing fleets (Farré 2014). Shorter shipping routes, reduced (global) shipping emissions, and political stability due to the absence of piracy make the Arctic a particularly attractive alternate route to the Suez and Panama Canals (Byers 2010, 40; Ellis and Brigham 2009; Lasserre 2014; Browse et al. 2013).[35] Between 2007 and 2012, the number of vessels passing through the Northern Sea Route increased from 2 to 47 with numbers expected to rise (Arctic Council, Stockholm Environment Institute, and Stockholm Resilience Centre 2013). In addition to commercial shipping, tourism and commercial fishing may increase the number of ships traveling northward. The successful voyage of the *Crystal Serenity*, a 2000-person cruise ship, through the NWP in the summer of 2016 cemented the possibility of large-scale tourism in particularly precarious Arctic waters.[36] An increase in ships from commercial fishing is more difficult to estimate due to the compounding uncertainty connected to ocean acidification and fish stocks management (Arctic Monitoring and Assessment Programme 2017, 264).

Arctic Leader's Statement, Obama permanently banned oil and gas development in U.S. waters in the Chuckhi and Beaufort Seas while Trudeau committed to a five-year ban on new licensing in all Arctic waters with a review based on climate and marine science at the end of the five-year period.

[35] In terms of the distance between European ports and those far East and in Alaska, the *Arctic Marine Shipping Assessment* (2009: 44) estimates savings of 35 to 60 percent when comparing the Northern Sea Route to the Suez and Panama Canals – a sufficient incentive for some shipping companies and fishing fleets to look North. Meanwhile, the NWP, can accommodate super tankers and container-ships which are too large for the Panama Canal (Byers 2010, 40). See Melia, Haines, and Hawkins (2016) for model predictions.

[36] The *Arctic Resilience Interim Report* 2013 highlights that feedbacks limiting the further development of Arctic shipping, like environmental conditions or ice classification needs, are rapidly declining as positive feedback that encourages shipping, like sea ice loss or new shipping technology, increase.

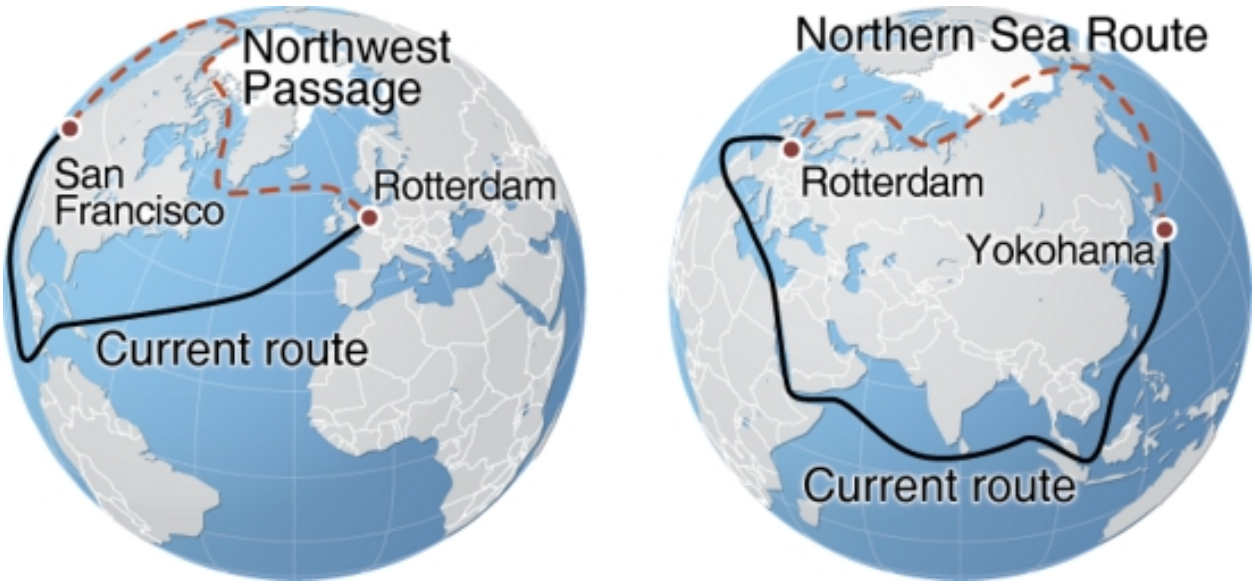

Figure 8: Arctic Shipping Routes (Source: Hugo Ahlenius/UNEP/GRID-Arendal)[37]

Still, the uncertainty of industrialization and infrastructure development remains substantial and the feedback associated with an increase in resource extraction and shipping potentially significant.[38] The unpredictability of environmental conditions remains the greatest hurdle to shipping through both the NSR and NWP (Durfee and Johnstone 2019, 207, 226). Risks associated with large vessel transit – through areas supporting Indigenous subsistence practices and marine mammal populations – include collisions, oil spills, toxic cargo, waste disposal, noise pollution, the introduction of alien species, ship strikes on marine mammals, and the disruption of migratory patterns of marine mammals (Earth Justice 2014). As an example, all northern shipping routes pass through the Bering Strait, an important whale migration route whose narrowness increasingly brings ships and whales head to head (Arctic Council and Stockholm Environment Institute 2016, 104; Humpert and Raspotnik 2012). An increase in ship traffic in this Strait could lead to a heightened number of collisions with whale aggregations; and thus, with potential consequences for cultural identity, food security, and more.

As is evident, the transformational changes occurring in the Arctic system provide opportunities for industrialization and infrastructure development by Arctic and non-Arctic actors. However, many of these developments also present risks to the Arctic environment and its inhabitants; in part, because they are so intricately linked. As I highlight in Chapter 4, increased shipping and navigation pose a variety of governance challenges, many of which are difficult to predict given the potential for non-linear change and extreme weather events, among other things.

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[37] Hugo Ahlenius, UNEP/GRID-Arendal, 2008. Access at: http://old.grida.no/graphicslib/detail/northern-sea-route-and-the-northwest-passage-compared-with-currently-used-shipping-routes_1336.

[38] A 2015 CAFF scoping study on the economics of Arctic ecosystems and biodiversity highlighted that biophysical feedbacks associated with expanding resource extraction in the Arctic may lead to irreversible, rapid and large-scale environmental change with negative consequences for people's well-being. See Conservation of Arctic Flora and Fauna Working Group 2015.

4. Conclusion: Reimagining the Arctic

Given the emerging material and social reality of the Arctic system, a clearer understanding of how its system components interact is integral to our ability to systematically, as opposed to separately, manage the issues that arise. Drawing on a complex systems ontology, previous sections examined the nature of change in Arctic non-living systems and living systems. A complex systems ontology is helpful because it shifts the focus to the implications of changes in the flow of energy and matter through the Arctic geophysical system.

As noted above, a shift from multi-year Arctic sea ice to thinner ice is substantial, not only because it contributes to a reorganization of the unique internal dynamics and feedback mechanisms of the Arctic geophysical system (Arctic Monitoring and Assessment Programme 2017), but also because of its secondary effects on Arctic biodiversity, traditional and commercial harvesting, and trajectories of industrialization and development. At the same time, ongoing material changes in the Arctic present new governance challenges related to individual and collective human rights or, for instance, in maintaining sufficient stability for financial investments in large-scale infrastructure projects.

I further argue that the emerging material and social reality of the Arctic system is reshaping, or transforming, Arctic norms and worldviews, the moral grounding and anchor of legitimacy and authority in the Arctic system. Over the past three decades, there has been a notable shift in the perception of the Arctic, from a relatively closed area – an inaccessible, inhospitable, and uninhabitable material environment (although there were plenty of Arctic Indigenous peoples living in the circumpolar North) (Koivurova 2012a, 134; Keskitalo 2007, 192; see also Berger 1977; Kikkert 2015; Dodds and Nuttall 2019) – to one that is increasingly open and permeable.

This dichotomy, between closed and open, is often used to reference geophysical change in the Arctic system (see for example Howard 2009; Koivurova 2012a, 139; Knecht and Keil 2013, 179; Le Mière and Mazo 2013; Young 2016c, 271; Smieszek 2019c, 10; Keskitalo 2007, 192). There are also vibrant debates – in the academic literature, in various policy documents, as well as in the news media – on (1) where the Arctic begins and where it ends (see for example Dodds 2016; Steinberg 2015; Keskitalo 2007; 2004; Lackenbauer and Greaves 2016); and a renewed debate on (2) whether the Arctic requires an alternative to its current form of governance (see for example Koivurova 2014; Young 2010). Within the context of these debates, the notion of closed and open is often understood in Westphalian terms (Krasner 1999), primarily relating to who has access to and control over an area. Given this project's focus on the capacity of international law, as an instrument of governance, to manage a rapidly changing Arctic system, I am particularly interested in this second debate.

While research frameworks increasingly embrace elements of complexity science to explore variation in Arctic geophysical and social-ecological systems, these frameworks rarely, if ever, extend to the study of Arctic worldviews or normative variation in Arctic environmental governance. As a consequence, scholarship on Arctic environmental governance often fails to explore the profound connections between material change, social change, and their link to the evolution of Arctic worldviews and norms, at times leading to tension. This tension is clearly exemplified by statements made in response to the same material environment; such as the notion that the Arctic is facing a "race for the resources" (see for example Borgerson 2009b; Blunden 2013; Huebert 2014) or claims that climate change reinforces political commitments to existing institutions, as opposed to rocking "current circumpolar governance structures out of kilter" (Nilsson and Koivurova 2016).

In the following three chapters, I explore the ways in which current heuristics for responding to change build on these two particular worldviews of the Arctic – as either a closed or open system, in both geophysical and Westphalian terms (Krasner 1999).

Chapter 3: Governance Responses

"The rules are in place and the five [Arctic] states have now declared that they will abide by them."

— Per Stig Møller, Danish Foreign Minister, 2008

At the end of the first chapter, I introduced three tools from complexity science, including an analytical framework called the WIT framework, which is designed to identify coherent sets of interconnected and interdependent worldviews, institutions, and technologies – or WIT sets – which can act as barriers or openings to a "realignment of the way we view and interact with our surroundings" Beddoe et al. (2009).

Given my central research question – on whether the functional requirements of law are fundamentally incommensurable with the requirements of the emerging material environment of the Arctic – I am especially interested in understanding how institutions, as well as technologies, are co-evolving with a shift in Arctic worldviews as the area's material environment transforms from closed to open. After all, the ultimate test of the robustness of a WIT set relates to whether it can thrive and reproduce itself in relation to its material environment; or in other words, meet the *law of requisite variety* (see Chapter 1).

In this chapter, I seek to understand current approaches to Arctic environmental governance, including their normative evolution and responses to higher levels of change and complexity in a tightly coupled Arctic system. I specifically highlight how different elements of Arctic environmental governance can institute closed and open worldviews of the Arctic, both in geophysical and Westphalian terms (Krasner 1999). I argue that, only with this understanding, can we map current governance responses onto various issues to assess whether they are sufficient and, if not, seek to understand why.

I focus on Arctic environmental governance for two reasons: first, because there is already a rich descriptive and normative debate on its role in managing change in the Arctic system; and second, because a better understanding of Arctic environmental governance may provide insights for nascent research on the juridical dimension of Earth system governance. I give limited attention to social governance beyond the direct impacts experienced due to environmental change (for instance, in relation to climate change or shipping). I also do not seek to provide a comprehensive overview of the governance landscape, recognizing that previous scholarship has drawn on a variety of theoretical lenses to systematically describe the evolution of broader Arctic governance to date (see for example Young 1998; Hønneland and Stokke 2007; VanderZwaag, Huebert, and Ferrara 2002; Young 2000; Keskitalo 2004; Stokke 2007a; Nilsson 2009; Koivurova 2010; English 2013; Byers and Baker 2013; Stokke 2015; Keil and Knecht 2016; Schönfeldt 2017; Durfee and Johnstone 2019).

I begin this chapter by succinctly defining the role of governance and international law as a tool thereof. Then, I provide an overview of current formal approaches to Arctic environmental governance – institutions that maintain a recognized status in international law and politics (Slaughter 2004, 33) – with insights into how they are, or are not, responding to accelerating, non-linear change in the Arctic system. I place a particular focus on international legal norms relevant to Arctic environmental governance, including the

law of the sea, international environmental, and human rights regimes. I also include a section devoted to Arctic-specific agreements. Following an overview of current formal approaches to Arctic environmental governance, I outline current informal approaches, specifically focusing on the development of the Arctic Environmental Protection Strategy (AEPS) and the subsequent Arctic Council. I briefly introduce other, informal governance responses, as well. I make note of how actors, especially states, draw on these institutions as a means of reinforcing particular Arctic worldviews throughout.

A forewarning: this chapter is long and descriptive, in part because it seeks to provide the reader with a sense of the complex and fragmented nature of Arctic environmental governance. It also seeks to highlight a range of governance approaches – treaties, principles, customary law, and informal arrangements – as well as examples of how they are responding to the ongoing transformation in the Arctic system.

1. Governance & Law in the Arctic

Governance can have a pervasive influence on both endogenous and exogenous drivers of change in a system. Broadly speaking governance refers to social institutions — rules that define social practices, assign roles and guide interactions among actors — with the capacity to resolve conflict, facilitate cooperation, or alleviate collective action problems in an increasingly interdependent world (Hurrell 2007). Most often, it is measured in terms of its legitimacy, accountability, and a notion of "good governance" (Alcántara 1998).

At the national level, governance implies a degree of self-regulation through formal and informal institutions by various actors including the national government; sub-national, regional, and territorial governments; municipalities; transnational corporations; intergovernmental organizations; international and transnational non-governmental organizations; as well as Indigenous peoples (Kahler 2009).[39]

In a similar vein, the governance of large-scale economic, social, political and biological systems, largely occurring at a global level, is no longer equivalent to hierarchical regulatory or bureaucratic structures bounded by the state (Hurrell 2007; Rosenau and Czempiel 1992; Lake 2010). Instead, sovereignty and autonomy are increasingly embedded within a more complex system of governance (Held 1995; Slaughter 2004; Cerny 2010) where the authority of the state is disaggregated to supra- and international actors and organizations, like the International Criminal Court or the European Union; to cities and communities; and to civil society and non-state actors like corporations. Within such governance systems, various state and non-state actors seek to provide solutions to transnational problems, like climate change (Avant, Finnemore, and Sell 2010).

In the context of this research project, I place a particular focus on the role of international law, as a tool of governance. I do so because even though the discourse on governance often ignores the role of law (Baxter, Barry, and Dunphy 2005, 209), it is one of the most pervasive sub-systems of our social system, seeking to regulate human behaviour by defining rights, obligations, and the power to act. International law, distinct from national law, comprises a set of formal rules and customary practices which together define the legal rights and obligations, as well as govern the interactions, of international legal subjects. Traditionally, states are the only actors to enjoy the status of international legal subjects, although the status increasingly also applies to international organizations and sub-national groups or peoples exercising their

[39] Naturally, there is a variation in governance depending on the context of the actors. For instance, in an Arctic context, the self-governing approach of Nunavut differs from the self-governance practiced by the Northwest Territories.

right to self-determination, as I will outline in relation to Arctic Indigenous peoples later on in this chapter. Primarily, though, international law still constitutes the "law of nations" (Reeves 1925) — a reality which is also visible in the Arctic, with significant implications for how actors seek to maintain stability amidst ongoing change.

Current approaches to Arctic environmental governance reflect broader trends in global governance in many ways (Prior 2017); they are formal (including treaties, principles, and rights-based approaches) and informal, disaggregated across multiple levels of governance (Slaughter 2004) — local, regional, national, and pan-Arctic — with a variety of state and non-state actors.

While there is no internationally agreed-upon legal definition of the Arctic (Israel and Oppenheimer 2014, 933), there are generally two approaches to formal and informal Arctic environmental governance, geographical and sectoral (by issue area). As becomes evident in my discussion of the Inuit Petition in Chapter 4, the mismatch between these two definitions can, at times, lead to governance failure.

When defined geographically, Arctic environmental governance generally spans the Arctic Ocean, formed by several seas and a deep central basin flanked by continental shelves, and its surrounding land which falls under the jurisdiction of eight Arctic states – Canada, the Kingdom of Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States. Within these jurisdictions the southern boundary of the Arctic is often delineated using three criteria: above the Arctic Circle in northern Europe and northwest Russia; the areas down to 60 degrees north latitude in North America, Iceland, and eastern Russia; the marine boundary; and the July isotherm. The area can be further delineated by the coastlines of the five Arctic coastal states — Canada, Denmark, Norway, Russia, and the U. S.

On a local scale — and within the bounds of these geographical parameters — Arctic environmental governance includes the governance of natural resources through co-management agreements between state and local community. Regionally, it includes cooperation through intergovernmental fora like the Barents Regional Council or the Northern Forum. At the national level, governance in the Arctic implies a significant degree of self-regulation including northern policy strategies and frameworks. National governments also engage in bilateral cooperation, for instance along the Alaska-Yukon border. Meanwhile, pan-Arctic cooperation takes place through intergovernmental fora like the Arctic Council, long-standing transnational Indigenous organizations and networks like the Sámi Council, non-governmental organizations like the Association of World Reindeer Herders, business networks like the Arctic Economic Council (AEC), and scientific networks like the University of the Arctic.

Recognizing that the Arctic does not operate in a vacuum, especially when it comes to issues like climate change or biodiversity, formal and informal Arctic environmental governance is also defined by sector, or issue area. So, even though international legal regimes might not necessarily account for the Arctic *per se* (Koivurova 2008a, 15), they focus on issue areas that are pertinent to the Arctic. The law of the sea, for one, provides the fundamental framework for the governance of the Arctic marine environment (Byers and Baker 2013; Young 2016c, 274). The *United Nations Convention on the Law of the Sea* (UNCLOS) is used to bilaterally and multilaterally negotiate the marine boundaries of Arctic coastal states. Various international environmental regimes, ranging in focus from the global marine environment to hazardous substances (Conca 2012), and their respective multilateral environmental agreements and principles of international environmental law, apply to the Arctic as well. Meanwhile, the human rights regime defines groups of rules and principles concerned with the basic civil and political rights of individuals. This includes instruments that recognize the collective rights of Arctic Indigenous peoples.

2. Notes on the Rise in Formal & Informal Agreements relevant to the Arctic

In the following sections, I unpack both formal and informal approaches to Arctic environmental governance. In doing so, I make note of an increase in the number of formal and informal agreements relevant to the Arctic as the material reality of the Arctic transforms from a predominantly closed to an increasingly open system (see Figures 9 and 10; see also Chapter 2). Section 3.2.4.2. in particular maps out the rise of formal and informal Arctic-specific agreements over the last three decades.

However, before I begin to describe current formal and informal approaches to Arctic environmental governance, I want to provide a brief overview of the broader context within which these agreements are made (see Figure 8). Formal governance arrangements are legally-binding, based on treaties and conventions. Meanwhile, informal governance arrangements are based on non-binding agreements including political declarations, memoranda of understanding, and joint communiqués.

In examining the population of formal agreements relevant to Arctic environmental governance from the beginning of the 20th century – particularly under the purview of the law of the sea, international environmental regimes, human rights regimes and Indigenous peoples' rights – I note a steady increase in formal global (or multilateral) agreements following the end of the Second World War, and peaking in the 1970s and 1990s, largely due to a rise in multilateral environmental agreements (see section 2.2.). Informal global (or multilateral) agreements relevant to the Arctic, such as the *United Nations Declaration on the Rights of Indigenous Peoples* or the *Rio Declaration*, have also seen an uptick over the past thirty years.

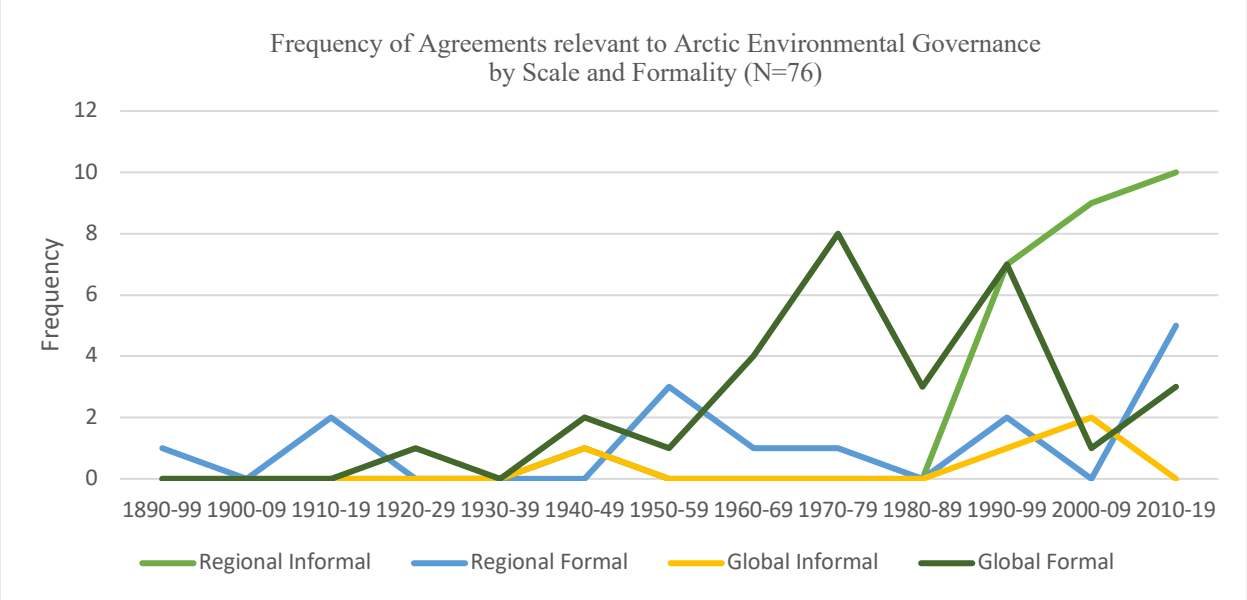

Figure 9: Frequency of Agreements relevant to Arctic Environmental Governance by Scale and Formality

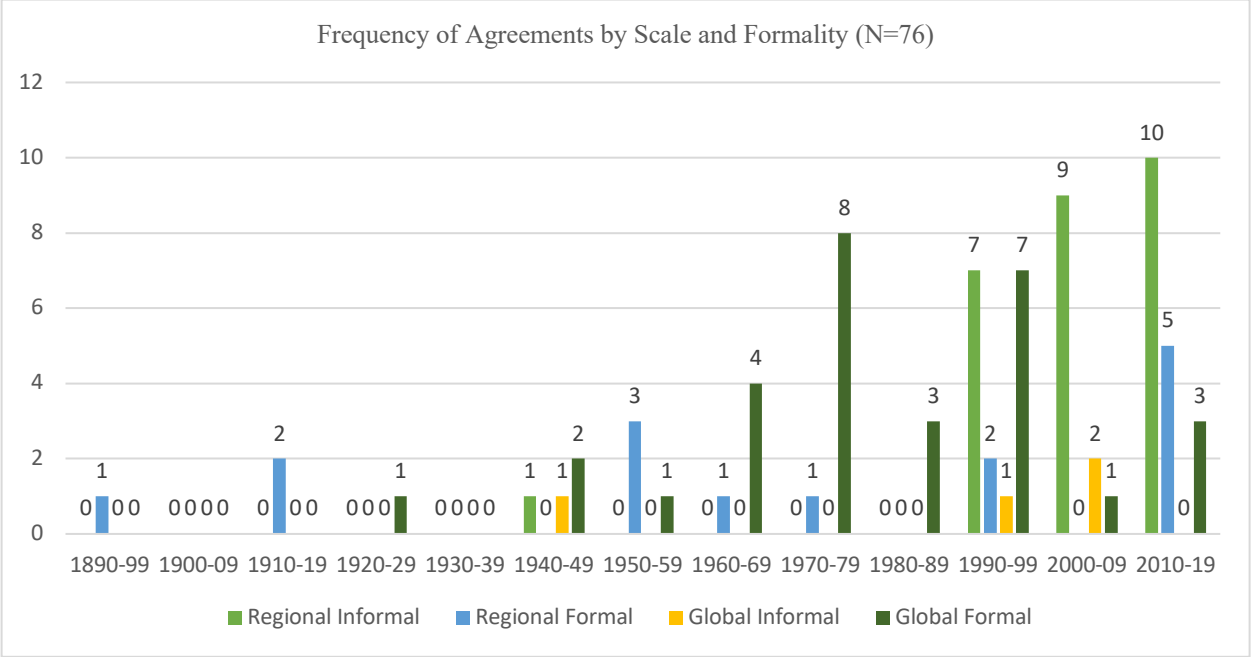

Figure 10: Frequency of Agreements by Scale and Formality

Meanwhile, formal and informal regional agreements – including Arctic-specific and non-Arctic-specific agreements – have followed slightly different trajectories. Over the last decade, there was a noticeable increase in formal regional agreements including Arctic-specific agreements, like the 2011 *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic*, and relevant non-Arctic agreements, such as the *Inter-American Convention on Human Rights*. There has been an even more significant increase in informal regional agreements, including non-Arctic-specific agreements which are nevertheless relevant to the Arctic, such as the 1948 *American Declaration of the Rights and Duties of Man*. They also include Arctic-specific developments approved by all eight Arctic states and explicitly recorded in the Ministerial Declarations of the AEPS and the Arctic Council (see below). More specifically, these developments include the formation of the AEPS and Arctic Council, as well as their Working Groups, task forces, and expert groups; the inception of a permanent Arctic Council Secretariat; the admission of new Observers; as well as the adoption of new rules, guidelines, and communication plans.[40] Figure 11 provides an additional breakdown between Arctic-specific and non-Arctic-specific regional agreements relevant to the Arctic, showing a notable increase in Arctic-specific agreements over time.

[40] My data set of informal regional agreements draws on Smieszek's (2020, 69) distinction, which the author labels as a "formal" development within the Arctic Council (meanwhile, in the context of Smieszek's work, social practices within the council are defined as "informal").

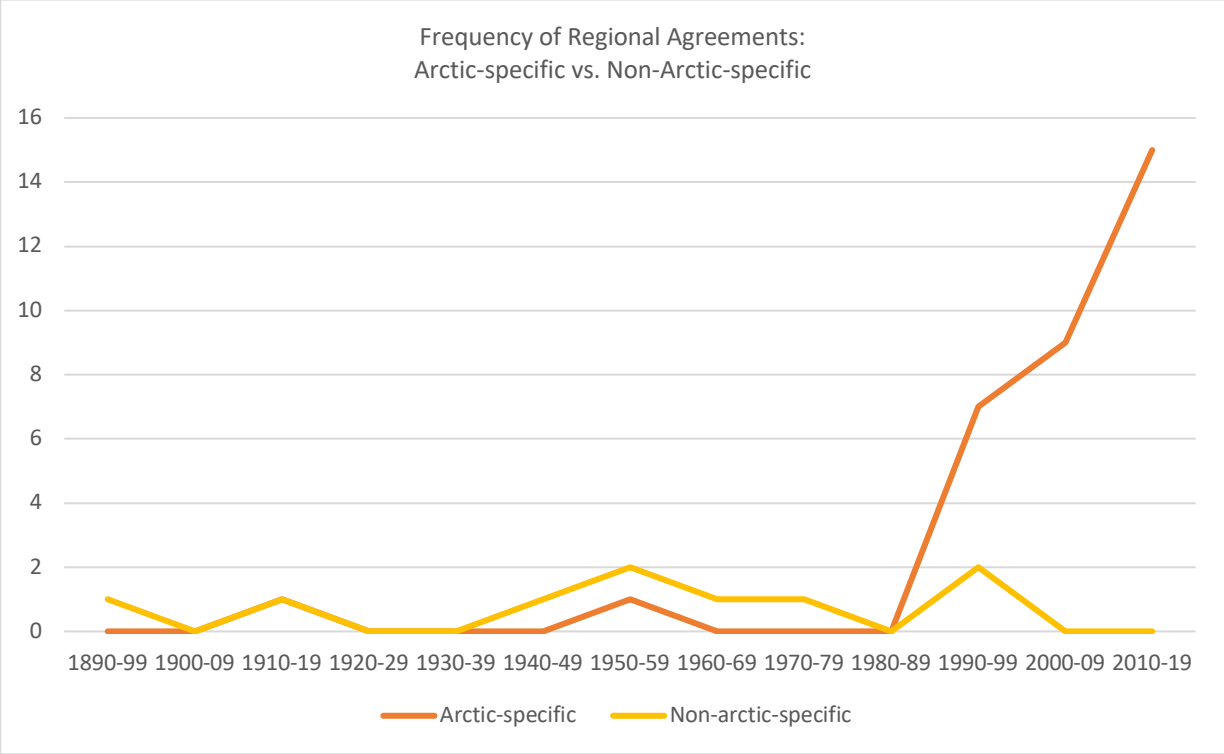

Figure 11: Frequency of Arctic-specific and non-Arctic-specific Regional Agreements

In looking at Figures 10 and 11, a connection between the scale and formality of agreements relevant to Arctic environmental governance, over time, becomes evident as well. Over the past thirty years, there has been a clear rise in formal and informal Arctic-specific agreements – agreements like the *International Agreement to Prevent Unregulated High Seas Fisheries in the central Arctic Ocean* and the *Arctic Council's Guidelines for Implementing an Ecosystem Approach to Management of Arctic Marine Ecosystems*. I provide a more detailed, overview of what appears to be a common trend in the normative evolution of formal and informal governance approaches – in what I argue is a means of maintaining stability in response to increasing change and complexity in the Arctic system – below.

3. Formal Governance

Formal approaches to Arctic environmental governance take the form of domestic law, as well as global and regional norms of international law (including treaties, principles, and rights-based approaches). Fundamentally distinct from other forms of Arctic governance in their normative quality, these legal norms are defined by their formal pedigree, often emerging from fixed-state hierarchies or the transfer of jurisdiction over territorial lands to territorial governments (Wacks 2014: 12-13).

While I do not focus on the domestic scale in the context of this research project, it is nevertheless important to briefly make note of the context from which these domestic legal norms emanate, as well as the context into which regional and international norms are translated (see Koh 1996); the heterogeneous,

domestic legal systems of the eight Arctic states including five unitary and three federal states (Canada, Russia, and the U.S.).[41] These eight domestic legal systems "reflect [a] difference in history, tradition and socio-cultural values" (Einarsson et al. 2004, 102), as well as a diversity in how they assert control over land and resources. For instance, sub-national units within the U.S. and Canada, like Alaska and the Northwest Territories, are accorded varying mandates through the devolution of state power. Meanwhile, Greenland maintains extensive autonomous powers from Denmark through its home rule government, including sovereignty over its environment and fisheries. Within the traditions of these states, "the emergence of an Arctic consciousness is a very recent development" (Einarsson et al. 2004, 101).

A laundry list of regional legal norms of international law apply to the Arctic as well. As a treaty-based political and economic union (with limited competence), the European Union (E.U.) is relevant to the Arctic through the membership of Finland, Denmark, and Sweden. For instance, E.U.-states act as a single unit when it comes to fisheries, with the E.U. Commission signing onto the central Arctic Ocean fisheries agreement as a unit. Iceland and Norway — with the exception of Svalbard which is excluded by a Special Protocol — are members of the European Free Trade Association which binds them both to European law as parties of the European Economic Area Agreement (Ulfstein 1995, 299). Additional regional regimes and treaties that provide normative ideas and guidance include: the *Convention for the Protection of the Marine Environment of the North-East Atlantic* (OSPAR Convention) on offshore oil and shale activities; the Council of Europe treaties on minority rights and the conservation of flora and fauna; and the Organization of American States (OAS) through the jurisprudence of the Inter-American Court of Human Rights and the Inter-American Commission of Human Rights.[42]

A range of international legal regimes — based on global international treaties and customary norms — are also relevant to the Arctic. In fact, as Durfee and Johnstone (2019, 19; 251) note, it is impossible to understand the Arctic without understanding the role of international law in Arctic governance. In this section, I focus on three specific international legal regimes relevant to Arctic environmental governance: the law of the sea (LOS); environmental regimes including their respective multilateral environmental agreements (MEAs) and principles of international environmental law; as well as international human rights instruments and Indigenous peoples' rights. I outline these international legal regimes in a descriptive manner in order to illustrate the complexity of the current governance approach in each issue area, and to the Arctic more specifically. This includes the responses of these regimes to ongoing material and social-ecological changes in the Arctic. I also seek to foreshadow some of the complexity that emerges in the interplay between formal and informal governance approaches, and in the co-evolution of Arctic environmental governance with shifting Arctic worldviews and the emerging material reality of the Arctic system, examined in Chapter 6.

3.1. The Law of the Sea

"Ocean governance," Klaus Dodds (2019) writes, "…is entangled with and made by geographical forces and imaginaries." This is precisely the case in the Arctic today, where some of the most significant geophysical and social-ecological changes to the Arctic system are occurring in relation to the Arctic Ocean. Its large-scale material transformation — guided by a synergy of causes including climate change and

[41] For a breakdown of the domestic legal systems of the eight Arctic states, see Bankes and Koivurova (2004, 103–4).
[42] While Canada and the US are members of the OAS, they are not State Parties to the *Inter American Convention on Human Rights* and thereby not subject to the jurisdiction of the Inter American Court.

fluctuations in the global economy — increasingly opens the area to both opportunities, such as shorter commercial shipping routes, and risks related to oil spill pollution.

Within this context, the LOS provides the fundamental framework for the governance of all oceans, including the Arctic marine environment (Byers and Baker 2013; Young 2016c, 274); marine ecosystems, marine access, extreme weather hazards, as well as industrialization and development through shipping and resource extraction. The LOS is emergent, constituted by a variety of global, regional, and bilateral instruments; decisions by international and intergovernmental organizations; and international rules from other sources, including customary international law (Molenaar 2012, 556). Still, only a small part of this abundance of law and regulation is specific to the Arctic (Durfee and Johnstone 2019, 221), in part because the Arctic was perceived as a frozen desert during the negotiations of the UNCLOS and other multilateral treaties related to the LOS, which were adopted in the 1950s (Koivurova, Kirchner, and Kleemola-Juntunen 2020, 61).

Below, I outline some of its key components relevant to the Arctic; I begin with a concise overview of the governance approach of the UNCLOS. Following this, I highlight two regulatory instruments relevant to shipping, navigation, and fishing in Arctic waters. Finally, I briefly look beyond the UNCLOS at other treaties, protocols, and guidelines relevant to the governance of the Arctic Ocean.

3.1.1. The United Nations Convention on the Law of the Sea

The development of the LOS stretches back centuries, culminating in efforts to codify it into treaties through a set of three international conferences over the course of the second half of the twentieth century.[43] The first meeting in 1958, lasting two months, resulted in four important conventions on the Territorial Sea and the Contiguous Zone; on the Continental Shelf; on the High Seas; and on Fishing and Conservation of the Living Resources of the High Seas.[44] Following this, in 1960, the second conference sought to address the breadth of the territorial sea and the extent of fisheries jurisdiction; to no avail, however (Rothwell and Stephens 2010, 9–10). The third UN Conference on the Law of the Sea, lasting nine years (1973-1982) resulted in the United Nations Convention on the Law of the Sea (UNCLOS). Fourteen years after this meeting, and a separate implementing agreement later, the UNCLOS was formally accepted (through state accession) and came into force in 1994.[45]

It is especially interesting to observe how the legal form of UNCLOS matches onto increasingly complex systems, because the Convention is undeniably mechanistic in how it seeks to maintain stability (see Table 1 in Chapter 1). First, the UNCLOS is immensely powerful (Durfee and Johnstone 2019, 251) and unabashed in its focus on the sovereignty of states. Through its application, Arctic states become the facilitator and moral authority from which legitimacy is derived in the area (see Scott 1998) by mapping the terrain of Arctic continental shelves, delimiting maritime zones, and regulating access and ownership of resources.

[43] For a full overview see Churchill & Lowe (1983: 1-24). Some lawyers characterize this era as an "ocean land grab" by coastal states and international administrative bodies like the International Seabed Authority (Ranganathan 2019).
[44] Convention on the Territorial Sea and the Contiguous Zone 1958, 516 U.N.T.S. 205; Convention on the high Seas 1958, 450 U.N.T.S. 11; Convention on Fishing and Conservation of the Living Resources of the High Seas 1959; 559 U.N.T.S. 285; Convention on the Continental Shelf 1958, 499 U.N.T.S. 311.
[45] UN Convention on the Law of the Sea 1982 [UNCLOS], 1833 U.N.T.S. 397.

All Arctic coastal states, as well as many non-Arctic states, such as China and France, adhere to the Convention. Even the U.S. – which is not party to the agreement – understands it (or most of its provisions) to be customary law which serves as a testament to the Convention's weight in public international law and marine governance.[46] To that end, it can be noted that all Arctic coastal states have identifiable rights and obligations toward other states, including non-Arctic states with an interest in the region and to those who seek to exercise their legitimate rights under UNCLOS (Rothwell and Baker 2013).[47]

However, neither humans, nor peoples feature in the UNCLOS. Historically, they were also not considered in the development of the LOS (see Durfee and Johnstone 2019, 195; see also Papanicolopulu 2019). This means that, on an international scale, states have yet to consider or recognize Indigenous sovereignty offshore — such as rights to marine areas and marine resources — even though Indigenous communities can be granted particular privileges under domestic law (see Chircop, Koivurova, and Singh 2019). As such, it fails to create the necessary conditions for self-determination (see section 3.3.).

Second, the UNCLOS is heavily sector-based with rights flowing from static sets of rules on pollution, fisheries, shipping, and more. More precisely, it consists of a non-exhaustive seventeen parts with more than three hundred articles and nineteen annexes. Part XII, for instance, sets out obligations for the protection and preservation of the marine environment including the adoption of regional rules and standards for land-based marine pollution, ocean dumping, seabed activities, and atmospheric pollution (see Articles 207, 210, 208 and 2012, respectively). Meanwhile, Part VII governs the high seas with obligations to cooperate in the conservation and management of marine living resources of the high seas. There are also two Implementing Agreements: the 1994 Deep-Sea Mining Agreement (which amended Part XI) and the Fish Stocks Agreement (built on Part V).[48] At this time, there are negotiations on a third implementing agreement to conserve and sustainably use biodiversity within the high seas.[49] There are also provisions to address emerging governance needs in the Arctic (UNCLOS, Art. 122-123), which I note in Chapter 5 (Young 2016c, 271).[50]

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[46] The *US National Strategy for the Arctic Region,* moreover, includes a proposal to accede to the UNCLOS. See Polar Research and Policy Initiative 2016, 9—10. The US Navy, too, recognizes "provisions related to traditional ocean uses" under UNCLOS as customary international law. See U.S. Navy (2013).

[47] Though Koivurova (2016: 90) argues that framework gives states significant leeway to interpret and implement the Convention as they wish.

[48] Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks 1995 [Fish Stocks Agreement], 2167 U.N.T.S. 3.

[49] Development of an Internationally Legally Binding Instrument under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction, UN General Assembly Resolution 69/292, July 6, 2015.

[50] As I will highlight in my discussion on Arctic Fisheries below, the structure of UNCLOS provides a framework for the bilateral and regional negotiation of agreements in accordance with its general principles (see section 3.5 and Chapter 4). For instance, when it comes to the governance of closed or semi-enclosed sea areas (see Article 122) — defined as "a gulf, basin or sea surrounded by two or more States and connected to another sea or the ocean by a narrow outlet or consisting entirely or primarily of the territorial sea and exclusive economic zones of two or more coastal States" — the Convention favours the regional implementation of its provisions, rather than implementation by individual states. This notion is further evident in Articles 123 and 197, where the former delineates obligations for littoral states of the semi-enclosed sea while the latter encourages the regional implementation of marine environmental protection standards. As I will further outline in Chapter 5, there is a vibrant debate as to whether the Arctic Ocean should be regarded as a semi-enclosed sea. If it were to be classified as such, Arctic coastal states would have to espouse a greater obligation to cooperate on environmental protection (Koivurova 2008a, 20; see also Young 2011, 328).

Together, these international agreements self-organize to provide a general framework for the delineation of coastal state jurisdiction – through bilateral and multilateral negotiations – and control over human activities, as well as living and non-living resources (such as fisheries, minerals, and oil) up to 200 nautical miles from the coast; flag state jurisdiction and control; port state control; maritime boundaries in the Arctic; and the high seas (see Appendix 2) (Koivurova, Molenaar, and VanderZwaag 2009; see also Nilsson and Koivurova 2016).

Third, the segregation of spheres of sovereignty is, most recently, visible in the delineation of the extended, outer limits of the continental shelf of the Arctic coastal states, subject to Article 76 of the UNCLOS under which parties must submit a claim to the Commission on the Limits of the Continental Shelf (CLCS).[51] Several of these submissions were made to the CLCS in recent years; Russia submitted its claim in accordance with Article 76, paragraph 8, on December 20, 2001 (and re-submitted its claim in 2015 with additional information); Norway made its submission in 2006 (approved in 2015); Denmark submitted its claim on December 14, 2014; with Canada partially submitting its claim in May, 2019. The U.S. is also gathering data to support a potential claim even though it is not party to the UNCLOS. No unilateral claims to the Arctic Ocean deep seabed have been made (Rothwell and Baker 2013). While these claims would extend sovereign rights over seabed minerals, the waters above the extended continental shelf, beyond the EEZ, would remain the high seas.

Processes like this not only define and expand sovereign reach but also reinforce particular worldviews of extraction and privatization (Steinberg 2015; Carroll 2015) by closing off different parts of the Arctic to various actors, including non-Arctic states and Arctic Indigenous peoples, as the material environment opens. In this way, "Rock, water and ice become 'resources' enabling the territorialisation of state power." (Dodds 2019).

Despite its mechanistic approach, the UNCLOS has some level of recognition of the complexity of our planet's ocean system, as well; for instance, the preamble of UNCLOS acknowledges that issues connected to the oceans are closely interrelated and must be considered as a whole. There are also provisions which lend themselves to some of the characteristics exhibited by an increasingly open Arctic Ocean; they include the "duty to cooperate" and the obligation to give "due regard" as a means of responding to complexity (Craik 2020, 17). More precisely, the "duty to cooperate" requires states to consider the impact of their actions on other states and "seek outcomes based on good faith and due respect." (Craik 2020, 3). For instance, the UNCLOS includes the duty to cooperate on scientific matters which ought to be exercised "in accordance with the principle of respect for sovereignty and jurisdiction and on the basis of mutual benefit." (Conference on the Law of the Sea and United Nations Conference on the Law of the Sea 1982, Art. 242, see also Art. 143; see also Craik 2020, 6). Meanwhile, the obligation to give "due regard" for the interests of other states imposes obligations of cooperation in contexts involving conflicting interests (Craik 2020, 18).

Even so, other provisions on marine areas located beyond national jurisdiction (such as the Arctic high seas) have essentially divided the system of oceans governance leaving it far from integrated (Warner 2009, 27). In this way, it is clear that Arctic coastal states have much certainty and stability to gain from following the UNCLOS which also means that "challenging or even defying the rules that apply in one context risks undermining the whole system." (Durfee and Johnstone 2019, 197). As a consequence, the mechanistic approach of the UNCLOS – which understands the state as the primary actor, seeks precision and

[51] For a general overview of the delineation and delimitation process see Durfee and Johnstone (2019, 193); Scott and VanderZwaag (2015, 734); see also Dodds (2019, 545) for a discussion of how Article 76 not only extends sovereignty but maintains an active managerial grip on shipping routes.

predictability, and turns to formal legal rationality as means of bounding geographical areas – holds significant power within the system of Arctic environmental governance. What is more, because the UNCLOS contains a compulsory dispute settlement procedure (UNCLOS Part XV), there is an additional incentive for states to follow rules and negotiate constructively.[52]

Nevertheless, the emerging material reality of the Arctic increasingly put forward the notion that certain actions can be contained, as well as the unfettered authority of states, into question. In fact, researchers of the ICE LAW Project at Durham University have already questioned "whether UNCLOS provides the ideal foundation for Arctic governance," arguing that the Convention elevates states and ascribes a particular materiality to water, both of which fail to acknowledge changing geophysical conditions in the Arctic and how Arctic Indigenous peoples engage with water in all of its various physical states (see Inuit Circumpolar Council 2008; 2014; Steinberg 2014; Steinberg, Kristoffersen, and Shake 2020; Steinberg and Peters 2015; Shake et al. 2018; Dalby 2003). Still, neither the framework of the UNCLOS, nor its application to the Arctic have been challenged by states in response to a transforming Arctic Ocean. As noted by legal scholar, Maurice Mendelson in a statement to the Arctic Committee of the House of Lords: "[The UNCLOS] required such a huge effort, that I think states are very unlikely to want to or to be able to muster such unanimity to [sic], or agreement to, amend it." (Parliament TV 2014)."

3.1.2. Governing Arctic Shipping & Navigation under UNCLOS Art. 234

Given the emerging material reality of the Arctic, particularly in relation to rapidly melting sea ice in the Arctic Ocean, it is important to note that all states, including land-locked states, have navigational rights and responsibilities to preserve and protect the Arctic marine environment.[53] This includes the governance of Arctic shipping and navigation through the Northwest Passage (through the Canadian Archipelago), the Northeast Passage (from the Norwegian Arctic across the Russian North Coast to the Bering Strait, including the Northern Sea Route), and the central Arctic or Transpolar Route (over the top between the Bering Strait and the North Atlantic through the Norwegian Sea or the Greenland Sea).

As I highlight in Chapters 2 and 4, the regulation of Arctic shipping and navigation is important given an expected, relative increase in vessel transit through increasingly open Arctic waters, which could have significant consequences — including collisions, oil spills, toxic cargo, waste disposal, noise pollution, the introduction of alien species, ship strikes on marine mammals and the disruption of migratory patterns of marine mammals — for the Arctic environment and its inhabitants.

Article 234 of the UNCLOS, which is specific to both Polar regions and bolsters the regulation of foreign ships sailing through international straits, states that:[54]

> Coastal States have the right to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels in *ice-covered* areas within the limits of the exclusive economic zone, where particularly severe climatic conditions and the presence of ice covering such areas for most of the year create obstructions or exceptional hazards to navigation, and pollution of the marine environment could cause major harm to or irreversible disturbance of the ecological balance. Such laws and

[52] Although some provisions of the UNCLOS are exempt from compulsory dispute settlement, Articles 297-298. Farrens (2010, 670–71) notes that nations may opt-out of UNCLOS dispute resolution procedures, which all nations except Norway have done to avoid the Convention's binding language.
[53] Conference on the Law of the Sea and United Nations Conference on the Law of the Sea 1982, Part XII.
[54] UNCLOS provisions relating to the protection and preservation of the marine environment only apply to government non-commercial service vessels, not warships or other vessels (Ellis and Brigham 2009, 53).

> regulations shall have due regard to navigation and the protection and preservation of the marine environment based on the best available scientific evidence. [emphasis added]

Article 234 is formal and exclusive in giving greater power to coastal states to adopt more unilateral standards than would otherwise be possible, although it does not necessarily "provide clear and firm guidance." (Franckx 2010, 129; Hartmann 2018, 276–77). In fact, Lamson (1987) describes it as "probably the most ambiguous, if not controversial, clause in the entire treaty [LOSC]."[55] For instance, it never defined the geographical extent of "ice-covered waters". Further questions remain as to whether Article 234 grants broader powers in terms of geographical scope of coverage and breadth of regulatory powers in terms of ship construction, crew, and equipment requirements (Hartmann 2018, 276).[56] In addition to this, measures taken under Article 234 are theoretically subject to compulsory dispute resolution (Caminos and Cogliati-Bantz 2015, 416; Hartmann 2018, 282).

Article 234 was clearly developed at a specific moment in time when the Arctic was relatively closed, both geophysically in terms of its frozen state, and to various actors through the regulation of movement, surveillance and defence (Dodds 2019, 545). A rapidly changing Arctic environment raises additional questions about the ways in which Article 234 is linked to navigational hazards related to ice. For instance, Article 234 only provides measures for marine environmental protection when Arctic waters (in the EEZ) *are* ice-covered "…for half a year plus one day, after which the ongoing application of pre-existing measures would be legally dubious…" (Rothwell and Baker 2013; see also Durfee and Johnstone 2019, 207). Should sea ice fall below the six-month mark, the relatively arbitrary distinction made by Article 234 becomes unworkable. In that case, some scholars have noted that the area would no longer be exceptional and could be governed as any other maritime region under the UNCLOS (Parliament TV 2014; Franckx 2010). Furthermore, Canada and Russia (who are currently the only states to apply Article 234) may be required to reassess their Arctic marine environmental protection laws, which are stricter than the generally agreed-upon international requirements and standards, based on scientific evidence, and non-discriminatory by paying due regard to freedom of navigation (Durfee and Johnstone 2019, 207, 224; Hartmann 2018, 281).[57] The U.S. could introduce such measures but has chosen not to.

Beyond this, though, the legal rationality of Article 234 increasingly undercuts the complexity of the problem related to the transition from old, multi-year Arctic sea ice to younger, thinner, and more mobile ice (see Appendix I) and fails to appreciate that navigation through Arctic waters will continue to face

[55] This ambiguity, in part, reflects a balance between competing priorities – Canada was primarily interested in environmental protection while the U.S. and Russia were primarily focused on freedom of navigation. See Huebert (2001) and Hartmann (2018, 281).

[56] There are varying interpretations related to the extent of Article 234; while some confine "the scope of Article 234 to the EEZ, excluding the territorial sea," (McRae and Goundrey 1982) other interpretations include the territorial sea, straits, and when relevant also internal waters (Churchill and Lowe 1983, 132). In the former case, it would mean that coastal states would have greater powers to regulate shipping in ice-covered waters within their EEZ than in ice-covered areas of the territorial sea. (Hartmann 2018, 281).

[57] The government vessels of other states — not Canadian or Russian — are not required to comply (UNCLOS, Art. 236). Durfee and Johnstone (2019, 224) further note that the link between the rights of transit passage in international straits and Article 234 of the UNCLOS is unclear. "Were Canada and Russia to lose the battle over the straits in their self-declared internal waters, they would rely on article 234 to continue to apply environmental and probably even management regulations. The United States and others might argue, however, that the right of transit passage in international straits takes precedence over article 234 and would therefore deny the authority of Canada and Russia to pass regulations that go beyond the international standards." See Molenaar, Europäische Kommission, and Generaldirektion Maritime Angelegenheiten und Fischerei (2010, para. 883).

significant challenges that are specific to the Polar regions – including drifting ice, swells, and extreme weather events – which would remain unaddressed by UNCLOS.

3.1.3. Arctic Fisheries under UNCLOS & the Arctic Fisheries Agreement

A decline in multi-year Arctic sea ice and snow cover has significant consequences for Arctic biodiversity and marine ecosystems, including fish (Arctic Monitoring and Assessment Programme 2017; see also Chapter 2). Arctic fisheries serve as a particularly salient example of how shifting worldviews of the Arctic – including the notion of an emerging "new ocean" (Koivurova, Kirchner, and Kleemola-Juntunen 2020; Feron 2018) – interact with its material transformation – from a frozen Arctic Ocean to an increasingly open one – to lead actors to choose particular institutions, and legal forms, to manage emerging changes (Koivurova, Kirchner, and Kleemola-Juntunen 2020).

The abovementioned Fish Stocks Agreement seeks to address some of these accompanying issues. Built on Part V of the UNCLOS and signed by all Arctic states, the agreement is built around 12 Principles (Art. 5), including the precautionary principle (outlined in section 2.2.2.), to encourage the sustainable and equitable exploitation of straddling stocks and highly migratory species. Based on scientific data, coastal states are entitled and required to exploit fish within their EEZs following the principle of "maximum sustainable yield" (Durfee and Johnstone 2019, 184–85). They are also entitled, but not obliged, to catch marine mammals. Fish stocks can be shared across the EEZ of more than one state or can straddle across the EEZ and the high seas. States with shared fish stocks, including in the high seas, are required to reach agreement on how to manage resources through regional fisheries management organizations (RFMO) (Ellis and Brigham 2009, 24–23). For instance, the Joint Norwegian-Russian Fisheries Commission manages the Barents fisheries, while Canada and the U.S. maintain joint management regimes.

The Central Arctic Ocean (CAO) — a high seas area — is not governed by an RFMO, largely because there is no commercial fishing in the area at this time; ice-cover and a lack of commercially interesting stocks are currently also at play. Nevertheless, because the governance of highly migratory species is especially challenging in areas that are open to all states, like the Arctic high seas, Arctic coastal states agreed to a moratorium on commercial fishing (not non-commercial fishing) in the CAO in 2015 through the adoption of the *Declaration Concerning the Prevention of Unregulated High Seas Fishing in the Central Arctic Ocean* (Oslo Declaration).[58] In addition to the five Arctic coastal states, the declaration recognized the special role of Arctic Indigenous peoples and acknowledged the interest of non-coastal states to prevent unregulated and illegal fishing in the CAO.

Then, in 2018, these five coastal states — together with China, Iceland, Japan, South Korea and the E.U. — signed (although it is not in force) the *International Agreement to Prevent Unregulated High Seas Fisheries in the central Arctic Ocean*. The preamble of the agreement – which falls outside the jurisdiction of the UNCLOS and the *Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, but recalls their principals and provisions – recognizes the emerging

[58] The Declaration was negotiated over the course of six meetings, between 2010 and 2015. The goal of the second meeting, in 2010, was to clarify the role of coastal states in generating a conservation and management regime for the high seas. Arctic coastal states – Canada, Denmark, Norway, Russia, and the United States. Iceland, Finland, and Sweden – were reluctant to involve the *Arctic Council* (Dodds 2019). The declaration was ultimately adopted by the five Arctic coastal states. See 'Canada; Denmark; Norway; Russia; United States: Fishing Declaration Covering Central Arctic,' 2015.

material reality of the Arctic Ocean and a potential rising interest in fishing in the Arctic high seas.[59] In other words, worldviews are already shifting toward the potential geophysical opening of areas which were previously inaccessible to human activity at an industrial scale (Koivurova, Kirchner, and Kleemola-Juntunen 2020, 61). The agreement notes,

> RECOGNIZING that until recently ice has generally covered the high seas portion of the central Arctic Ocean on a year round basis, which has made fishing in those waters impossible, but that ice coverage in that area has diminished in recent years; and
>
> ACKNOWLEDGING that, while the central Arctic Ocean ecosystems have been relatively unexposed to human activities, those ecosystems are changing due to climate change and other phenomena, and that the effects of these changes are not well understood;

It further recognizes "the role of healthy and sustainable marine ecosystems and fisheries for food and nutrition," as well as "the special responsibilities and special interests of central Arctic Ocean coastal States in relation to the conservation and sustainable management of fish stocks in the central Arctic Ocean." However, rather than taking an ecosystem-based approach in defining the parameters, the agreement is mechanical in its definition of the CAO, defining it by the fisheries jurisdiction of the five Arctic coastal states (Schatz, Proelss, and Liu 2019).[60] This potential mismatch in definition raises questions about the ability of the current approach to meet the *law of requisite variety* – to respond to the dynamic nature of Arctic fishing in the context of a dynamic Arctic Ocean, rather than reinforce the existing formal governance structure – moving forward. What is more, it speaks directly to my research question on whether the functional requirements of law – in this case, the positivist requirements of this CAO Fisheries agreement – are incommensurable with the material reality of the Arctic system, including its marine ecosystems.

While the coastal states agree that "commercial fishing is unlikely to become viable in the high seas portion of the central Arctic Ocean in the near future," they acknowledge the uncertainty through the adoption of the precautionary approach by seeking to establish a framework – prior to any commercial fishing – that is underpinned by conservation and management measures.[61] Thus, while bounding (or closing-off) the system of Arctic fisheries governance – and thereby also potential future access and control – to the five Arctic coastal states and five interested parties (China, Iceland, Japan, South Korea and the E.U.), the agreement takes a principled approach in seeking to account for the complex characteristics of the Arctic system. Through this legal form, states may be able to provide some level of coherence and legitimacy across jurisdictional boundaries (Scotford 2017) while also accounting for the uncertainty of the future of Arctic fisheries in the CAO.

Even so, scholars like Klaus Dodds (2019) argue that the agreement "sits uneasily with the marine ecologies of the wider Arctic Ocean." The agreement does not address other areas of interest in the high

[59] Article 14 of the *International Agreement to Prevent Unregulated High Seas Fisheries in the central Arctic Ocean* states that: Nothing in this Agreement shall prejudice the positions of any Party with respect to its rights and obligations under international agreements and its positions with respect to any question relating to the law of the sea, including with respect to any position relating to the exercise of rights and jurisdiction in the Arctic Ocean.

[60] The Agreement is specific in noting "fisheries jurisdiction," as opposed to "national jurisdiction" because the agreement excludes the Norwegian archipelago of Svalbard and its fisheries protection zone as the legal status of the waters surrounding Svalbard are subject to dispute; Norway and the other signatories to 1930 Spitzbergen Treaty disagree on the degree to which Norway's sovereign rights exist beyond the territorial sea. See Dodds (2019).

[61] The agreement does not address non-commercial fishing.

seas, such as resources on the seabed of "the area" and challenges the freedom of fishing. There is also little critical engagement with the requirement to show a "real interest" in living resource management in the CAO in order for states to be admitted into the agreement. This notion of "real interest" has its origin in the 1995 Fish Stocks Agreement (Article 8(3)); generally, interest is displayed by the participation of commercial fisheries. However, because there has been no prior activity in the CAO by the states who are party to this agreement, the notion of "real interest" raises additional concerns because it precludes the interests of adjacent Arctic states like Iceland, Indigenous peoples (including the complex treaties and agreements between Arctic coastal states and their respective Indigenous peoples), militaries, scientists and non-Arctic states (Schatz, Proelss, and Liu 2019; Dodds 2019). However, as Dodds (2019) aptly points out, "Usually a 'real interest' would be displayed by participation in commercial fisheries." Recognizing that indigenous knowledge has not extended to the CAO historically, little is known about the process by which indigenous knowledge might in fact be "incorporated" into fisheries management in the central Arctic Ocean. A the same time, the potential of an active fishery raises questions about indigenous rights (including Free, Prior, and Informed Consent) in areas beyond national jurisdiction (see Mulrennan and Scott 2000; Harden-Davies et al. 2020), about the transboundary connectivity of migratory species and the rights and role of Indigenous peoples as custodians thereof (Vierros et al. 2020), as well as the connection between oceans and culture – and whether or not this occurs as a means of consolidating state sovereignty or to ensure the self-determination of Arctic Indigenous peoples (Todd 2016). In fact, this is already visible in the precautionary principle as a means of justifying a legal positivist approach to managing Arctic fisheries.

Fishing in the Arctic high seas remains pending under the 2018 agreement, dependent upon the status of current stocks, based on scientific evidence and Indigenous knowledge, and the set-up of an RFMO (see section 2.2.2.).[62] Finally, it must be noted that even despite this agreement, the status of Arctic fisheries continues to be debated.

3.1.4. Arctic Ocean Governance beyond UNCLOS

Beyond the UNCLOS, a wide array of treaties, protocols, and guidelines adopted under the auspices of the International Maritime Organization (IMO) are responsible for issues relating to the global maritime industry.[63] The backbone of the global shipping regime (Stokke 2013, 71) includes the 1974 *International Convention on Safety of Life at Sea* which provides mandatory minimum safety standards — rules, codes, and procedures — for the construction, machinery, equipment, and operation of merchant shipping; the International Association of Classification Societies (IACS) which further develops non-mandatory unified Requirements for members; and more recently, the 2017 *Polar Code* for ships operating in Arctic ice-

[62] Agreement to Prevent Unregulated High Seas Fisheries, available at Commission of the European Union, Proposal for a Council Decision on the Signing on Behalf of the European Union, of the Agreement to Prevent Unregulated High Seas Fisheries int eh Central Arctic Ocean, Annex, COM (2018) 454 final, June 12, 2018, articles 3-5. This agreement followed the 2015 non-binding Declaration Concerning the Prevention of Unregulated High Seas Fishing in the Central Arctic Ocean. For an analysis of the agreement see Schatz, Proelss, and Liu (2019); see also Schatz, Proelss, and Liu (2018).

[63] Norm-development at the IMO takes place under the auspices of five committees and nine sub-committees. These committees have significant technical expertise, and are open to maritime-agency representatives from all member states, as well as roughly eighty industry and civil-society associations (Stokke 2013, 68).

covered waters.[64] It also includes Enhanced Contingency Planning Guidance for Passenger Ships Operating in Areas Remote from Search and Rescue Facilities and Guidelines on Voyage Planning for Passenger Ships Operating in Remote Areas. Part XII of the UNCLOS provides another framework for coastal states to combine its marine environmental protection measures with other legal instruments, like the *International Convention for the Prevention of Pollution from Ships* (MARPOL) (Rothwell and Baker 2013).

Other relevant global institutions include the International Hydrographical Organization, the World Meteorological Organization, and the International Labour Organization. In addition to this, global insurance companies and industries, such as the Association of Arctic Expedition Cruise Operators, impose strict technical and operational standards on their clients (Kirchner 2016).

3.2. International Environmental Regimes

Since the 1970s, the role of international environmental law has significantly grown through the development of multilateral environmental agreements (MEAs) and institutions for the governance of different issues areas ranging from nature conservation and terrestrial living resources, to the marine environment, to air and atmospheric pollution (Conca 2012, 127; see also Kotzé and Kim 2019). As such, this sub-discipline of law has become the juridical foundation for regulating human-environment relations, including in the context of the Arctic. In the following two sections I focus on two of the approaches taken: treaties and principles. While neither approach can comprehensively respond to the complexity of the Arctic system, the latter exhibits a level of coherence and reflexivity that may be better suited to governing complex systems.

3.2.1. Multilateral Environmental Agreements relevant to the Arctic

Given their sectoral delineation, many international environmental regimes and their respective MEAs do not necessarily include formal mechanisms that account for particular geographical areas like the Arctic (Koivurova 2008a, 15; see also Durfee and Johnstone 2019, 81). Nevertheless, these agreements and institutions are integral to Arctic environmental governance. Due to the scope of this project, I cannot examine all MEAs relating to the Arctic in detail; instead, I provide a general overview of the landscape, homing in on relevant MEAs through specific examples in the following chapter.

MEAs for nature conservation and terrestrial living resources relevant to the Arctic range as far back as the early 20th century and include the 1940 *Convention on Migratory Species of Wild Animals*, the 1946 *International Convention on the Regulation of Whaling*, the 1971 *Ramsar Convention on Wetlands of International Importance*, 1972 *Convention Concerning the Protection of the World Cultural and Natural Heritage*, and the 1973 *Convention on International Trade in Endangered Species,* and the 1992 *United Nations Convention on Biological Diversity* (UNCBD) (and the Nagoya Protocol). In addition to this, the UNCBD *Akwé: Kon voluntary guidelines* (2004) for cultural, environmental, and social impact assessment prioritize the participation of Indigenous peoples when assessing projects that take place on Indigenous

[64] There are neither uniform international standards for ice navigators, nor safety and survival for seafarers in polar conditions.

territories, including in the Arctic.[65] Meanwhile, other MEAs such as the *Convention on International Trade in Endangered Species* and the *Convention on Migratory Species* increasingly understand Arctic species, like the polar bear and narwhal, to be of global interest.[66]

Beginning in the 1970s, a strong focus on the marine environment was reflected in the negotiation of the 1972 *Convention* and 1996 *Protocol on the Prevention of Marine Pollution by Dumping of Water and Other Matter*, the 1973/78 *International Convention for the Prevention of Pollution from Ships*, and the 1990 *International Convention on Oil Pollution Preparedness, Response and Cooperation*. This, of course, relates back to the negotiation of UNCLOS, outlined above.

As noted in the previous chapter, air and atmospheric pollution continue to illuminate the close link between the Arctic and other planetary systems. International agreements to combat such hazards started to emerge around the 1980s, with the negotiation of the 1979 *Convention on Long-Range Transboundary Air Pollution*, the 1985 *Vienna Convention for the Protection of the Ozone Layer* (and the *Montreal Protocol*), the 1989 *Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal*, 1992 *United Nations Framework Convention on Climate Change* (UNFCCC) (and the 1997 *Kyoto Protocol* and the 2016 *Paris Agreement*), the 2002 *Stockholm Convention on Persistent Organic Pollutants,* and the 2013 *Minamata Convention* on Mercury.

Other agreements, more generally applicable to the Arctic environment and its inhabitants (in Arctic states who have ratified the conventions), include the 1991 *Espoo Convention on Environmental Impact Assessment in a Transboundary Context*[67] (see Koivurova 2002; Koivurova et al. 2016; Bastmeijer and Koivurova 2008, 151–73; Craik 2010, 106–7, 262, 277) and the 1998 *Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters* (Duyck 2012; Poto 2017).[68]

Many of these formal agreements touch on the Arctic but do not necessarily account for it. In this regard, I want to briefly make note of the UNFCCC and the *Paris Agreement* as pertinent examples thereof. While the Arctic has become the most prominent icon of ongoing climate impacts, the region has not been directly addressed in either the UNFCCC (Doelle 2009; Duyck 2012) or the *Paris Agreement*. The inability of these agreements to address the disproportionate climate impacts on the Arctic is a direct reflection of their mechanistic approach, the widely diverging level of industrialization among and within Arctic states, and the broader, fragmented nature of Arctic environmental governance.

Scholars have identified several reasons for this. First, the UNFCCC (1992) is neither a comprehensive law, nor a fully-formed and detailed regulatory regime (Birnie, Boyle, and Redgwell 2009, 357). Instead, it is a framework convention that establishes a process for reaching further agreement on policies and measures to deal with climate change, primarily through mitigation but also through adaptation. The Convention specifies objectives – the primary objective being to stabilize greenhouse gas emissions "at a level that would prevent dangerous anthropogenic interference with the climate system" (United Nations Framework Convention on Climate Change and Secretariat) – and principles – such as the principles of the *Rio Declaration* including intergenerational equity, common-but-differentiated responsibility, the

[65] The practical application of *Akwé: Kon voluntary guidelines* (2004) is scarce. In an Arctic context, one of the few studies on the application of these guidelines focused on their application in land-use planning in the Finnish Arctic, specifically in the municipality of Eanodat in Finnish Sápmi. See Markkula, Turunen, and Kantola (2019).

[66] See Larsen, Fondahl, and Nordic Council of Ministers (2015, 227) for a discussion about the role of CITES, particularly in the protection of polar bears in the Arctic. See also Durfee and Johnstone (2019, 234–35).

[67] Canada, Denmark, Finland, Norway, and Sweden have ratified the Convention. Iceland, Russia, and the US have signed onto it, thereby indicating their support in principle. For a discussion see Durfee and Johnstone (2019, 230).

[68] Finland, Denmark, Iceland, Norway, and Sweden have ratified the Convention.

precautionary principle, and the right of all parties to sustainable development (Art. 3). These principles and objectives, in turn, guide the implementation and development of related legal instruments by parties (Birnie, Boyle, and Redgwell 2009, 357–58). Since its inception in 1992, the UNFCCC has also established a set of institutions and bodies including a Conference of the Parties, a secretariat of the Convention, a Subsidiary Body on Scientific and Technological Advice and a Subsidiary Body Implementation.

With its near-universal membership (197 Parties), built on the principle of sovereignty (Sands 2003), states continue to control the evolution of the climate change regime (Doelle 2009, 28–29) while non-state actors, including Arctic Indigenous peoples and intergovernmental organizations, can only exert their influence through state parties.[69]

Second, the UNFCCC differentiates state obligations based on economic, as opposed to geographic, criteria and does not address regional specificities (Duyck 2012; 2015a), like those of the Arctic system.[70] Based on these economic criteria, the Arctic falls exclusively within the jurisdictions of industrialized states whose needs related to climate mitigation and adaptation are considered to be a part of the domestic politics of the eight Arctic states (Duyck 2015b).[71] However, Arctic states widely diverge in their positions on climate change – including the U.S. decision to withdraw from the *Paris Agreement* under the leadership of President Donald Trump in 2020 and Russia's position as a state "undergoing the process of transition to a market economy" (see discussion thereof prior to *Paris Agreement* in Duyck 2012) – and thus also in their obligations to implement the Convention. What is more, even though the northern parts of the eight Arctic states share similar experiences and are collectively seen as a climate canary (Young 2009), the Convention does not address the regional specificity of the Arctic.[72] Instead, national decision-making occurs in national capitals, often located far from the Arctic, with the onus on Arctic states to represent the area in their respective international negotiating positions (Doelle 2009, 28–29, 48). However, Arctic states have played a relatively limited role in raising northern interests at the UNFCCC over the past three decades, even as the Arctic has transformed; there is a clear reticence among states to overlap existing jurisdictions and a preference to address regional aspects of climate change at a local scale instead (French and Scott 2009, 640; Keskitalo, Koivurova, and Bankes 2009, 438).

Third, a lack of formal legal status precludes some Arctic-specific institutions, like the Arctic Council (see section 4), from participating as an observer in UNFCCC processes (Duyck 2015b, 5).[73]

More recently, the 2015 *Paris* Agreement, the first-ever universal legally binding global climate change agreement, builds on the UNFCCC with the aim to combat climate change and accelerate and intensify actions and investments needed for a sustainable low carbon future (UNFCCC 2015). Its mitigation measures focus on: the long-term goal to limit global average temperature rise below 2°C above pre-

[69] Arctic Indigenous peoples regularly participate as members of governmental delegations or through Indigenous organizations, like the ICC, which hold observer status at the UNFCCC. See for example Watt-Cloutier (2015).
[70] References to Africa are a notable exception.
[71] Common-but-differentiated responsibility is established by two annexes which address the vulnerabilities and adaptation needs of non-industrialized states. Duyck (2012) outlines the differences that these two annexes set up between the eight Arctic states.
[72] However, the Convention *does* note the vulnerability of "low-lying and other small island countries, countries with low-lying coastal, arid and semi-arid areas or areas liable to floods, drought and desertification, and developing countries with fragile mountainous ecosystems [which] are particularly vulnerable to the adverse effects of climate change." (United Nations Framework Convention on Climate Change and Secretariat Preamble, para. 19; Sands 2003, 361–62).
[73] Individual Arctic states have previously also requested that the Council not participate in negotiations. However, it must be noted that the Arctic Council has undertaken work related to climate change and that its ministerial declarations have also emphasized the importance of tackling Arctic climate change (Duyck 2015b, 5).

industrial levels; to pursue efforts to limit the increase to 1.5°C to reduce the significant risks and impacts of climate change (Art. 2); the need for global GHG emissions to peak as soon as possible with a recognition that non-industrialized countries are on a different trajectory (Art. 4); and to undertake rapid reduction in accordance with the best available science in order to achieve a balance between emissions and their removals in the second half of the century (Art. 4). It also established a global goal to enhance adaptive capacity, strengthen resilience, and reduce climate vulnerability with the aim of reaching the above temperature goal (Art. 7). Additionally, the agreement recognizes "the importance of averting, minimising, and addressing loss and damage associated with the adverse effects of climate change," whether incremental or non-linear and abrupt. It also "acknowledges the need to cooperate and enhance the understanding, action and support in different areas such as early warning systems, emergency preparedness and risk insurance." (European Commission 2016). To this day, though, the obligations of the *Paris Agreement* fall short of matching the necessary mitigation action to prevent irreversible harm to the Arctic environment and its inhabitants.[74] The Arctic is widely experiencing temperatures above the 2°C limit set out in the agreement and above 3°C in some areas (UNFCCC 2019). In spring 2020, Siberia experienced temperatures between 8-10°C above average (Ramsayer 2020).

In short, the inability of MEAs, like the UNFCCC, to meet the *law of requisite variety* partly stems from an inability to reconcile the disproportionate impacts of climate change on a particular geographical area, like the Arctic, with the jurisdictional definitions upon which these agreements and mechanisms are built. In Chapter 4, I highlight the Inuit Petition, which serves as a salient example of how this ill-fit leads non-state actors, like Arctic Indigenous Peoples, to find solutions outside the context of MEAs, like the UNFCCC, which may not acknowledge actors aside from the state, thereby also limiting the potential variety of solutions to climate change.

3.2.2. Principles of Environmental Law relevant to the Arctic

While rules set out in various MEAs require clear outcomes on issue areas related to the Arctic, principles of environmental law must be taken into account as well (see Verschuuren 2017, 20). Environmental principles are of notable interest because they seek to provide coherence and legitimacy by transcending jurisdictional boundaries, as well as various issue-specific regimes. The work of Eloise Scotford (2017, 5, 13) further points to the self-generating and reflexive, yet positivistic, nature of legal principles as symbols with the ability to not only stimulate legal change, but the ability to look and behave differently in diverse jurisdictions and regions, like the Arctic.

Within a broader normative context, Arctic environmental governance continually seeks to institutionalize key principles of the *Rio Declaration* (1992), a non-binding instrument with a set of 27 principles outlining the rights and responsibilities of states relating to the promotion of environment and development, coming out of the 1992 *Rio Conference on Environment and Development* (also known as the Earth Summit). The Earth Summit, in short, "sought to foster extensive rescaling across issue areas, linking environmental protection, inter alia, to development, poverty, the plight of Indigenous peoples, energy policy, and urbanization" (Andonova and Mitchell 2010).

Given the emerging material and social reality of the Arctic system, four principles of the *Rio Declaration* stand out in particular: Principle 2, Principle 10, Principle 15, Principle 22.

[74] Doelle (2009, 32) concludes the same about the *Kyoto Protocol*. See also Doelle (2005, 32).

Principle 2 – the significant harm principle – is relevant given some of the vulnerabilities of the Arctic environment and northern communities, including those related to resource extraction and shipping outlined in Chapter 2. Under Principle 2,

> States have, in accordance with the Charter of the United Nations and the Principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

In other words, states have an obligation to take the necessary measures to prevent or minimize possible risk. At the same time though, Principle 2 neither outright prohibits global or transboundary environmental damage, nor confers total freedom on states to exploit natural resources (Birnie 1992a, 115; Craik 2010, 60);[75] the specifics of this are often negotiated within sectoral treaty regimes, dependent on context. In an area like the Arctic – where activities can pose transboundary harm to the environment of other states, or of areas beyond national jurisdiction – the harm prevention principle implies an obligation to act with due diligence. Article 194 of the UNCLOS serves as a clear formulation of this principle (Birnie 1992a, 148):

1. States shall take, individually or jointly as appropriate, all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable means at their disposal and in accordance with their capabilities, and they shall endeavour to harmonise their policies in this connection.
2. States shall take all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other states and their environment.

The obligation to prevent harm is also found in Article 3 of the UNCBD and in the preamble of the UNFCCC, both applicable to the Arctic. Principle 2 is further affirmed in the 1993 *Nuuk Declaration on Environment and Development in the Arctic*.

Where there is a danger of significant impact, states must also take measures to identify risks through environmental impact assessments (EIAs). The UNCLOS, for instance, requires an EIA with regard to potential damage to the seas.[76] The *Espoo Convention* provides a formal framework for transboundary EIAs in the Arctic, both on- and offshore (Koivurova 2008b, 161). Meanwhile, a set of non-binding guidelines for EIA were developed under the auspices of the Arctic Environmental Protection Strategy (see section on informal governance) to help Arctic states develop systems of EIA adapted to the Arctic context; attuned to its vulnerable environment, to its logistical challenges, and to traditional and Indigenous knowledge and values.[77] The 2009 *Arctic Offshore Oil and Gas Guidelines* seek to provide similar support for domestic regulatory authorities and the public in the planning of such activities in a northern context. It is intriguing to observe the reflexive and procedural nature of the no-harm principle as it is institutionalized in various ways across issue areas relevant to the Arctic.

[75] Principle 2 reiterates the point that economic development and environmental protection both need to be accommodated. See Birnie (1992a, 148)

[76] Convention on the Law of the Sea and United Nations Conference on the Law of the Sea 1982, Arts. 205 and 206.

[77] It is important to note that the original guidelines were not widely followed. For the SDWG revival of the Arctic EIA guidelines see "Arctic EIA Project," Sustainable Development Working Group, http://www.sdwg.org/arctic-eia (last accessed: March 21, 2019).

Principle 10 is relevant in the context of the Arctic because it links environmental protection to human rights, primarily through procedural terms (Shelton 2002, 70). In short, Principle 10 sets out three fundamental rights as key pillars of sound environmental governance: access to information, access to public participation, and access to justice. More specifically, it proclaims that,

> Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.

In the context of this research project, Principle 10 offers critical guidance for Arctic environmental governance on core tenets of human rights, including the right to development and the right to self-determination. It elevates public participation, including the participation of Indigenous peoples, as a principle of sustainable development (as well as intergenerational equity).

Both global and regional environmental and human rights treaties, adopted since 1991, include provisions specific to the rights contained in Principle 10 with some variation in designation (Shelton 2002, 70). At times, public participation includes openness to individuals and groups, and the right to information; some treaties include substantive rights to environmental quality, while others focus on remedies for environmental harm.

There are various examples to be found in treaties relevant to the Arctic context. For instance, Principle 10 is found in Article 4(1)(i) of the *UNFCCC*, which obliges parties to encourage "the widest participation in this process including that of non-governmental organizations," and access to information. In a similar vein, Article 8(j) of the *UNCBD* calls for the participation of Indigenous and local peoples in decisions on sharing knowledge, innovations, and practices concerning conservation and the sustainable use of biodiversity. Meanwhile, Article 10(1) of the *Stockholm Convention* provides that “each party shall, within its capabilities, promote and facilitate provision to the public of all available information on persistent organic pollutants and ensure that the public has access to public information and that the information is kept up to date.”

With regard to UNECE agreements, Article 2 of the *Espoo Convention* stipulates that "[t]he Party of origin shall provide an opportunity to the public in areas likely to be affected to participate in relevant impact assessment procedures regarding proposed activities and shall ensure that the opportunity provided to the public of the affected party is equivalent to that provided to the public of the Party of origin." Furthermore, Article 3(8) makes public participation obligatory noting,

> The concerned Parties shall ensure that the public of the affected Party in the areas likely to be affected be informed of, and be provided with, possibilities for making comments or objections on the proposed activity, and for the transmittal of these comments or objections to the competent authority of the Party of origin, either directly to this authority or, where appropriate, through the party of origin.

Elements of Principle 10, including access to information and public participation, are also found in the *Aarhus Convention*. Article 1 states that, “in order to contribute to the protection of the right of every person of present and future generations to live in an environment adequate to his or her health and well-being, each Party shall guarantee the rights of access to information, public participation in decision-making, and

access to justice." Article 4-5 of the *Aarhus Convention* further "obliges States [sic] Parties to collect and publicly disseminate information and respond to specific requests."[78] In its various forms, the application of Principle 10 to the Arctic is most visible in relation to the participation of Arctic Indigenous peoples in a variety of processes, thereby contributing to a more coherent shift away from a purely state-centric approach to Arctic environmental governance.

Meanwhile, the precautionary principle (Principle 15) establishes an independent obligation to prevent environmental damage which should be avoided or minimized through anticipatory, preventative regulatory controls (Applegate 2002, 13). This principle displays greater sensitivity to uncertainty surrounding scientific inquiry and human ignorance (Clapp and Dauvergne 2005), demanding that, "[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."[79] [80]

Still, it must be noted that the definition and requirements of the precautionary principle are subject to intense debate with contrasting views on its status in international law (see Harrison 2017, 14; VanderZwaag 2010; Trouwborst 2006).[81] The implementation of the precautionary principle takes on a wide spectrum of measures, often on a case-by-case basis. Some cases take an adaptive management approach where the effects of an activity are monitored, and the regulatory framework is adjusted accordingly. Others set cautious standards to limit impacts (Trouwborst 2006; VanderZwaag 2002, 168). In other cases, moreover, the principle may be invoked by prohibiting particular actions until there is evidence of no harm.

Diverse, context-dependent interpretations of the precautionary principle have found their way into numerous binding and non-binding instruments relevant to the Arctic, including the UNFCCC, the UNCBD, the *Stockholm Convention*, and the *Ozone Convention*.[82] The UNCLOS indirectly requires a precautionary approach, as well; the International Tribunal for the Law of the Sea has referred to it implicitly in fisheries conservation matters to avoid serious harm, although it has avoided pronouncing its status as customary international law (Trouwborst 2006, 7; see also McIntyre and Mosedale 1997, 222–23). The 1995 *Straddling Stock Agreement* further elaborated on living marine resources by obliging countries to apply a precautionary approach to fisheries management.

The proactive, anticipatory approach of the precautionary principle underpins both formal and informal environmental governance specific to the Arctic context, including the previously mentioned 2018 *International Agreement to Prevent Unregulated High Seas Fisheries in the central Arctic* Ocean (see section 2.1.5.). In this particular case, the precautionary principle seeks to provide key coastal states, with

[78] Enshrined as an individual right under the *Aarhus Convention,* this commitment to participation was ratified on a state level under the *Espoo Convention*.

[79] More specifically, Fitzmaurice (2009, 29—30) argues that the precautionary approach is applied when four conditions are met: when there is a risk of negative impact; when the impact is serious or irreversible; when there is *some* scientific evidence of risk yet the evidence is inconclusive; and when developing states are held to different standards. When these conditions are met, a state is permitted (but not obliged) to take preventative measures. Uncertainty is not an impediment to protective measures. Moreover, the implementation of a stricter precautionary approach is possible when implemented through particular treaties.

[80] However, when scientific evidence *is* conclusive, and pointing to a risk of transboundary harm, then Principle 2 applies; a state must conduct a transboundary EIA, account for its findings, and must not permit an activity that could significantly damage a neighbouring state.

[81] For a summary of the debate see (Krämer 2018, 180–82). For a brief summary on differing academic views see VanderZwaag (2010, 613); Ellis and FitzGerald (2003, 784); VanderZwaag (2002, 168–69).

[82] For instance, both the 1995 *Straddling Stock Agreement* and its 2010 Review Conference reinforced an international conviction relating to the need to protect seas and oceans as unique ecosystems.

a potential interest in Arctic fishing, with some level of coherence as to how to proceed should fishing in the CAO become a possibility; for now, uncertainty remains surrounding three elements: a decline in Arctic sea ice, shipping capability in previously inaccessible Arctic waters, and the northward migration of fishing stocks. References to Principle 15 are also found in the 1993 *Nuuk Declaration on Environment and Development in the Arctic* which notes that, "…development in the Arctic must incorporate the application of precautionary approaches to development with environmental implications, including prior assessment and systematic observation of the impacts of such development…," and in support of, "the implementation of the provisions of the Convention on Environmental Impact Assessment in a Transboundary Context." In addition to this, the declaration highlights "the importance of prior and timely notification and consultation regarding activities that may have significant adverse transboundary environmental effects, including preparedness for natural disasters and other emergencies that are likely to produce sudden harmful effects on the Arctic environment or its peoples." More recently, the 2009 *Tromsø Declaration* urged Arctic Council Member States "to apply the precautionary approach and polluter-pays principle as reflected in Principles 15 and 16 of the *Rio Declaration*, respectively, and conduct risk and environmental impact assessments for the exploration, development, transport and storage of oil, and enact and/or enforce appropriate laws and controls." The 2009 *Arctic Offshore Oil and Gas Guidelines* also references Principle 15 (Arctic Council 2009, 6).

Lastly, Principle 22 of the *Rio Declaration* shifted the role of Indigenous peoples from objects of protection to objects of cooperation by recognizing the value of traditional knowledge and creating an active role for Indigenous peoples to participate in the process of sustainable development (Heinämäki 2016, 214; Bernstein 2001, 107). More specifically, Principle 22 states that (Rio Declaration 1992),

> Indigenous people and their communities and other local communities have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognize and duly support their identity, culture and interests and enable their effective participation in the achievement of sustainable development.

There are various examples of this principle's application in treaties and declarations relevant to the Arctic. Article 2 of *ILO Convention No. 169 concerning Indigenous and Tribal Peoples in Independent Countries,* outlined in the following section, provides that actions respecting Indigenous peoples shall be developed with the participation of the peoples concerned.[83] Meanwhile, the opportunity to give or withhold free, prior, and informed consent is a cornerstone of the *United Nations Declaration on the Rights of Indigenous Peoples* – Articles 29(2), 30(2) and 32(2) all explicitly require that states obtain free, prior, and informed prior consent before engaging in activities on the lands or territories of Indigenous peoples.

Finally, and more specifically to the Arctic context, Principle 22 is acknowledged in the 1993 *Nuuk Declaration on Environment and Development in the Arctic* which highlights that, "decisions relating to Arctic activities must be made in a transparent fashion and therefore undertake to facilitate, through national

[83] Other relevant articles include Article 4 which provides that special measures are to be adopted for safeguarding the environment of such peoples consistent with their freely expressed wishes. State Parties must consult Indigenous peoples (Art. 6) and provide for their participation in formulating national and regional development plans that may affect them (Art. 7). Environmental impact assessment must be done of planned development activities with the cooperation of the peoples concerned (Art. 7(3)) and "governments shall take measures, in cooperation with the peoples con- to protect and preserve the environment of the territories they inhabit" (Art. 7(4)). Rights to remedies are provided in Article 12. Part II of the Convention addresses land issues, including the rights of the peoples concerned to the natural resources pertaining to their lands.

rules and legislation, appropriate access to information concerning such decisions, to participation in such decisions and to judicial and administrative proceedings" (Strategy 1993, 4; see also Tennberg 2017, 35). It also recognizes "the special role of the Indigenous peoples in environmental management and development in the Arctic, and of the significance of their knowledge and traditional practices and will promote their effective participation in the achievement of sustainable development in the Arctic." Similarly, the Preamble and Articles 1(a), 2, and 3(c) of the 1996 *Joint Communique and Declaration of the Establishment of the Arctic Council* (see more below) provide rights of participation to Indigenous communities of the circumpolar region. Lastly, Principle 22 is also found in the Guidelines for Environmental Impact Assessment in the Arctic which recognize the importance of traditional knowledge and values in the EIA process. The guidelines also establish a normative commitment to respect traditional knowledge and values, thereby raising the presumption that they should be accounted for in decision-making processes (Craik 2010, 150).[84]

As is evident, the four principles outlined above – Principles 2, 10, 15, and 22 – transcend various regimes. They support the formal work of MEAs, link to the UNCLOS as well as human rights instruments and Indigenous peoples' rights and lay a foundation for much of the informal work of the Arctic Environmental Protection Strategy and the subsequent Arctic Council, outlined later on. It is also important to make note of how different formal and informal agreements draw on environmental principles in conjunction with different legal definitions of the Arctic, whether legitimacy and authority emanates from the five Arctic coastal states or the eight Arctic states. For instance, when it comes to how the five Arctic coastal states drew on the precautionary principle as a means of justifying the positivist approach of the Arctic Fisheries Agreement (see section 3.1.3).

If we further build on Scotford's (2017, 11) argument that environmental principles "have no settled meanings and have legal identities that are nascent, fragmented and idiosyncratic across jurisdictions," then these reflexive principles can, in fact, serve as canvases for national political and legal orders to imagine and re-imagine areas like the Arctic through either a mechanistic or a complex systems lens, thereby contributing to various forms of legal change.

3.3. Human Rights Instruments & Indigenous Peoples' Rights

Material changes in the Arctic system can pose significant challenges for the lifestyle, culture, and socio-economic well-being of northern communities as well (see Chapter 2). Arctic Indigenous peoples face particular challenges as some communities seek to maintain connection to the land, including for subsistence-based livelihoods. At times, the socio-economic consequences reverberate within communities in unexpected ways, raising questions and concerns related to individual and collective rights.

In addition to the LOS and international environmental regimes, this human dimension of Arctic environmental change is largely protected by human rights instruments and Indigenous peoples' rights. Generally, the human rights regime provides rules and principles — including special rules for rule-creation, rule-application and change (Koskenniemi 2007, 17) — concerned with the basic civil and

[84] At the same time, it must be noted that the Arctic EIA guidelines also recognize the challenge of conducting transboundary EIA given the presence of remote, Arctic Indigenous communities (Craik 2010, 150; Finnish Ministry of the Environment and Arctic Environmental Protection Strategy 1997).

political rights of individuals.[85] This includes a complex web of binding and non-binding global and regional instruments, most of which have emerged since the end of the Second World War. There are three main sources of human and Indigenous rights in the Arctic: the UN system, the Council of Europe system, and the Inter-American system (Durfee and Johnstone 2019, 153). However, as with the MEAs, outlined above, these human rights instruments and Indigenous peoples' rights are not specific to the Arctic *per se*.

3.3.1. Human Rights Agreements

All Indigenous peoples and individuals are protected under the *Universal Declaration of Human Rights* (UDHR) which, although non-binding, is now considered customary international law.[86] In addition to this, the eight Arctic states are also party to some of the universal and regional international instruments in which these human rights are enshrined; including the *International Covenant on Civil and Political Rights* (ICCPR); the *International Covenant on Economic, Social, and Cultural Rights* (ICESCR); the *International Labor Organization's Convention concerning Indigenous and Tribal Peoples in Independent Countries* (ILO Convention No. 169); the *European Convention on Human Rights*; the *European Charter for Regional or Minority Languages*; the *Optional Protocol to the ICCPR*; the *Convention on Elimination of all Forms of Racial Discrimination*; the *Inter-American Convention on Human Rights*, and *the American Declaration of the Rights and Duties of Man*. Table 2 (adapted from the AHDR 2004 and updated) highlights the current status of ratification of these instruments by each Arctic state.

In addition to the civil and political rights of individuals, some of these instruments also recognize collective rights, including rights relating to Arctic Indigenous peoples.[87] Both the *International Covenant on Civil and Political Rights* and the *International Covenant on Economic, Social, and Cultural Rights*, for instance, have asked Arctic states to report on the position of Indigenous peoples under common Article 1 — the right of all peoples to self-determination — "a prerequisite to the enjoyment and exercise of all other human rights" (Einarsson et al. 2004, 104). Indigenous peoples' rights are further protected under general human rights like *Article 27* — the minorities' provision — of the *International Covenant on Civil and Political Rights* (Möller 2011).[88]

[85] Some human rights regimes like the International Covenant on Economic, Social and Cultural Rights (ICESCR) go even further in ensuring the enjoyment of economic, social, and cultural rights including rights to education, fair and just conditions of work, an adequate standard of living, the highest attainable standard of health, and social security.

[86] The International Covenant on Economic, Social and Cultural Rights (ICESCR) and the International covenant on Civil and Political Rights (ICCPR), both agreed in 1966, converted much of the content of the UDHR into binding obligations for state parties.

[87] It must be noted that despite the general political commitment of Arctic states to support Indigenous and human rights globally, some argue that developments relating to Indigenous rights in international law do not have a significant impact on the domestic legislation of Arctic states (Larsen, Fondahl, and Nordic Council of Ministers 2015, 241). A comparison of Arctic states reveals major human rights differences in terms of the scope of self-governance or autonomous arrangements, some more generous than others (Loukacheva 2010, 167). In a similar vein, Indigenous peoples' status as Permanent Participants in the Arctic Council, has not necessarily guaranteed the implementation of Indigenous rights in domestic law (Koivurova and Stepien 2011; Bankes 2009).

[88] Russia has been asked to report on the position of their Indigenous peoples under the ICCPR while Canada, Finland, Norway, Sweden, and the U.S. report to the ICESCR (Larsen, Fondahl, and Nordic Council of Ministers 2015).

Table 2: Ratification of universal and regional international human rights instruments *(Einarsson et al. 2004)*

	Canada	Denmark	Finland	Iceland	Norway	Russia	Sweden	US
European Convention on Human Rights	✗	✓ (1953)	✓ (1990)	✓ (1953)	✓ (1952)	✓ (1998)	✓ (1952)	✗
European Charter for Regional or Minority Languages	✗	✓	✓	signed	✓	signed	✓	✗
International Covenant on Civil and Political Rights (ICCPR)	✓	✓	✓	✓	✓	✓	✓	✓
Optional Protocol to the ICCPR	✓	✓	✓	✓	✓	✓	✓	✗
Convention on Elimination of all forms of Racial Discrimination (CERD)	✓	✓	✓	✓	✓	✓	✓	✓
ILO Convention 107	✗	✗	✗	✗	✗	✗	✗	✗
ILO Convention 169	✗ (1996)	✓	✗	✗	✓ (1990)	✗	✗	✗
International Covenant on Economic and Social Rights	✓	✓	✓	✓	✓	✓	✓	✗
Inter-American Convention on Human Rights	✗	✗	✗	✗	✗	✗	✗	✗
American Declaration on the Rights & Duties of Man	✓	✗	✗	✗	✗	✗	✗	✓
United Nations Convention on the Rights of Indigenous Peoples[89]	E	E	E	E	E	✗	E	E
United Nations Declaration of Human Rights	E	E	E	E	E	E	E	E

✗ = *not a party*

✓ = *a party to the treaty by accession or ratification*

signed = the state has signed the treaty thereby indicating support for the object and purpose of the treaty but has yet to become bound by the instrument by ratification or accession

E = endorsed politically

[89] It is important to note that declarations are not signed or ratified but adopted by parties.

3.4. Indigenous Peoples' Rights

The Arctic is home to four million inhabitants, including approximately 400,000 Indigenous peoples. Past decades have witnessed a paradigm shift in relation to the status of Indigenous peoples – including Arctic Indigenous peoples – in international law, from Indigenous peoples as passive objects of protection to semi-subjects with procedural rights in matters important to them (Heinämäki 2016, 211–19; see also Barsh 1994).

Indigenous peoples' rights are protected through norms enshrined in the only modern Indigenous-specific convention, the 1989 *International Labor Organization's Convention concerning Indigenous and Tribal Peoples in Independent Countries* (ILO Convention No. 169), and the non-binding *2007 United Nations Declaration on the Rights of Indigenous People* (UNDRIP).[90] Together, these two mutually reinforcing instruments define the rights of Indigenous peoples to land, territory, and resources under international law (see Feiring 2013; Khan 2019, 683).

Seeking to establish a framework of partnership between Indigenous peoples and states (see Swepston 1990; Swepston and Tomei 1994), ILO Convention No. 169 recognizes the collective entitlement of Indigenous peoples rights. This includes a recognition of Indigenous peoples as political and legal entities who must be accounted for in decision-making related to matters concerning the group. For instance, under ILO Convention No. 169, it is required that Indigenous peoples' rights "to the natural resources pertaining to their lands shall be specially safeguarded. These rights include the right of these peoples to participate in the use, management and conservation of these resources." As such, the Convention is significant in the extent to which it creates treaty obligations among its ratifying states; of the eight Arctic States, only Denmark and Norway have ratified ILO Convention No. 169. While ratification is being explored by Finland and Sweden, it is not on the agendas of Canada, Russia, and the US (see Larsen, Fondahl, and Nordic Council of Ministers 2015, 237).

The 2007 *United Nations Declaration on the Rights of Indigenous Peoples* is another part of the aforementioned paradigm-shift in state-Indigenous relations (Heinämäki 2016, 210; Fitzmaurice 2009, 76) by enshrining rights that constitute "the minimum standards for the survival, dignity and well-being of the Indigenous peoples of the world" (Office of the High Commissioner for Human Rights 2007, Art. 43). Adopted by the UN General Assembly in 2007 following two decades of negotiation, the UNDRIP is distinguished as the only UN declaration to be drafted together with rights-holders (Davis 2008, 2; see also Barsh 1994), an innovation in international law even though all final decisions were taken by states. Endorsed by Denmark, Finland, Iceland, Norway, and Sweden, both Canada and the U.S. initially voted against the adoption of the non-binding Declaration, while Russia abstained. Canada and the U.S. have since endorsed it, while Russia has not. Nevertheless, Russia has indicated that it will account for its fundamental, underlying principles when developing new, national legislation given that it does not clash with the Constitution of the Russian Federation.[91]

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[90] Article 1 of the ILO Convention No. 169 defines "Indigenous peoples" as follows: "on account of their descent from the populations which inhabited the country, or a geographical region to which the country belongs, at the time of conquest or colonisation or the establishment of present State boundaries and who, irrespective of their legal status, retain some or all of their own social, economic, cultural and political institutions".. It must also be noted that the term Indigenous is not commonly used across all Arctic states (Hughes 2018, 15).

[91] Andrichenko, L. V., 2011. Kommentariy k stat'ye 69 konstitutsii Rossiyskoy Federatsii [Comment to Article 69 of the Constitution of the Russian Federation]. In: Zorkin, V.D. (ed.). Kommnetariy k Konstitutsii Rossiskoy Federatsii (postateynyy), 2nd edition, revised. M.: Norma, Infra-M.

The UNDRIP is explicit in addressing Indigenous peoples' right to self-determination and self-governance, as well as the principle of free, prior and informed consent (FPIC). Self-determination is central to the recognition of Indigenous peoples for their identity, way of life, as well as to the right to traditional lands, territories, and natural resources (Fallon 2012, 13). While ILO Convention No. 169 does not recognize Indigenous peoples' right to self-determination, the UNDRIP is the first universal instrument to recognize and elaborate on the content of the right to self-determination beyond the traditionally referenced "external right to self-determination" – the right of colonized peoples to independent statehood, as a means of ensuring sovereignty – by recognizing the right to "internal self-determination" of a segment of a population within a state. Grounded in human rights law (International Court of Justice, 2019, p. 4), this understanding of self-determination implies equal participation as a collective unit in decision-making processes on matters affecting the collective. In accordance with this, exercising self-determination implies the autonomy of the collective in its internal affairs, in decision-making on a state-level, as well as the right to be represented and participate in decision-making at the intergovernmental level (Cambou 2018, 27–28; 2019, 46; see also Anaya 2009).[92] By virtue of this application, Indigenous peoples can freely determine their political status and pursue their economic, social and cultural development.

Still, the right to self-determination remains contentious in practice. For instance, in seeking to understand the application of self-determination in the context of Greenland and the 2009 *Act on Greenland Self Government*, Dorothee Cambou (2020) points to its dynamic nature as a process that comprises multiple facets including: the right to decolonisation (from the Kingdom of Denmark), the right to internal self-determination (focusing on the relationship between the Government of Greenland and its population), and the right of Indigenous peoples to self-determination (focusing on a plurality of identities of Inuit people within Greenland); as well as the right of Inuit people, as a collective group, to maintain their culture, including their right over traditional land and natural resources, domestically and internationally.

What is also fundamental to "internal self-determination" is the principle of "free, prior and informed consent," which essentially means that Indigenous peoples have the right to make fully informed choices – without pressure or threat of coercion – on the development of their traditional lands or resources prior to the authorization and start of a project.[93] It also means that the choice to withhold or give consent is both respected and upheld by states (Ward 2011, 55). I mention FPIC earlier in my discussion of Principle 22 of the *Rio Declaration* (see section 2.2.2.). When implemented appropriately, Leena Heinämäki (2016, 209) argues that FPIC can positively influence matters relating to Indigenous peoples' land use and governance.

Although FPIC is referenced in both ILO Convention No. 169 and the UNDRIP, Heinämäki (2016, 225) observes their difference, arguing that while the former requires "the spirit of FPIC," the latter necessitates the "body of FPIC" whereby the principle is applied in cases where interference would lead to significant negative impacts on Indigenous peoples' traditional lands and way of life. For reference, ILO Convention No. 169 refers to FPIC in Article 16 in relation to the relocation of Indigenous peoples from their land; Article 7 recognizes the right of Indigenous peoples "to decide their own priorities for the process of development" and "to exercise control, to the extent possible, over their own economic, social and cultural development." Finally, Articles 2, 5, and 15 require States to fully consult with Indigenous peoples and

[92] However, this does not include a right to secession.

[93] Like the concept of self-determination, the principle of FPIC remains contested with various conflicting interpretations and requirements included in non-binding and binding international legal instruments and industry standards (Heinämäki 2016, 221). In the negotiation of the UNDRIP, the concept of FPIC was the most contentious precisely because of its ambiguity (Davis 2008, 465). Some advocates understood it as a veto right while others argue that it is meant to be a way of meaningfully ensuring the participation of Indigenous peoples in decisions on matters that impact their lands, territories, and resources. See Heinämäki (2016, 224)

ensure their informed participation in the development of legislative measures regulating consultation processes, in national institutions and programs, and as well as in the management of lands and resources (Heinämäki 2016, 222). Meanwhile, UNDRIP calls for FPIC in Article 10 on the relocation of Indigenous communities; in Article 19 under which "States shall consult and cooperate in good faith with Indigenous peoples" to obtain free, prior and informed consent before implementing any administrative or legislative matters that may affect them;" and Article 29 regarding the disposal of hazardous waste within Indigenous peoples' territories. Furthermore, Article 32 requires FPIC prior to "the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources."

In line with the UNDRIP, all Arctic states have embraced their obligation to consult with Indigenous peoples although each state maintains a varying approach to its implementation (see Fallon 2012, 14; Heinämäki 2016; Hughes 2018; Khan 2019; Hossain 2013; Cambou 2019; Sellheim 2019).[94] Arctic Indigenous peoples, like the Inuit, have also declared that "[n]o matter what level or form of self-determination the Inuit of any particular region have achieved, resource development in Inuit Nunaat must proceed only with the free, prior, and informed consent of the Inuit of that region." (Inuit Circumpolar Council 2010; see also 2011). Meanwhile, on a global scale, the language of self-determination and FPIC are increasingly also mainstreamed through human rights instruments and MEAs, like the UNFCCC and the UNCBD (see *Akwé: Kon Voluntary Guidelines* and Article 15; Article 8(j) requires approval), thereby confirming its normative significance and status.[95] For instance, in a submission to the 21st Conference of the Parties (COP) of the UNFCCC, the Office of the High Commissioner for Human Rights referenced the right to self-determination as one of the human rights most vulnerable to climate change.

Lastly, it must also be noted that, although the Arctic comes to the attention of institutions like the United Nations Permanent Forum on Indigenous Peoples, as well as other human rights bodies, they do not focus on the rights of Arctic Indigenous peoples *per se* (Durfee and Johnstone 2019, 81). In later sections I briefly examine the extent to which Indigenous peoples' rights are included in the Arctic Environmental Protection Strategy and the Arctic Council.

3.5. Arctic-Specific Agreements

Arctic-specific agreements are domestic, bilateral, and multilateral. Domestic legal norms include the regulation of marine areas, such as the Northern Canada Vessel Traffic Services Regulations (NORDREG), or laws to recognize self-governance including land claim agreements in Canada, Norway's 2005 Finnmark Act, and Greenland's 2009 *Self-Governance Act*. They also include bilateral agreements such as the boundary delineations between Arctic states, outlined above.

International legal norms specific to the Arctic are historic and contemporary. Some, like the *Treaty Concerning the Archipelago of Spitsbergen* (The Spitsbergen Treaty) or the *Agreement on Conservation of Polar Bears* stretch back to 1920 and 1973, respectively. The 1920 Treaty Concerning the Archipelago of Spitsbergen, for instance, preceded the UNCLOS and gave Norway sovereignty over Spitsbergen (now

[94] See Sellheim (2019, 108–11) for a concise overview of the situation of Indigenous peoples in Arctic states.

[95] See Human Rights Committee, Poma Poma v. Peru., Communication No. 1457/2006, Doc. CCPR/C/95/D/1457/2006 (27 March 2009). ("UN Human Rights Committee (UN-HRCee), Geneva/New York - 27.III.09 - Protection of Minorities, Economic Aspect / Dispossession of Waters Used by Indigenous People for Their Traditional Activities (Raising Llamas on the Andean Altiplano) / Violation of Article 27 CCPR / Poma v. Peru" 2009). See, also, generally, Heinämäki (2016).

Svalbard) and 12 nautical miles of territorial seas (from the baseline) in return for Norway's commitment "to demilitarize the area, grant all parties equal access to the archipelago's natural resources, encourage scientific research, and establish an equitable administrative system."[96] To this day, the Spitsbergen Treaty provides states with the opportunity to build research stations on Svalbard and accepts "the rights of the treaty parties to nondiscriminatory access to resources in that area (essentially fisheries)."[97] Meanwhile, the *Polar Bear Agreement* was the first form of multilateral cooperation in the Arctic (amended over decades, including management agreements between the U.S. and Canada) (Durfee and Johnstone 2019, 48).

In recent years, Arctic states started to develop new formal agreements unique to the Arctic environment and in response to new challenges. Many of these agreements are mechanistic, mirroring broader international developments like the devolution of state power (Nilsson and Koivurova 2016).

These Arctic-specific agreements include the 2011 *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic* (SAR Agreement); the 2013 *Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic* (EPPR agreement); the 2017 IMO *Polar Code* to make navigation safer and more environmentally sustainable in increasingly ice-free Arctic waters (see Chapter 4); and the 2017 *Agreement on Enhancing International Arctic Scientific Cooperation*.[98] As noted, Arctic coastal states have also signed the 2018 *International Agreement to Prevent Unregulated High Seas Fisheries in the central Arctic Ocean*.

Several of these new legally binding instruments, some of which I outline in greater detail in the following chapters, were negotiated under the auspices of the Arctic Council (see below) but are anchored in and thereby affirm some of the existing international agreements and principles outlined above. For instance, the SAR agreement is linked to both the 1979 *International Convention on Maritime Search and Rescue* and the 1944 *Convention on International Civil Aviation* while the EPPR agreement is linked to the 1982 UNCLOS, the 1990 *International Convention on Oil Pollution Preparedness Response and Cooperation*, and the 1969 *International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties* in terms of the latter.[99] These new, Arctic-specific agreements are significant because they seek to develop a comprehensive framework that involves all eight Arctic states, strengthens existing cooperation, and covers the entire Arctic region.

In a similar vein, the 2017 *Polar Code* is implemented through amendments to the *International Convention for the Prevention of Pollution from Ships* and the *International Convention for the Safety of Life at Sea* (SOLAS) (to delay having to secure a new treaty).[100] Specifically, the *Code* seeks to provide for "safe ship operation and the protection of the polar environment by addressing risks present in polar waters and not adequately mitigated by other instruments of the Organization." (see Chapter 4 for a more thorough discussion of the Code).

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[96] "Treaty Concerning the Archipelago of Spitsbergen" 1920, 7.

[97] However, "Norway claims that the 200 nautical miles fisheries protection zone (beyond the territorial sea) is entirely under its own jurisdiction with no obligation to share resources with the treaty parties, and it assert that the continental shelf around Svalbard is in fact part of the same shelf that joins the main Norwegian coast and hence is exclusively Norwegian, too. Other parties to the Spitsbergen Treaty have protested Norway's interpretation, arguing that the EEZ and continental shelf around Svalbard is subject to the same sharing provisions as the islands themselves" (Durfee and Johnstone 2019, 195; see also Erik J. Molenaar 2012; Ørebech 2017).

[98] This *Agreement on Enhancing International Arctic Scientific Cooperation* accounts for the provisions of UNCLOS, Part XIII on marine scientific research including Article 261 on non-interference with shipping routes, in particular.

[99] Although the negotiation of the *Polar Code* was multilateral it was also significantly informed by the PAME WG of the Arctic Council (Durfee and Johnstone 2019, 82).

[100] International Convention for the Safety of Life at Sea 1974, 1184 U.N.T.S. 278.

In addition to this, the *Nordic Sámi Convention,* which is currently being finalized*,* is set to become an international instrument specific to some Indigenous peoples' rights in the Arctic (Åhrén 2007; Bankes and Koivurova 2013). In recent years, the Sámi peoples across Norway, Finland, and Sweden put forward a draft *Nordic Sámi Convention*, an international treaty that would accommodate the self-determination of the Sámi peoples within the territory of the three (out of four) nation states that they inhabit in the Arctic. Its aim is to improve cross-border contact and cooperation between Sámi communities (Bankes and Koivurova 2013; Hossain 2013; Koivurova 2014; Staalesen 2017).

4. Informal Governance

In addition to formal governance responses, a significant and more prominent part of Arctic environmental governance is informal with a broad constellation of actors, including Indigenous peoples. The evolution of informal governance in the Arctic is defined by both continuity and change (Koivurova and Smieszek 2017, 12–13). For decades, formal and informal state-to-state cooperation in the Arctic was preceded by strong, transboundary Indigenous leadership which continues to contribute to Indigenous peoples' participation in global governance. The Nordic Sámi Council, established in 1956, and the Inuit Circumpolar Conference (later known as the Inuit Circumpolar Council) formed in 1977, are but two examples of organized international Arctic activism.

Building on much of this work, other forms of state-to-state cooperation have developed over past decades – many sparked by a speech from then-General Secretary of the Communist Party of the Soviet Union, Mikhail Gorbachev, in Murmansk, Russia, in 1987 (Heininen 2011) – and have grown exponentially since the end of the Cold War.[101] Several international and regional bodies – including the Arctic Environmental Protection Strategy (AEPS), the International Arctic Science Committee, the Council of the Baltic Sea States, and the Barents Euro-Arctic Region – developed therefrom (Hønneland and Stokke 2007; Rogne et al. 2015).

Below, I focus on two of these institutions operating at a pan-Arctic and international scale: The AEPS and the Arctic Council, both established through non-binding political accords in the 1990s, and both defined by geography.[102]

Unlike the previous section on formal approaches to Arctic environmental governance, this section on informal approaches provides a more detailed focus on the institutional design of these particular fora, precisely because they serve(d) as the primary venue(s) for Arctic-specific governance; because Arctic scholarship has heralded them for their unique and innovative approach to transboundary governance for some time; and because these institutions themselves have experienced significant endogenous change in response to a rapidly changing Arctic environment, its tightening social-ecological links, and a shift in

[101] More specifically, Gorbachev called for the Arctic to become a zone of peace and fruitful cooperation through the coordination of scientific research, as well as through the protection of the Arctic's natural environment supported by a circumpolar environmental monitoring program. See for example (Heininen 2011; Hønneland and Stokke 2007; Koivurova 2012a; Nilsson 2009; English 2013).

[102] It must be noted that there is some variation and recognition of different delineations of the Arctic within the Council's Working Groups based on their sectoral focus, be it the monitoring of pollutants or flora and fauna.

Arctic worldviews – both in- and outside the Arctic – over the past three past decades. The evolution of the AEPS and the AC, however, does not necessarily guarantee governance success.

4.1. Arctic Environmental Protection Strategy

Spurred on by a series of environmental and political events, like the *Exxon Valdez* oil spill in Alaska in 1989 and the end of the Cold War, the Foreign Ministers of the eight Arctic states – Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States – gathered in Rovaniemi, Finland, in 1991 to sign *the Rovaniemi Declaration*, a non-binding multilateral agreement, to adopt an *Arctic Environmental Protection Strategy* (1991).

With the aim of streamlining environmental protection strategies for the Arctic, the AEPS took a social-ecological approach, combining Canada's focus on Indigenous peoples and the environment and Finland's desired emphasis on curbing transboundary pollution (Arctic Environmental Protection Strategy 1991; Keskitalo 2007, 190; Koivurova and VanderZwaag 2007; English 2013).

From the beginning, the AEPS distinguished itself from other forms of international cooperation through its full acceptance of Arctic Indigenous peoples as right-holders, as well as its acceptance of three Indigenous peoples' organizations – the Inuit Circumpolar Council (ICC), the USSR Association of Small Peoples of the North, and the Sámi Council – as observers (Arctic Environmental Protection Strategy 1991).[103] In its founding declaration, Arctic states also acknowledged the consultation of additional observers – including Germany, Poland, the United Kingdom, the UN Economic Commission for Europe, the UN Environment Program, as well as the International Arctic Science Committee – who assisted in the preparation of the *Strategy* based on the "pragmatic and functional evaluation of their involvement in and contribution to Arctic environmental questions." (Arctic Environmental Protection Strategy 1991).

Given the Cold War context in which the AEPS arose, scientific cooperation on environmental issues was considered neutral ground for cooperation (Koivurova 2012a; Nilsson 2009). Thus, under the AEPS, the eight Arctic states — alongside non-Arctic states, IGOs, NGOs, and Indigenous peoples' organizations (Koivurova 2012a, 133, 137; 2008a, 16) — sought to develop initiatives to deepen their scientific understanding of, and counter, six particular threats — contaminants, oil pollution, heavy metals, noise, radioactivity, and acidification — by identifying applicable multilateral environmental agreements and by encouraging the publication of relevant, transparent environmental impact assessments, reports, and policy recommendations (see Keskitalo 2004; Arctic Environmental Protection Strategy 1991). The Strategy also aimed to assess threats to fragile northern ecosystems.

Much of this work took place under the auspices of four Working Groups — the Arctic Monitoring and Assessment Programme (AMAP); the Conservation of Arctic Flora and Fauna (CAFF); Emergency Prevention, Preparedness and Response (EPPR); and the Protection of the Arctic Marine Environment (PAME) — whose aim it was to develop common standards and good practices, like harmonize environmental impact assessments across the Arctic (Koivurova 2012a, 137). Projects within these groups were developed with significant leeway and supervised by eight Senior Arctic Affairs Officials (SAAO; later shortened to SAOs), Member State appointed government representatives who oversaw the overall

[103] More specifically, the use of the term "peoples" in the *Rovaniemi Declaration*, as opposed to people, has a particular implication for self-determination under international law (see Åhrén 2016; van Genugten, Meijknecht, and Rombouts 2014).

functioning of the Council, and who also prepared AEPS ministerial meetings in Nuuk, Greenland, in 1993; in Inuvik, Canada, in 1996; and in Alta, Norway, in 1997.[104]

These Working Groups essentially operated as a form of transgovernmental network – understood as peer-to-peer ties developed through frequent interaction, as opposed to formal negotiation (Raustiala 2002, 6) – that sought to foster compliance with existing treaties and international agreements, promoted convergence with national laws and regulations, and possessed credibility through their capacity to collect, distill, and disseminate information, ideas, norms, and practices to their members (Slaughter 2004, 169; see also Moore and Westley 2011).

Finally, in looking more precisely at its informal governance approach and the non-binding declarations signed at ministerial meetings, we can see both the history and motivation for the Strategy's inception, as well as the evolution of its conception of the Arctic system and how to respond to change within it – a critical observation given the nature of this project.

Within these declarations, the Arctic is most prominently understood as a self-contained, or closed, system where the environment must be protected from external harm. The 1991 *Rovaniemi Declaration*, the 1993 *Nuuk Declaration*, the 1996 *Inuvik Declaration*, and the 1997 *Alta Declaration* all acknowledge the vulnerability of the Arctic environment to human activities; this includes its fragile Arctic ecosystems with unique features that "require special protective measures" (Strategy 1993). In line with this, there is a clear recognition of the importance of the Arctic environment to present and future Arctic Indigenous peoples and local populations, as well as their contributions to the protection of the Arctic environment (Arctic Environmental Protection Strategy 1991). Beginning with the 1993 *Nuuk Declaration*, there is also a more specific awareness of the link between the state of the environment and the economy, health, social, and cultural well-being of Arctic people more specifically.

While there is no explicit mention of the complexity of interactions within the Arctic system (or a rapidly changing Arctic environment) *per se*, these four declarations show a growing recognition of some of the causal connections and recursive interactions highlighted in Chapter 2, including the link between local and global scales over time. The threat of global and local-source pollution – including oil, acidification, persistent organic contaminants, radioactivity, noise, heavy metals (Arctic Environmental Protection Strategy 1991) – to the Arctic environment serves as a pertinent case for Arctic international cooperation in each declaration. Another prominent issue, beginning with the *Rovaniemi Declaration*, is the conservation, protection, and restoration of Arctic flora and fauna, and the special role of Indigenous peoples within these processes. Meanwhile, the *Inuvik Declaration* was the first to acknowledge "the need for sustainable development and use of resources in the Arctic for the benefit of Indigenous peoples and other people living in the Arctic region" (Arctic Council 1996). Despite many of these recognitions though, the actions of the AEPS largely related to the production of scientific assessments and reports, and the maintenance of regularized international cooperation on the Arctic.

Some reflection on the structure of Arctic environmental governance appears in the *Alta Declaration* with Arctic states endorsing "the continued analysis and maintenance of a comprehensive overview regarding the adequacy and effectiveness of international agreements, measures and guidelines, and the analysis of accident notification systems to identify gaps and improve existing arrangements." (Arctic Council 1997). Nevertheless, little focus is given to whether the informal structure of the AEPS is required to address the challenges outlined.

[104] SAAOs/SAOs are almost always officials (often at the ambassadorial level) from the respective foreign ministries of Arctic Member States.

4.2. Arctic Council

For some Arctic states, the narrow environmental focus of the AEPS was insufficient to address all issues pertaining to the Arctic, especially the human dimension. That is when an earlier Canadian initiative in favour of establishing an Arctic Regional Council (see Chapter 5), an umbrella organization based on an international treaty and focused on a wider set of issues falling under the pillar of sustainable development in the Arctic, was revived (English 2013).[105]

The Arctic Council was established in 1996 as the coordinating body of the AEPS through the signing of the *Declaration establishing the Arctic Council* (hereafter the *Ottawa Declaration*) and a *Joint Communique*, explaining the role of this new high-level intergovernmental forum. As a consequence of U.S. pushback to creating a new international organization with legal personality, the non-binding *Ottawa Declaration* circumscribed the Council to an intergovernmental forum with a biennially rotating chair (between the eight Arctic states), no stable funding, and no permanent secretariat, thereby seeking to reduce any independent action of the Council (Scrivener 1999, 55–56; see also Bloom 1999; English 2013).[106] Even so, discussions surrounding the shape of the Council continued into its first years, under the Canadian chair.

Through this transition and negotiation process, the Council did ultimately broaden the mandate of the AEPS to encourage cooperation, coordination, and interaction on common Arctic issues between Arctic States, as well as Arctic Indigenous and non-Indigenous communities. A particular focus was placed on two pillars – "sustainable development" and "environmental protection" – with issues relating to the military consciously excluded (Hønneland and Stokke 2007; see also Keskitalo 2004). [107] [108] The challenge of invoking a principle like sustainable development though is that it often looks and behaves differently in diverse Arctic jurisdictions (see Carvalho 2001) leading to a variety of possible (If-Then) responses which may, in fact, prove to be too complex to successfully regulate the complexity of the Arctic system, thereby failing to meet the *law of requisite variety* by providing no coherent approach. In fact, this was already the case early on in the Arctic Council; the broad scope of its mandate – especially related to a wide range of

[105] As I explore in greater detail in Chapter 5, the idea for circumpolar collaboration was not new, considered as early as the 1970s. See for example (Cohen 1970).

[106] More specifically, the idea of an Arctic Council was met with resistance from the U.S. for four reasons: first, an increased emphasis on the participation of Indigenous peoples; second, a weariness surrounding the use of the concept of "sustainable development;" third, a fear that an umbrella approach would inevitably include issues of security; and finally, little domestic pressure or attachment to the Arctic in Washington D.C. (English 2013, 188–93). The U.S. maintained the view that the Council should remain a purely consultative forum instead (Scrivener 1999, 55; 1996; English 2013).

[107] Keskitalo (2004) argues that the lack of a precise definition of "sustainable development" was a consequence of a debate surrounding the question of conserving *versus* the utilising Arctic marine resources, particularly with regard to whaling and sealing (Tennberg 1998). The primary source of disagreement on the concept of "sustainable development" was found between the U.S.– a proponent of wilderness conservation – and Canada – in favour of traditional and Indigenous practices – during the negotiation of the 1996 *Ottawa Declaration* which sought to establish a coherent program for the Council. As a consequence of this disagreement, the Arctic states agreed to establish the Sustainable Development Working Group (SDWG) (Arctic Council 1998) which continues to focus on small, local projects across the Arctic. The SDWG itself did not have a Strategic Framework outlining its long-term plan until 2017 (Smieszek 2019b).

[108] The first ten years of the AEPS and the Arctic Council were focused on the environment with attention only shifting toward sustainable economic development in the Arctic in 2013 (Smieszek 2020, 66). Furthermore, the conscious exclusion of the military is noted in a footnote to paragraph 1a of *the Declaration on the Establishment of the Arctic Council*, September 19, 1996 (Arctic Council 1996). Even despite this, Arctic Member States negotiated the SAR agreement and established the Arctic Coast Guard Forum under its auspices.

projects falling under the umbrella of "sustainable development" – made it difficult for Arctic states to operationalize their work in practice (Smieszek 2020, 73–74; Tennberg 2017).

In 1998, following a two-year transition and the adoption of the Arctic Council's *Rules of Procedure* at the Iqaluit ministerial meeting, the Council effectively subsumed the AEPS in the form of an intergovernmental forum.[109] Since its inception, the Council experienced a dynamic evolution in both reach and stature (Smieszek 2019c); from a low-profile regional institution to the primary forum for Arctic environmental governance, globally. Most recently, the Arctic Council was nominated for a Nobel Peace Prize, with those who nominated it referring to the Council as a "model for promoting fraternity between nations" (Quinn 2018).

As I briefly outline below, the Council has gone through significant endogenous change over the past decades, expanding the scope of its structures, activities, and instruments. Its work is becoming increasingly complex as it seeks to respond to changes in the Arctic system over time. However, this does not necessarily mean that it meets the *law of requisite variety*.

4.2.1. Membership

Since its inception, the membership of the Arctic Council has grown substantially, and the rules surrounding individual contributions have remained in step. Although it took nearly a decade to operationalize the provisions of the 1996 *Ottawa Declaration* (Smieszek 2019c, 61–62), the membership of the Arctic Council includes eight Arctic Member States, Permanent Participants, Observer States and Observer Organizations today.

Building on the structure of the AEPS, a unique and innovative characteristic of the AC – one that moves beyond the positivistic approaches of many of the formal agreements outlined above – is its inclusion of Arctic Indigenous organizations as Permanent Participants; the ICC, the Saami Council, and the Russian Arctic Indigenous Peoples of the North (RAIPON) – who served as observers under the AEPS – in addition to the Arctic Athabaskan Council (AAC), the Gwich'in Council International (GCI), and the Aleut International Association (AIA).[110] In line with Principle 22 of the *Rio Declaration,* outlined above, the status of Permanent Participant in the Council was established "to provide for active participation and full consultation with the Arctic Indigenous representatives within the Arctic Council" (Arctic Council 1996).[111] Permanent Participants, as such, have full rights to participate in all activities of the Council and sit at the table at Ministerial meetings. Although this does not give them formal veto power, it provides Permanent Participants a moral authority and the opportunity to participate in norm-making, to frame issues, to lobby member states, to share knowledge, and to gain access to information (Koivurova 2012a; Fenge and Funston 2015; Prior 2017).[112] In a legal context, their inclusion is innovative given that Indigenous peoples often

[109] The Arctic Council has been described in various ways; as an intergovernmental forum (see for example, Berkman and Young 2009), a peak organization (Prior 2017), as a boundary organization (Spence 2017), etc.

[110] Not all current Permanent Participants were included at once. The 1996 *Ottawa Declaration* only included the ICC, Saami Council, RAIPON. The subsequent Ministerial Meeting in Iqaluit in 1998, admitted the Aleut International Association (AIA) as the fourth Permanent Participant. At the following meeting in Barrow, Alaska, in 2000, the Arctic Athabaskan Council (AAC) and Gwich'in Council International (GCI) were also granted Permanent Participant status. See (Smieszek 2020, 48–49).

[111] All meetings and activities are open to Permanent Participants, although there is a rarely invoked provision for the heads of delegation of Member States to meet privately (Spence 2017).

[112] It must be noted that some scholars, including Michael Byers and Douglas Nord, have suggested that Permanent Participants do effectively have veto power. See Byers and Baker (2013, 229–30); Nord (2015, 38 and 70).

face the limitations of international treaty-making processes and thus remain outside the sphere of influence (Ingimundarson 2014, 190; Koivurova 2010, 151; see also Fenge and Funston 2015; Lindroth and Sinevaara-Niskanen 2019).[113]

While the inclusion of Indigenous peoples allows the Council to surpass the epistemological limitations of the traditional legal order by removing the state as the reference point of sovereignty (Khan 2019, 691), Arctic Indigenous peoples remain passive in the sense that decision-making ultimately still remains with the state. This ontological limitation of international law curtails the full and equal participation of Indigenous peoples (Hossain 2013, 316). It also neglects the plurality of Indigenous legal orders (Khan 2019, 692). In addition to this, the engagement of Permanent Participants in various projects is, at times, restricted by their ability to access funding and the challenges posed by the highly specialized nature of the work done in various subsidiary bodies of the Council (Lindroth and Sinevaara-Niskanen 2017, 32). These limitations are reflected in the fact that only 16 of the Council's 90 activities include a Permanent Participant as a co-lead (Arctic Council 2019c).

The Council also grants Observer status to non-Arctic states, like China; global and regional inter-governmental and inter-parliamentary organizations, such as the United Nations Environment Programme; and non-governmental organizations, like Greenpeace. The most significant change has occurred in response to this status in recent years. Today, the Arctic Council has 39 Observers following a surge of interest in the Arctic between 2007 and 2011, which placed significant pressure on both the institution and its Member States (Smieszek 2020, 55–57; see also Graczyk and Koivurova 2014; Graczyk 2011; Graff 2007).[114]

In response to this interest, and with a desire to maintain some control, Arctic ministers adopted rules to clarify the role and criteria for Observers to the Council at the Nuuk ministerial meeting in 2011. An *Observer Manual* was subsequently developed under the Swedish Chairmanship (2011-2013) in order to guide the role of Observers in Arctic Council Working Groups and Task Forces (Arctic Council 2013d). The *Manual* further clarified that Observer status is based on the consensus of the ministers of the eight Arctic states and accredited through ministerial declarations (Arctic Council 2013a, Rule 37 and Annex 2, Rule 5), re-evaluated every four years, and reversed at any given time.[115] Observers must recognize the sovereignty of Arctic states, international law (particularly the LOS), the rights of Indigenous peoples and the work of Permanent Participants (including through financial commitment to their work), as well as provide evidence of their capacity to contribute to scientific research (Arctic Council 1998 Annex 2; see also Durfee and Johnstone 2019, 76). Currently, 10 projects have Observer co-leads listed which raises interesting procedural questions about *who* develops policy recommendations (Arctic Council 2019c; Barry et al. 2020b), especially when considering the number of Permanent Participant who are co-leads.[116]

Finally, there is no instrument or individual who speaks on behalf of the Arctic Council internationally (Durfee and Johnstone 2019, 78). The Council is in no way independent from its Member States whose decisions are consensus-based following the full consultation of all Permanent Participants (Koivurova and

[113] It must be noted, however, that in the proposed Nordic Saami Convention, outlined above in section 2.5., Indigenous peoples would be accommodated as equal partners despite being formally party to the treaty like Norway, Sweden, and Finland.

[114] This includes 13 states and 26 international organizations. In addition to this, it must be noted that the European Union *de facto* participates as an Observer to the Council.

[115] Prior to this, Observers were accredited by the Council's subsidiary bodies – its Working Groups, Task Forces, and Expert Groups.

[116] This does not include the broader engagement of Observers leading on various project components nested within broader initiatives (Barry et al. 2020b, 2).

VanderZwaag 2007; Arctic Council 1996, Art. 7).[117] In this way, the informal nature of the Arctic Council maintains some elements of legal positivism, such as the primacy of the state in international cooperation, as well.

4.2.2. Structure & Process

Over the past thirty years, the Arctic Council has undergone a dynamic evolution, both in response to endogenous and exogenous pressures, leading it to become increasingly complex. A significant part of this change occurred in response to various calls to restructure the Council in order to increase its effectiveness during the intervening years between the AEPS and the Arctic Council (Haavisto 2001; Chairmanship 2008; Barry et al. 2020b). More recently, changes have occurred in response to a rising interest in the Council's work from outside the Arctic (see above). Many of the resulting structural and procedural changes were enabled by Member States, Permanent Participants, and Observers through consensus-based decisions, as well as through financial commitments and other resource support.

While there has been no constitutive change – relating to mandate, membership, consensus-based decision-making, rotating chairmanship, or rules of procedure – that would alter the Council's provisions under the *Ottawa Declaration*, there have been notable operational changes related to its secretariat, subsidiary bodies, Observers, and guidelines (Smieszek 2020, 68). These include, among other things, guidelines for participation in the Council's structure beyond the *Ottawa Declaration* and the *Rules of Procedure* like its *Communication and Outreach Guidelines*, its first *Strategic Communications Plan*, and *Host Country Agreement*.

Without undergoing any significant constitutional changes and without an overall strategy to guide its activities, the Council continues to offer a political platform for various actors to influence processes and outcomes under the provisions of the *Ottawa Declaration* (Tallberg 2010, 245). Member States seek to balance out this reality – as well as the impacts of any non-linearities in decision-making as a result of discontinuities within the domestic politics of individual Arctic states – with a rotating two-year Chairmanship that bestows equal advantage on all Member States (Smieszek and Kankaanpää 2015, 11).[118] During these two-year periods, Member States convene major meetings and set policy directions and priorities (Keskitalo 2004). A rotating chairmanship is often established in an attempt to avoid collective action and bargaining problems, generally conferring functional tasks on the Chair instead (Smieszek and Kankaanpää 2015, 2–3).

The consensus-based decision-making noted above takes place at biennial ministerial meetings between the Foreign Ministers of the eight Arctic states during which they respond to SAO progress reports by signing non-binding declarations or statements that welcome, endorse, or approve work plans for the

[117] Smieszek (2020, 71–72) distinguishes consensus from unanimity, noting that unanimity requires each party to explicitly and formally approve a measure or decision while consensus refers to situations in which a party or more are content to participate or abstain, as opposed to actively halt the will of the majority. Smieszek further notes that a consensus-based approach was a key objective of the U.S. in negotiating the *Ottawa Declaration*.

[118] Smieszek and Kankaanpää (2015, 10) point to the *Arctic Climate Impact Assessment* (ACIA) as a pertinent example where changes in domestic politics within the U.S. translated into different political approaches to Arctic projects; after the launch of the assessment process under the Clinton administration, the following administration under George W. Bush, proposed a delay in drafting policy recommendations which seriously hampered the policy process. The document was eventually published in 2005 following significant public pressure on the US (Fenge 2013; Nilsson 2009).

following two years; highlight emerging issues; and provide SAOs with instructions on required actions (Barry et al. 2020b).[119]

The work of the Council, including its proceedings and projects, are guided by its *Rules of Procedure* under the direction of the eight SAOs (see 3.1.).[120] SAOs must ensure internal coordination with officials from other government ministries, as well as domestic right- and stakeholders, to foster and maintain the interdisciplinary work of the Council (Balton and Ulmer 2019, 9). More specifically, SAOs meet 2-3 times per year with Permanent Participants, as well as others, to present project updates and other relevant information (Smieszek 2020, 62). In addition to this, they oversee the work of the Council's subsidiary bodies; for instance, working groups report to SAOs who guide their work based on the foreign policies of the eight Arctic states (Spence 2017; Smieszek 2020, 62). As outlined in greater detail below, the Council also produces policy recommendations; guidelines and manuals; as well as chairmanship and WG work plans outlining project commitments and financing.

While there have been no constitutive changes, some operational changes have occurred in response to calls for greater efficiency. Many of these changes were possible given the absence of an underlying legal agreement. By avoiding formal governance structures, the Council's current approach provides opportunities for state and non-state actors to build social capital – as well as a common understanding among rights- and stakeholders (Hoel 2009) – through years of interaction, at times making it easier to break with convention (Prior 2017).

Today, most of the work of the Arctic Council takes place under the auspices of its permanent Secretariat; the Indigenous Peoples' Secretariat (IPS); its six Working Groups (WGs); as well as several Task Forces and Expert Groups.[121] Several of these administrative bodies have become centralized over the past two decades (Smieszek 2020, 50–52; Arctic Council 2013c; Arctic Council 2015b). The Arctic Council Secretariat (ACS), the IPS, and the secretariats of three WGs – the AMAP, ACAP, and EPPR – are now based in Tromsø, Norway.[122]

While the 1996 *Ottawa Declaration* circumscribed the Council to no permanent secretariat, one was established by a decision made at the 2011 Nuuk ministerial meeting "to strengthen the capacity of the Arctic Council to respond to the challenges and opportunities facing the Arctic" (Arctic Council 2011b); it became operational in 2013.[123] Its aim is to *inter alia* assist the sitting Chair in an administrative capacity – in drafting meeting documents, developing strategic communication and outreach plans, and providing other required services and functions directed by the Council and its sitting Chair (Art 2.2.).[124] Meanwhile, the IPS – established in 1994 under the AEPS – facilitates the contributions of Permanent Participants to their cooperation with Arctic states by providing background information, recent research findings, and

[119] It must be noted that SAOs maintain a level of flexibility to adjust Working Group mandates and work plans so long as they remain within the scope of biennial ministerial declarations (Koivurova and Smieszek 2017, 6).
[120] Adopted under the *Iqaluit Declaration*, the *Rules of Procedure* include guidelines for Council meetings, the process for submitting project and program proposals, and the role of subordinate bodies. See also Council (1998).
[121] It must be noted that despite any of the outlined checks and balances, the SAO Chair of the Member-State holding the Chairmanship maintains some leverage and control over the director of the Arctic Council Secretariat (Arctic Council 2012 Art 3.2. and 3.4. Smieszek and Kankaanpää 2015, 8–9).
[122] Meanwhile, the secretariats of the CAFF and PAME WGs are based in Akyureyri, Iceland. Lastly, the SDWG secretariat does not have a fully permanent arrangement but follows the rotation cycle of the Arctic Council Chairmanship instead. At the 2019 Ministerial Meeting, however, Canada announced its willingness to fund a permanent SDWG secretariat (see Arctic Council 2019a).
[123] The first budget of the ACS was adopted ministerial meeting in Kiruna in 2013 (Arctic Council 2013b).
[124] One key benefit of the Secretariat is the institutional memory it provides through rotating chairmanships.

assisting in policy processes (see more Smieszek 2020, 50; Lindroth and Sinevaara-Niskanen 2017, 32).[125] I outline the structure of the Council's subsidiary bodies below.

4.2.3. Working Groups, Task Forces, and Expert Groups

Governance and legal innovation in the Arctic Council — in the form of guidelines, scientific reports and assessments, as well as the conservation of Indigenous languages and cultures (Graczyk and Koivurova 2014) — primarily take place under the auspices of its WGs, task forces, and expert groups (Prior 2017). These subsidiary bodies operate as a form of transgovernmental network (Raustiala 2002; Slaughter 2004), exhibiting high connectivity and feedback. Seeking to address many of the issues outlined in Chapter 2, each is organized according to their own specifications – mandates, strategies, priorities, modes of work, expert groups and networks of collaboration identified by scientists and officials – approved by SAOs and Ministers (Fenge and Funston 2015).[126] At any given moment, the portfolio of Arctic Council projects – administered by the staff of the ACS and the capacities of subsidiary body secretariats – hovers around 80 (See Arctic Council 2015c), and the number continues to grow. Generally, one half of the Council's projects are science-oriented, while the other half are focused on small-scale, practical projects across the circumpolar North (Smieszek 2019c, 22).

Building on the four WGs of the AEPS, current WGs include the Arctic Contaminants Action Program (ACAP), the Arctic Monitoring and Assessment Programme (AMAP), the Conservation of Arctic Flora and Fauna (CAFF), the Emergency Prevention, Preparedness and Response (EPPR), the Protection of the Arctic Marine Environment (PAME), and the Sustainable Development Working Group (SDWG).[127]

These six thematically-organized WGs are overseen by a chair, management board or steering committee, and supported by their secretariats to ensure continuity.[128] With exception of the SDWG, which is led by the chair of the Arctic Council, each of the remaining WGs is chaired by different Arctic states which, Smieszek and Kankaanpää (2015, 9–11) argue, provides a system of checks and balances. Management boards are generally comprised of Member State representatives connected to the mandate of the WG, Permanent Participant representatives, and Observer States or Organizations. Some WGs have established additional, specialized subsidiary bodies (Spence 2017, 795). Meanwhile, membership in each of the WGs is distinct, including representatives from Member State agencies, Permanent Participants, Observer States and Observer Organizations (who may not propose agenda items), as well as technical experts (from non-Arctic states, non-governmental and intergovernmental organizations, and academia) based on merit. Ministers and SAOs can establish new task forces and assign specific priorities to WGs when issues do not fit within the mandates of existing groups (Spence 2017, 795).

More precisely, ACAP seeks to eliminate, reduce, and prevent the adverse effects of Arctic environmental pollution. It does so through existing legal arrangements and by identifying cooperative activities that can be implemented for pollution prevention and remediation. AMAP draws on national and international programmes to monitor, synthesize, assess, propose and promote actions to reduce pollution

[125] Although the IPS maintains a separate operational budget, it was relocated from Copenhagen to Tromsø in 2015 and became a part of the ACS in 2016 with a work plan based on the ACS *Terms of Reference* (see Arctic Council 2013b).
[126] AC subsidiary bodies only requires active participation or funding from Member States for whom the respective projects are a priority (as opposed to all Member States) (Smieszek 2020, 72).
[127] The SDWG was created in 1998 while the ACAP WG was established in 2006.
[128] With exception of the SDWG which is led by the chair of the Arctic Council, WGs are each chaired by different Arctic states (Smieszek and Kankaanpää 2015, 9).

and climate change in the Arctic. CAFF monitors, assesses, and communicates its findings on Arctic biodiversity to Arctic governments and residents, seeking to promote informed decision-making practices that ensure the sustainability of living resources in the Arctic. EPPR contributes to the protection of the Arctic environment from the threat and impact of an accidental release of pollutants or radionuclides by exchanging information on best practices, developing guidance and risk assessment methodologies, as well as mobilizing response exercises and training. PAME seeks to address non-emergency pollution prevention, as well as policy and control measures for the protection of the marine environment from land- and sea-based activities through coordinated action programmes and guidelines. Lastly, SDWG proposes and adopts steps — such as initiatives providing practical knowledge and capacity-building in northern communities — which Arctic states can take to advance sustainable development in relation to environment, economy, culture, and health in the Arctic.[129]

Task Forces and Expert Groups are another structural innovation of the Arctic Council. "These additions," Barry et al. (2020) argue, "were introduced in response to the increasing complexity of the Council's agenda." Current task forces include the Task Force on Arctic Marine Cooperation and the Task Force on Improved Connectivity in the Arctic. Previous task forces focused on means and mechanisms for enhancing Arctic marine cooperation (Arctic Council 2015b), black carbon and methane (Arctic Council 2013c), improved scientific research collaboration (Arctic Council 2013b), developing an Arctic Business Forum (Arctic Council 2013c) Arctic marine oil pollution prevention (Arctic Council 2011b), institutional issues, and the arrangement of the Arctic Council Secretariat (Arctic Council 2011b). Current expert groups include the Expert Group in support of the implementation of the framework for action on Black Carbon and Methane (Arctic Council 2015b), and an Expert Group to develop a circumpolar infrastructure assessment (Arctic Council 2015b), and the Ecosystem-Based Management Expert Group (Arctic Council 2011b).

Added to the Council's institutional architecture in 2009, task forces have become quasi-permanent. Similar to WGs, task forces and expert groups are chaired by different Arctic states, operate with their own issue-specific mandate and mode of operation, producing a wide range of outcomes including guidelines, frameworks, and legal instruments within a set time frame (Smieszek 2020, 53–55). As an example, the Task Force on Short-Lived Climate Forcers was established with the mandate to identify existing and new measures to reduce emissions from climate forcers including black carbon and methane (Arctic Council 2015a), while the Task Force on Search and Rescue was critical in developing the legally-binding SAR agreement under the helm of the Council, outlined above. In fact, Arctic Council task forces served as temporary venues for the negotiations of *all* legally-binding agreements concluded among the eight Arctic states – the SAR agreement, the EPPR agreement, and the *Agreement on Enhancing International Arctic Scientific Cooperation*.[130] What is more, some task forces were integral in the development of complementary satellite bodies seeking to address issues of common concern such as the Arctic Economic Council, the Arctic Offshore Regulators Forum, and the Arctic Coast Guard Forum (Molenaar 2017; Barry et al. 2020b). At the same time, it must be noted that not all task forces produce tangible output, at times causing outright confusion as was the case with the overlapping mandates of the Task Force on Short-Lived Climate Forcers and the AMAP's integral expert group on methane and black carbon (Smieszek 2020, 55).

In addition to these WGs, task forces, and expert groups, the most recent Icelandic Chairmanship appointed a Special Coordinator on Plastics and Marine Litter, although the longevity or mandate of this

[129] For more information on the SDWG, see fn 111 above.

[130] This *Agreement on Enhancing International Arctic Scientific Cooperation* accounts for the provisions of UNCLOS, Part XIII on marine scientific research including Article 261 on non-interference with shipping routes, in particular.

position remains unknown. The creation of this new ad-hoc role, Barry et al. (2020) argue, "may reflect uncertainty among the Arctic States as to the effectiveness of the current institutional structure; or a desire to exert more direct control on specific issues rather than through Subsidiary bodies with established rules and processes which guide how priorities are acted upon."

Nevertheless, various challenges remain. Partly because of its non-binding nature, there appears to be no mechanism to prioritize or coordinate the Council's consensus-based projects (Smieszek 2020, 72) and no follow-up mechanism to oversee the implementation of its work – its guidelines, advice, or recommendations (Arctic Council 2013a). For instance, even though each WG has a strategic document that defines its overarching goals and objectives; only two of these strategies – the 2013 Actions for Arctic Biodiversity 2013-21: implementing the recommendations of the Arctic Biodiversity Assessment and the Arctic Marine Strategic Plan 2015-2025 – provide reporting mechanisms used to evaluate the impact of activities (Barry et al. 2020b). In fact, a multilateral audit conducted by several Arctic states on how their national authorities' work together with the Arctic Council found that the institution faces several challenges, including that many of the recommendations within its reports and declarations have neither regional or national reporting requirements, nor resource implications (Arctic Council 2015c; Prip 2016). So, unlike Observers who are re-evaluated every four years, Arctic states are not obligated to report on their contributions, signaling a lack of transparency.

Another hindrance to the Council's work includes a lack of national coordination between SAOs – who generally represent Ministries of Foreign Affairs – and national representatives in Arctic Council Working Groups like the AMAP or the CAFF – who represent various Ministries of Environment – which can pose challenges to the implementation of various Council projects, such as the Arctic Invasive Alien Species Strategy and Action Plan (Secretariat 2017) which was approved in 2017 but whose goals and priority actions have yet to be implemented (Barry et al. 2020b).

In addition to this, much of the work of the subsidiary bodies is dependent on in-kind funding which they must secure independently from Member States, Permanent Participants, Observers, national agencies, and international organizations. The voluntary nature of this funding scheme can lead to inequalities as some projects are prioritized, thereby slowing down or hindering the completion of others. For instance, while the need for a comprehensive Arctic Biodiversity Assessment was noted in 2001, it took 12 years for it to be completed (Meltofte 2013). This funding reality raises questions about the Council's ability to govern a rapidly changing Arctic system.

4.2.4. Output

Since its inception in 1996, the Council's subsidiary bodies have contributed to Arctic environmental governance in two significant ways: first, through high-level scientific assessments and reports; and second, through a broad range of formal and informal instruments. I briefly outline how each is used as a tool to strengthen existing institutions and maintain stability amid increasing change and complexity in the Arctic system below. I have noted that while many of the Council's scientific assessments and reports apply a complex systems ontology to understand the nature of change in the Arctic system, they often fall short in extending the same lens to Arctic environmental governance, where a desire to manage ongoing transformations in the Arctic system is leading to the negotiation of new legally binding instruments (see section 2.5), but also to the development of new rules and social practices within the Arctic Council.

4.2.4.1. Scientific Assessments & Reports

Although previous sections of this chapter (see section 2.2.2.) discussed assessments in prescriptive terms, the Arctic Council is known for its highly salient, credible and legitimate scientific output including its scientific assessments, technical reports and guidelines, as well as summaries and recommendations for policymakers. In fact, over the first decades of its existence, the Council primarily operated as a science forum – a factfinder and consensus-builder – more than a policy forum (Fenge and Funston 2015; Smieszek 2019a, 122; Koivurova and Smieszek 2017). As such, it has arguably enjoyed greater cognitive impact through its scientific work than normative impact through its three legally binding agreements (Smieszek 2019b, 13), outlined below.

Developed under the subsidiary bodies of the Arctic Council, this scientific output includes, among other things, the 1997 AMAP *Arctic Pollution* report, the 2004 *Arctic Climate Impact Assessment* (ACIA), the 2004 and 2014 Ar*ctic Human Development Reports* (AHDR), the 2016 *Arctic Resilience Report* (ARR), the 2013 *Arctic Biodiversity Assessment*, and the 2017 *Snow, Water, Ice, and Permafrost Assessment* (SWIPA) all of which highlight various changes in Arctic geophysical and social-ecological systems (see Chapter 2).

A significant part of this output – based on field and laboratory experiments, model simulations, observed trends and theoretical analyses – would be difficult, if not impossible, to coordinate without the social capital established through Arctic cooperation. What is more, the status of Permanent Participant has enabled Indigenous peoples to contribute historical knowledge, as well as current observations and lived experiences of environmental and social change. In this way, Arctic Indigenous peoples continue to contribute to policy-development across multiple scales of governance; in discussions ranging from climate change to development (Lindroth and Sinevaara-Niskanen 2017, 9).

The ability of Arctic Council WGs, task forces, and expert groups to successfully identify emerging issues and frame them for policy-makers has enabled the Council to inform the Arctic policy agenda, its individual Member States, as well as relevant international processes over the past two decades (Smieszek 2019b, 11–14). Some reports, like the 1997 *Arctic Pollution* report and the 2004 ACIA, have influenced the delineation of the Arctic, the discourse surrounding it, as well as the course of its governance.

As I highlight in the following chapter, the *Arctic Pollution* report (1997) provided evidence of the negative exposure experienced by Arctic Indigenous and non-Indigenous communities to the effects of POPs and was instrumental in the legalization of the 2001 *Stockholm Convention* on Persistent Organic Pollutants (Downie and Fenge 2003). Meanwhile, the ACIA (2004) was the first comprehensive multi-disciplinary assessment of the impacts of climate change on socio-economic conditions in the Arctic. On a global scale, the assessment raised the profile of the Arctic in the proceedings of the UNFCCC and significantly contributed to the 2007 Fourth Assessment Report of the IPCC, a scientific intergovernmental body operating under the auspices of the United Nations (Duyck 2015a). On a regional scale, its findings altered the structure of the Arctic Council secretariat and the agenda of its subsidiary bodies (Koivurova 2008a, 22). The more recent 2013 *Arctic Biodiversity Assessment* included a recognition of the complexity of the Arctic system, as well as its current governance system, noting that "Current knowledge of many Arctic species, ecosystems and their stressors is fragmentary, making detection and assessment of trends and their implications difficult for many aspects of Arctic biodiversity." (CAFF 2013 Key Finding 8). Among the Assessment's 17 policy recommendations, relating back to the UNCBD, is a recommendation to require the Arctic Council to incorporate "biodiversity objectives and provisions into all [its] work and encourage the same for on-going and future international standards, agreements, plans, operations and/or

other tools specific to development in the Arctic." (Recommendation No. 4). The first suggested action is to "Develop binding agreements related to the conservation and/or sustainable use of biodiversity."

The Council's scientific contribution, Graczyk and Koivurova (2015, 312) argue, is "probably the most significant accomplishment in Arctic environmental cooperation: a substantial expansion of our knowledge about the Arctic environment, including natural and anthropogenic processes." As a consequence, the Arctic Council is often referenced as a 'cognitive forerunner' (Nilsson 2012; Nilsson and Koivurova 2016).

4.2.4.2. Formal & Informal Agreements

Over the past thirty years, there has been a notable increase in the number of formal and informal agreements relevant to Arctic environmental governance (see Figure 12), many linked to the work of the Arctic Council. These agreements seek to recognize and, in some cases, enhance the management of change in the Arctic system, thereby often also adding to the complexity of the system of Arctic environmental governance. As noted, many of the formal agreements build on, and must thus also cohere with the legal form of, the treaties and principles outlined above.

As is visible in Figure 12, the number of formal Arctic-specific agreements has increased relatively significantly in recent years to include the 2011 SAR Agreement, the 2013 EPPR agreement, the 2017 IMO *Polar Code,* 2017 *Agreement on Enhancing International Arctic Scientific Cooperation*, and the 2018 *International Agreement to Prevent Unregulated High Seas Fisheries in the central Arctic Ocean* (see section 2.5.). Notably, the Arctic Council evolved to provide a negotiating space for three of these legally binding agreements as a means of strengthening Arctic environmental governance (see Chapter 6 for analysis). While these agreements do not draw on a complex systems ontology, they recognize elements of change and complexity in the Arctic system and exhibit a desire to ensure capacity enhancement in the area. However, they add little substantive normative strength or governance *per se*.

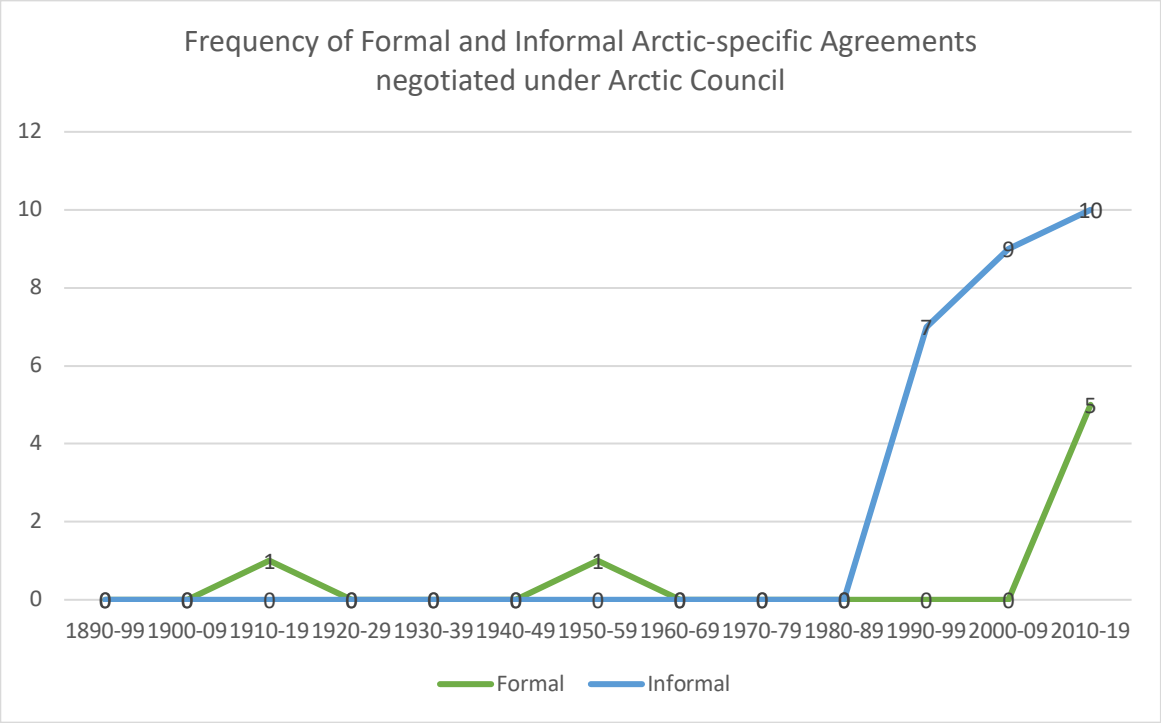

Figure 12: Frequency of Formal and Informal Arctic-specific Agreements

First and foremost, all three agreements recall the principles and provisions of the UNCLOS, thereby reiterating its primacy and the sovereignty of Arctic states in Arctic environmental governance. The preambles of both the SAR and EPPR agreements further recognize the challenges posed by a harsh Arctic environment (Arctic Council 2011a; 2013b). More specifically, under the EPPR agreement, Arctic states note their consciousness of the threat posed by "marine oil pollution to the vulnerable Arctic marine environment and to the livelihoods of local and Indigenous communities." The preamble of both agreements also makes note of an increase in maritime traffic and human activities in the Arctic, including the activities of Arctic residents and of those coming to the North. In addition to this, the EPPR agreement is mindful of the valuable resources and knowledge of Indigenous peoples, local communities, and regional governments on the Arctic environment in supporting EPPR. Lastly, the agreement recognizes the "importance of the Arctic marine ecosystem and cooperation to promote and encourage the conservation on and sustainable use of the marine and coastal environment and its natural resources." (Arctic Council 2013b)

Meanwhile, the primary purpose of the *Agreement on Enhancing International Arctic Scientific Cooperation* is to "increase effectiveness and efficiency in the development of scientific knowledge about the Arctic" (Arctic Council 2017b Art. 2). In signing this agreement, Arctic states also recognize "the importance of the sustainable use of resources, economic development, human health, and environmental protection," reiterating "the urgent need for increased actions to mitigate and adapt to climate change." Article 9 further states that Parties shall: (1) encourage Participants to utilize, as appropriate, traditional and local knowledge in the planning and conduct of Scientific Activities under this Agreement; (2) encourage

communication, as appropriate, between holders of traditional and local knowledge and Participants conducting Scientific Activities under this Agreement; and (3) encourage holders of traditional and local knowledge, as appropriate, to participate in Scientific Activities under this Agreement.

In addition to the space provided for the negotiation of binding and non-binding agreements under some of its task forces, the Arctic Council has helped catalyze the formation of satellite bodies like the Arctic Economic Council, the Arctic Offshore Regulators Forum, and the Arctic Coast Guard Forum. Both approaches are, in their own regard, responses to ongoing changes in the Arctic system.

Figure 12 also reflects a steady rise in informal agreements including Arctic Council (and previously AEPS) Ministerial Declarations and Statements, biennially approved and signed by all eight Arctic ministers. These documents record the formation of Working Groups, the establishment of task forces and expert groups, the inception of the Council's permanent Secretariat, the admission of new Observers, as well as the adoption of new rules, guidelines, and communication plans.

These informal agreements are relevant to observe because they also record the evolution of the Council's (and in some ways also a broader) conception of the Arctic, its concerns over time, as well as some of the suggested responses to changes in the Arctic system (see Arctic Council and Stockholm Environment Institute 2016, 32, Table 2.1). While these documents do not draw on a complex systems ontology as such, there is an increasing recognition of change and complexity in the Arctic system over time.

Similar to the declarations signed under the AEPS (see section 3.1.), the 1996 *Ottawa Declaration* and the subsequent 1998 *Iqaluit Declaration* continued to portray the region as a self-contained system, to be protected from outside harm, like pollutants. As mentioned earlier, the *Ottawa Declaration* also marked a shift in focus from environmental protection to sustainable development. The 2000 *Barrow Declaration* included the first acknowledgement of global climate change, linking geophysical and social-ecological systems with reference to its potential impacts on the Arctic and its inhabitants.[131] The following 2002 *Inari Declaration* and 2004 *Reykjavik Declaration* extended the system to include non-Arctic states, with an emphasis on economic development and a growing need for knowledge on issues including Arctic shipping. The 2006 *Salekhard Declaration* then acknowledged the complexity and heterogeneity of the region, seeking to improve its adaptive capacity and recognizing its cultural diversity. It was also the first declaration to acknowledge the potentially significant social, cultural, economic impacts of rapid change in the Arctic on those living in the area. The following 2009 *Tromsø Declaration* and 2011 *Nuuk Declaration* saw a disconnect between the attention given to environmental change and its underlying societal causes, focusing on the need for institutional control (such as international cooperation) of an increasingly accessible marine area (i.e., access to oil and gas). The 2013 *Kiruna Declaration* and 2015 *Iqaluit Declaration* pointed to a more significant system disconnect with no focus on social and ecological risks despite comprehensive evidence of both in the assessments produced by Arctic WGs, as well as in other reports. Instead, both declarations focused on the exploitation of the Arctic for economic gain, managing cultural and ecological harm in conjunction. While the 2017 *Fairbanks Declaration* noted the entry of the *Paris Agreement on Climate Change* into force and recognized rapid change as an increasing vulnerability in some areas of the Arctic, a disconnect remained. For one, it disguised that the U.S. sought to remove any reference to the *Paris Agreement* in the declaration.

Meanwhile, economic priorities continued to gain ascendancy, and although threadbare in terms of new initiatives, the Council requested that SAOs develop a strategic plan – "a comprehensive document that sets

[131] Prior to this, climate change had only been referenced in the *Nuuk Declaration* (Strategy 1993) in support of the UNFCCC.

priorities for future work and leads to a careful and honest deliberation about whether to make serious changes in order to meet those priorities" (Balton and Ulmer 2019) – for the Arctic Council under the Finnish Chairmanship (2017-2019). Such a plan should seek to respond to some common concerns, including: a lack of discipline in setting clear priorities and consistent follow-up; WGs which may not match with the issues at hand and a lack of organizational coherence within the Council; unpredictable funding; financial and human resource limitations related to the participation of Permanent Participants; and a struggle to identify the appropriate role for Observers in the work of the Council (Balton and Ulmer 2019, 5–6; Barry et al. 2020b).[132] Finally, the non-linear 2019 *Rovaniemi Joint Ministerial Statement* – delivered in lieu of a Ministerial Declaration following a breakdown over its text and the strategic plan due to U.S. refusal to accept any reference to climate change (Balton and Ulmer 2019) – reaffirmed a commitment to sustainable development and the protection of the Arctic environment instead of climate change. The accompanying *Statement by the Chair* (Arctic Council 2019b), though, stated that a majority of states noted the impacts of climate change on Arctic communities, cryosphere, and ecosystems with concern. It also instructed SAOs to continue the development of a Strategic Plan for the Council (Smieszek 2019a, 126; Balton and Ulmer 2019, 8), a lack of which currently hinders the Council's ability to address broader issues relating to it its mandate (Barry et al. 2020b).

The 2011 *Nuuk Declaration*, 2013 *Kiruna Declaration*, the 2015 *Iqaluit Declaration*, the 2017 *Fairbanks Declaration*, and the 2019 *Rovaniemi Joint Ministerial Statement* all emphasized the need to increase the resilience of Arctic communities and ecosystems, albeit with no coherent guide as to how this is to be achieved.

In addition to all of this, the work of Malgorzata Smieszek (2020, 79) makes note of a significant change in the informal social practices of the Council, not listed in Figure 12 above. This includes a shift in the Council's focus toward economic development, the attendance of high-level representatives and diplomats at ministerial meetings, the direct negotiation of Arctic Council ministerial declarations by foreign ministers, and the inclusion of policy recommendations in Council assessments and reports. Although these informal practices do not explicitly focus on changes in the Arctic system *per se*, they add to the complexity of Arctic environmental governance and signal a growing importance of the Arctic Council as a place of interaction and of the Arctic area itself.

4.3. Other Informal Governance Responses

In addition to the AEPS and the Arctic Council, it is also important to briefly make note of other forms of informal, multilateral cooperation in the Arctic. In addition to these two fora, the only other pan-Arctic forum is the Conference of Arctic Parliamentarians, an informal discussion body that cannot pass laws or regulations. The Conference is, in essence, a biannual gathering of parliamentary delegations from the eight Arctic states, representatives from the E.U. Parliament, permanent participants, and observers. Together, they provide policy statements seeking to influence other international fora and national parliaments.

Founded in 1993, the Barents Euro-Arctic Council (BEAC) is another key sub-regional intergovernmental forum — between Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden, and the European Commission — whose initial mandate was to decrease military tension (unlike the Arctic Council), address environmental challenges and improve living standards in Russia following the end of

[132] For instance as noted by Roddick (2017), the question relating to the role of Observers raises questions of how the Plan will accommodate differences in size, resources, and scale of activity among Member States, Permanent Participants, and Observers.

the Cold War (Conference on Cooperation in the Barents Euro-Arctic Region 1993). Similar to the Arctic Council, however, the Foreign Ministers of the Council's Member States and the E.U. meet biennially while a committee of senior officials — similar to Arctic Council SAOs — maintain momentum. The Council also includes nine observer states. In lieu of Permanent Participants, the BEAC established a Working Group of Indigenous Peoples in 1995.

Most recently, a group of states commonly known as the "Arctic Five" created some buzz among policymakers, Indigenous peoples, scholars, and the media alike. Over the past years, Arctic littoral states — Canada, Denmark Norway, Russia and the United States — have, at times, met informally outside of the Arctic Council framework — in Oslo, Norway, in 2007; in Ilulissat, Greenland, in 2008; and in Chelsea, Canada, in 2010 — to discuss the legal framework for the Arctic Ocean including fisheries management in the central Arctic Ocean. Their meeting in Ilulissat, Greenland, culminated in the signing of the *Ilulissat Declaration* (2008) which was "a broad declaration of state sovereignty in the Arctic, an endorsement of the law of the sea as the governing framework for the Arctic Ocean, and a message to non-Arctic states that a treaty based on the Antarctic model of environmental protection and internationalization would not be accepted in the North." (Durfee and Johnstone 2019, 79). As noted earlier, the "Arctic Five" most recently worked together with China, Iceland, Japan, South Korea and the E.U. to negotiate the 2018 *International Agreement to Prevent Unregulated High Seas Fisheries in the central Arctic Ocean* (see section 3.1.3).

5. Linking Formal and Informal Governance & Responses

There is no coherent approach to Arctic environmental governance, although there is some level of coherence within its elements. In this emergent, and increasingly dense, landscape of formal and informal Arctic environmental governance (Smieszek 2019c, 38), the interplay between various institutions seeks to provide some level of governance coherence across diverse issue areas, both horizontally between institutions located at the same level of social organization and vertically across various levels of social organization (see Gehring and Oberthür 2011; Oberthür and Stokke 2011; Young 2002; Young, King, and Schroeder 2008; Smieszek 2019c; Underdal and Young 2004).[133] More specifically, institutional interplay references when "one institution affects the contents, operations, or consequences of another" (Stokke 2011a). While I do not delve deeply into the literature on institutional interplay, here, there is value in pointing to some key research findings in other studies on institutional interplay in an Arctic context.

Horizontal interplay is visible in the processes by which some Arctic Council WGs work together with international legal regimes to achieve broader normative change – through the negotiation of international agreements, non-binding agreements, or the mainstreaming of international norms into Arctic institutions. Several examples stand out: First, subsidiary bodies of the Arctic Council have notably provided input into the negotiations of legally binding agreements like the *Stockholm Convention on Persistent Organic Pollutants*, the *Polar Code*, and the Minamata *Convention on Mercury*.[134] I outline some of these

[133] As an area of study, an increasing focus on institutional interplay is attributed to a growth in the density of the international institutional landscape, especially as it relates to the rise in MEAs over the past four decades (Smieszek 2019c, 38).

[134] Every four years, the Council provides an analysis of data on the reduction of POPs in the Arctic in support of Art. 4 of the Stockholm Convention.

interactions and their successes and failures in governing the constitutive and behavioural characteristics of the Arctic system in the following chapter.

The interplay between formal and informal governance institutions resulted in the development of non-binding agreements like the 2009 PAME *Arctic Offshore Oil and Gas Guidelines*, as well. These *Guidelines* cohere with existing legal arrangements like the UNCLOS, various treaties under the IMO, and the OSPAR Convention (Stokke 2011a, 157). For instance, they complement the OSPAR by advising industry officials and government regulators on standards for environmental monitoring including "testing acute toxicity, decommissioning structures, and requiring best available technology" (Rayfuse 2015, 201; PAME 2013, 61).[135] The *Guidelines* also address the precautionary principle (see section 2.2.2.). Still, the awareness and application of these guidelines at a national scale remains relatively weak across the Arctic (Offerdal 2007; Stokke 2011a, 157; Durfee and Johnstone 2019, 232). Stokke argues that it is their "nonbinding nature [that] implies low determinacy and constrains any normative or utilitarian interplay with other institutions."

Another example includes facilitated coordination and engagement on issues related to Arctic biodiversity through a framework of agreements developed by CAFF (2020). It includes various global conventions and initiatives like the memorandum of cooperation between the Secretariat of the UNCBD with the CAFF; others include the Association of Early Polar Career scientists, the UN Convention on Migratory Species, the Ramsar Convention on Wetlands; the Arctic Spatial Data Infrastructure; Global Biodiversity Information Facility (GBIF); Ocean Biogeographic Information System (OBIS); and Group on Earth Observations Biodiversity Observation Network (GEOBON); and the agreement on the conservation of Polar Bears.

Another significant interplay, of sorts, is the mainstreaming of human rights and Indigenous peoples' rights into informal approaches to Arctic environmental governance which could, for instance, help address some of the challenges of northern communities outlined in Chapter 2. Both the AEPS and the Arctic Council have contributed to the normative advancement of Indigenous peoples' rights through the status accorded to Indigenous peoples as Permanent Participants (Hughes 2018, 16; see also Sellheim 2019). Even so, Sellheim's (2019) review of "The Arctic Council and the Advancement of Indigenous Rights" highlights what current structures lack in their adherence to international human rights standards; this includes the Council's lack of endorsement of the UNDRIP, the ICCPR, and the ICESCR (Bratspies 2014, 175; Nuttall 2000, 633).[136]

Despite the Council's lack of official endorsement of the UNDRIP and other human rights agreements, there have been other efforts to mainstream Indigenous peoples' rights through AEPS and Arctic Council instruments including scientific assessments, as well as informal and formal agreements. The evolution of the advancement of Indigenous peoples' rights in the AEPS and the Arctic Council is visible in the language used in their respective declarations. For instance, while the founding document of the AEPS used the term "peoples" (see Åhrén 2016; van Genugten, Meijknecht, and Rombouts 2014), the founding document of

[135] Over the years, the PAME WG has also adopted various non-binding instruments relevant to the prevention of pollution from offshore oil and gas activities, including the 2004 *Guidelines on the Transfer of Refined Oil and Oil Products in the Arctic*; the 2004 *Arctic Shoreline Clean-up Assessment Technique Manual*; the 2008 *Arctic Guide for Emergency Prevention, Preparedness and Response*; the 2009 *Assessment of Effects and Potential Effects of Oil and Gas Activities in the Arctic* (Harrison 2017, 224). By cross-referencing other instruments and industry standards, Harrison (2017, 224) notes that these non-binding guidelines contribute to the broader development of a legal framework for the protection of the Arctic marine environment.

[136] For an overview of the situation of Indigenous peoples in each Arctic states see Sellheim (2019).

the Council – the 1996 *Ottawa Declaration* – refrained from doing so.[137] There is a shift in language – with reference to "peoples" – beginning with the *Inari Declaration* (Arctic Council 2002), although its accompanying asterisk denotes a distinction preferred by the U.S. whereby "the use of the term 'peoples' shall not be construed as having any implications as regard the rights which may attach to the term under international law." (Arctic Council 1996, Art. 2). A version of this statement is reproduced in various forms in following declarations. From the 2009 *Tromsø Declaration* through to the most recent 2019 *Rovaniemi Joint Ministerial Statement*, there is no reference to any state preference relating to the term "peoples", even despite the initial objection of Canada and the U.S. to the UNDRIP (as noted in the previous section, Russia abstained).[138] The distinction between "people" and "peoples" reflects an acceptance of Indigenous peoples as rights holders through the use of the latter term, which holds important implications for self-determination and the potential for statehood under international law (Sellheim 2019; see also van Genugten, Meijknecht, and Rombouts 2014; Åhrén 2016) (see section 2.4.). Scholars, like Sellheim, attribute this evolution to the adoption of UNDRIP in 2007.

Other efforts to mainstream Indigenous peoples' rights are visible in instruments like the *Arctic Marine Shipping Assessment,* which recommends the surveying of Indigenous communities' use of the marine environment (Brigham 2009, 6; see also Hughes 2018, 21), and the *Arctic Offshore Oil and Gas Guidelines* which stress the need for accessible and culturally appropriate information in a variety of local languages (PAME Working Group 2009, 12).

These horizontal interactions are now, in part, guided by the Arctic Council's 2016 *Guidelines for relationships with outside bodies* – to be followed in accordance with the Council's *Rules of Procedure* – adopted at the SAO meeting in Fairbanks, Alaska, in 2016.[139]

Meanwhile, outside the scope of the Arctic Council, the *International Agreement to Prevent Unregulated High Seas Fisheries in the central Arctic Ocean* recalls the 2007 UNDRIP, recognizing "the interests of Arctic residents, including Arctic Indigenous peoples, in the long-term conservation and sustainable use of living marine resources and in healthy marine ecosystems in the Arctic Ocean and underlining the importance of involving them and their communities." It also seeks to promote the use of "both scientific knowledge and Indigenous and local knowledge of the living marine resources of the Arctic Ocean and the ecosystems in which they occur as a basis for fisheries conservation and management in the high seas portion of the central Arctic Ocean." (see section 3.1.3.).

Moving forward, the development of an international, legally binding instrument on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction under UNCLOS could also significantly impact how the Council approaches Arctic biodiversity. An increased emphasis on

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[137] Instead, the Preamble of the *Ottawa Declaration* recognizes "the traditional knowledge of the Indigenous *people* of the Arctic and their communities" [emphasis added] and a desire to "ensure full consultation with and the full involvement of Indigenous *people* and their communities and other inhabitants of the Arctic" [emphasis added] (Arctic Council 1996, Preamble). And while Article 2 notes that "Permanent participation equally is open to other Arctic organizations of Indigenous *peoples* with majority Arctic Indigenous constituency." [emphasis added], its accompanying asterisk and footnote state that "the use of the term 'peoples' shall not be construed as having any implications as regard the rights which may attach to the term under international law." (Arctic Council 1996, Art. 2).

[138] As noted in the section on Indigenous Peoples' Rights, Canada finally voiced its support for the UNDRIP in 2010 with the U.S. voicing its support later, in 2016.

[139] In addition to this, the 2017 *Fairbanks Declaration* instructed SAOs "to explore the possibility of establishing formal cooperation mechanisms, such as memoranda of understanding, with those intergovernmental organizations that could contribute to the work of the Arctic Council, and submit relevant proposals on the potential structure and content of any such mechanisms to Ministers in 2019." (Arctic Council 2017a). This has yet to be completed.

improved coordination of ocean governance is, for instance, already visible in the development of the Arctic Council's Task Force on Arctic Marine Cooperation (2015-19) (Barry et al. 2020b).

And while this research project does not focus on the domestic scale *per se*, it is nevertheless important to briefly make note of the vertical dimension of institutional interaction, as well. The informal nature of the Arctic Council — what some argue is essentially a series of roundtable discussions with no law-making powers or compliance mechanisms (Durfee and Johnstone 2019, 77) — leaves the translation of normative goals into national law and policies at the discretion of its Member States (Arctic Council and Stockholm Environment Institute 2016, 158; Einarsson et al. 2004, 102; see also Koh 1996; Slaughter 2004). All eight Member States rely on their own national agencies whose representatives hold regular meetings, coordinate implementation plans, seek to realize recommendations, set out to afford adequate financial resources and transfer of technologies for joint projects, as well as share experiences and best practices (Prior 2017; Smieszek 2019b, 14; Stokke 2011b). Even so, another potential hindrance to the Council's work becomes visible: a lack of national coordination between SAOs – who generally represent Ministries of Foreign Affairs – and national representatives in AMAP or CAFF – who represent various Ministries of Environment – may pose challenges to the implementation of various Council projects, such as the Arctic Invasive Alien Species Strategy and Action Plan (Secretariat 2017) which was approved in 2017 but whose goals and priority actions have yet to be implemented (Barry et al. 2020b).

Beyond this though, little is known about the level of causality between the products of the Council – its ministerial declarations, guidelines, or regulations – and the behavior, or output, on a national or sub-national level (Smieszek 2019b, 12; Barry et al. 2020a).

6. Conclusion

In outlining the current governance landscape and its normative evolution over past decades, several things become evident. First, in response, the institutional landscape of Arctic environmental governance is becoming increasingly complex (see Loukacheva 2013; Stokke 2015; Schönfeldt 2017; Koivurova 2020) like the Arctic system itself, comprising a growing set of institutions and actors operating at multiple scales of governance. The complexity of Arctic environmental governance is perhaps most visible in the volumes of literature written about its institutional landscape, or various elements thereof, over the past thirty years. Kristina Schönfledt's book *The Arctic in International Law and Policy* (2017) – the first-ever collection of legal and policy documents relevant to the Arctic – is most evocative of the complexity of formal and informal governance. As Koivurova (2020) remarks in his review of the book, "Most of us working in the field of international law and Arctic policy are acutely aware of the complexity of this field…[the Arctic] is governed by a plethora of various types of global, regional and bilateral international treaties and regimes, nation-state systems, and Indigenous customary law."

This chapter purposefully reiterates the mechanistic ontological assumptions of many of these works – a focus on drawing boundaries, formality, scale, the roles of diverse actors (especially the state), structure and process, and to some degree on institutional interplay – with the intention of juxtaposing them against the complexity of the Arctic system, outlined in Chapter 2. Quickly, it becomes clear that although a complex systems ontology underpins many of the scientific assessments and reports like those produced by Arctic Council WGs, this ontology rarely, if ever, underpins research on Arctic environmental governance.

Second, although there is some interplay between formal and informal governance approaches, there is no coherent approach to Arctic environmental governance. This is evident in the piecemeal response to increasing change and complexity in the Arctic system where there is some level of coherence within individual elements like the UNCLOS, which provides a widely accepted constitutive foundation for the governance of the oceans, as well as across elements through the implementation of environmental principles. The deeply interpretive nature of law, combined with a lack of overall coherence in the current approach to Arctic environmental governance, means that different worldviews can interpret the same institution differently and use its elements strategically in ways that are coherent with their own expectations. As an example, the Arctic Council lends itself to informal cooperation, while increasingly also offering an established Arctic venue for the negotiation of formal agreements. It also appears that certain kinds of legal forms – treaties, principles, customary law, and informal arrangements – lend themselves to different worldviews

Third, and in line with the preceding observation, there is a notable common trend in the normative evolution of formal and informal governance approaches in an attempt to provide stability: both are turning toward the legalization of Arctic environmental governance through a re-commitment to formal governance frameworks like the UNCLOS (Ilulissat Declaration 2008) and the development of new international agreements for the Arctic. Legalization, in this case, means the hardening of current approaches along the dimension of precision, obligation, or delegation (Abbott and Snidal 2000). I also make note of a concurrent increase in the adoption of new internal rules, guidelines, and plans in the Arctic Council (Smieszek 2020, 69) in response to endogenous changes, such as the rising interest of non-Arctic states in the work of the Council, and exogenous changes like those relating to pollution, biodiversity, or climate change.

Following from this brief assessment, a more important question relates to whether an increasingly complex and rooted approach to Arctic environmental governance (Loukacheva 2013, 38; Koivurova 2008a; Sands 2003, 710) — where there is an insistence on formal legal rationality as a means of providing stability amidst change — meets the *law of requisite variety*. In other words, does the current repertoire of valid possible (If-Then) behaviour provide a sufficient response to match the emerging material and social reality of the Arctic? After all, as Durfee and Johnstone (2019, 222) remind us, "[m]ore than a dozen treaties are in force through the IMO and regional arrangements." However, that does not necessarily indicate "that the law is adequate to protect the unique Arctic marine environment." In fact, when it comes to some issues like Arctic fisheries, they argue that current governance is "insufficiently specific to govern the complexity of managing one of the world's most important food resources" (Durfee and Johnstone 2019, 185).

I explore this issue of fit in greater detail by drawing on three case studies in the following chapter.

Chapter 4: Real World Examples of a Mismatch between Two Realities

Writing the third chapter, on current approaches to Arctic environmental governance, as a follow-up to the second chapter, on the nature of change in the Arctic system, was particularly difficult. It felt as though the chapters were of their own mind, incommensurable in many ways. First and foremost because Arctic environmental governance is generally defined by (1) geography or (2) sector (or issue area), which essentially means that the Arctic is rarely, if ever, defined or treated as an open, integrated, dynamic and complex system – neither in the literature on Arctic governance and Polar Law, nor in international law or policy. (As said, even when the scientific reports and assessments, produced by these institutions, draw on a complex systems ontology.) The system's constitutive properties, like synergistic causation, and behavioural properties, such as unpredictability or non-linearity, are not easily translated into legal doctrine as such. What is more, as Smieszek (2019) observes, the state of knowledge on the implementation of various formal and informal governance response in the Arctic – including official statements, guidelines, and regulations – is limited because there are few follow-up mechanisms, "even if many government agencies involved with the [Arctic Council] agree that it would be useful to have some type of such reporting mechanism." (12). Second, because of this mismatch, it becomes difficult to assess whether current governance and its responses to the emerging material and social reality of the Arctic are sufficient.

In this chapter, I seek to illustrate some of the difficulties that arise when material conditions are, or are not, matched by the governance responses provided. (I pointed to some examples – including my discussion of Article 234 and the UNFCCC – in the previous chapter.) A non-exhaustive list of triggers and characteristics of governance failure includes absent or irrelevant policy, absence of policy implementation, absence of procedural mechanisms, absence of legal remedy, absence of cooperation (conflict), absence of coordination, insufficient or incomplete knowledge, insufficient resources, environmental degradation, disregard of cumulative effects, power imbalance, and corruption.

While I forego a detailed study of various sub-systems of regulation, or detailed case studies, the following pages highlight five legal instruments spanning three cases on: (1) governing Persistent Organic Pollutants (POPs) in the Arctic; (2) the intersection of climate change and human rights, where I examine the Inuit Petition to the Inter-American Commission of Human Rights; (3) and the governance of Arctic shipping and navigation, homing in on the 2011 *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic* (SAR agreement), the 2013 *Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic* (EPPR agreement), and the *Polar Code*. These case studies serve to demonstrate the ability of the prevailing approaches to law and governance to address the problems confronting the Arctic; each examines the complexity of the particular challenge, provides a concise overview of the governance response, a brief analysis (or diagnosis) of its success, governance failure, or potential thereof, followed by a conclusion. Understanding both governance successes and failures takes us to the heart of the debate about law's capacity to deal with change in the Arctic system (Bovens, T'Hart, and Peters 2001, 10–11).[140]

[140] I broadly draw on the work of Howlett and Ramesh to observe two orders of governance failure: in terms of (1) context or (2) capacity (Wu and Ramesh 2014, 321–22). The former, first-order failure is caused by a mismatch between the existing governance approach and the nature of the problem (Howlett and Ramesh 2014, 322); it is the inability of institutions to manage environmental and cultural shifts (understood as temporal governance failure), or the inability of institutions to address transboundary phenomena (understood as spatial governance failure). The latter,

I focus specifically on examples where actors have chosen to develop new, or draw on existing, legal instruments. I do so to better understand whether the insistence on formal legal rationality (see Chapter 3), as a means of maintaining stability, matches onto the complexity of each of the three challenges and meets the *law of requisite variety*. As I briefly alluded to in the introductory chapter and will explore in greater detail in Chapter 6, I argue that materially, complex systems require equally complex governance responses (Umpleby 2009, 232; see also Conant and Ashby 1970). For one, because the law is a part of, and co-evolves with, the system it seeks to govern (Ruhl 2008b; 2011) and second, because "there is a need to explore the underlying institutional architecture and its ability to 'fit' the behavior of a complex Earth system." (Galaz 2014, 45).

1. Case 1: Governing Persistent Organic Pollutants in the Arctic

A now well-known example of success of Arctic environmental governance – as it is outlined in this chapter – is the governance of Persistent Organic Pollutants (Harrison 2017, 74) where there is sufficient fit between the governance response and the nature of the challenge. This case is particularly salient as the development of informal Arctic governance – the AEPS and the Arctic Council – is inextricably linked to the issue of POPs (Prior 2013).

1.1. Complexity of the Challenge

The characteristics of the chemicals and their patterns of distribution make POPs a global issue with significant, disproportionate effects on the Arctic environment and its peoples, particularly the Inuit of Canada and Greenland. While existing research shows that *linear cause-and-effect* can be traced between the chemicals and their consequences on the environment, wildlife, and humans, it is difficult to trace any causal connection between the impacts and particular *sources in- or outside the Arctic* (e.g., whether the impacts in Nunavik are traceable to a particular site in North America).

POPs primarily refer to synthetic chemicals used in pesticides, herbicides, industrial processes and manufacturing. Some, such as PCBs and DDT, are produced for industrial or agricultural use, and to prevent malaria. Others, like dioxins and furans, are unintentionally generated and released (Birnie, Boyle, and Redgwell 2009, 448). POPs are primarily produced outside the Arctic, although there are some sources within the Arctic as well. These include smelters in Norway, line sites in Canada, and industrial activities in Russia (Arctic Monitoring and Assessment Programme 1998, vii). In these cases, however, the amounts released are relatively small in comparison to those originating outside the Arctic. For instance, one study found that Nunavut itself could have only contributed 0.32 percent of the total toxins in Nunavut, while sources outside North America contributed between 2 and 20 percent, which means that all dioxins and furans found in Nunavut came from sources in North America (Commoner et al. 2000).

POPs share numerous characteristics. For one, they are *extremely volatile*, which means that they evaporate in warm air and condense in cold air (Watt-Cloutier 2015, 134–35). They are thus more likely to be transported from warmer climates northward by wind and ocean currents, thereby leading to an *uneven*

second-order failure relates to a mismatch between problem solution and governance capacity, such as administrative and political resources (Howlett and Ramesh 2014, 322).

distribution globally, where the Arctic becomes a reservoir for these hazardous substances (Hønneland and Stokke 2007; Koivurova, Joona, and Shnoro 2004). Changes in snow distribution, among other phenomena, influence the cycling and toxicity of these contaminants (Arctic Monitoring and Assessment Programme 2017, 264–465). "They are a bit like a pinball," Watt-Cloutier (2015, 134–35) observes. "They can bounce around for a long time, but eventually there is only one place they end up: the coldest climates on earth. In other words, Arctic land and waters."

Second, their molecules are resistant to breakdown which allows them to pass through many seasonal cycles (Fiedler et al. 2019).

Third, POPs *bio-accumulate and bio-magnify* in their environment. They are highly soluble in fat which leads them to accumulate in the fatty tissues of various species, including marine mammals, and to move up the food chain to humans, where they are found in higher concentrations. As a consequence of their toxicity, POPs pose a disproportionate, "unreasonable and otherwise unmanageable risk" (Birnie, Boyle, and Redgwell 2009, 445) to Arctic ecosystems and northern communities whose families and strong traditions of hunting culture rely on wildlife populations (Downie and Fenge 2003; Watt-Cloutier 2015, 134–35). A notable example of the impacts of POPs on northern communities – and a catalyst for political action globally – were its impacts on northern women (Reiersen, Wilson, and Kimstach 2003, 60). In the late 1980s, thanks to improved techniques for measuring and analyzing quantitative and qualitative data samples, a Canadian report documented significantly higher levels of polychlorinated biphenyl (PCB) in the breast milk of Inuit women living in Nunavik than in women in other parts of the world (Downie and Fenge 2003; Prior 2013). POPs are also transmitted in utero (Mason and VanderZwaag 2015, 353) with long-term effects including impaired immune systems, as well as neurobehavioral and reproductive disorders (Hønneland and Stokke 2007). Similar results were found in marine mammals and seabirds (Birnie 1992). Areas like Greenland and northern Canada, where Inuit primarily subsist on the consumption of marine mammals, and have limited access to alternative foods, were found to be particularly vulnerable to the exposure to POPs (Downie and Fenge 2003). However, it must also be noted that any attempt at avoiding the consumption of subsistence foods would lead to a devastating loss of Inuit traditions.

1.2. Governance Response

The governance response to POPs in the Arctic is polycentric (Prior 2013), including many different actors operating at various scales – global, regional and domestic. On a global scale, the governance of most POPs is covered by the *Stockholm Convention on Persistent Organic Pollutants* (hereafter the *Stockholm Convention*) together with the *Basel* and *Rotterdam Conventions*, as well as the *Aarhus Protocol* of the CLRTAP. The *Stockholm Convention*, in particular, is regarded as an example of an expeditious and successful MEA negotiation (Bankes 2003, 160). Its strength is reflected in the degree to which its text articulates guiding principles while also seeking to operationalize them. In my discussion below, I focus primarily on the development of the *Stockholm Convention*. First, because it is the only MEA to specifically mention the Arctic (Keskitalo, Koivurova, and Bankes 2009, 8) and second, because the work of regional institutions, like the Arctic Council and the Inuit Circumpolar Council (ICC), were integral in the negotiation of the Convention (as well as in the negotiation of the *Aarhus Protocol*, which I make note of). The implementation of these agreements occurred domestically.

The governance of contaminants, particularly POPs, has been a central issue of Arctic environmental governance since the 1990s. It was a core part of the work of the AEPS (Arctic Environmental Protection Strategy 1991) and the Arctic Council (Arctic Council 1996), which committed itself to five objectives

including the identification, reduction, and elimination of pollution (Selin and Selin 2008, 77). Much of this work occurred under the purview of the Council's Arctic Monitoring and Assessment Programme (AMAP) – a network of Arctic Council Member States, Permanent Participants, Observers, and scientific experts – whose mandate remains to: monitor and assess the status of pollution in the Arctic; to document pollution levels and trends, pathways and processes, and the effects on Arctic ecosystems and humans and propose actions to reduce their threats; and to produce science-based, policy relevant assessments and public outreach to inform policy- and decision-making processes.

The ability of AMAP to harmonize and integrate domestic and international monitoring activities under its Trend and Effects Programme, and its National Implementation Plans (NIPs), was crucial in the negotiations of both the 1998 *Aarhus Protocol*, under the CLRTAP, and the 2001 *Stockholm Convention*. In fact, then-Executive Secretary of the AMAP Lars-Otto Reiersen, Simon Wilson, and Vitaly Kimstach (2003b, 60) argued that "AMAP was possibly the first international monitoring effort to design and implement [a] single program to cover all major ecological systems (atmospheric, marine, freshwater, and terrestrial) and humans [while] at the same time fully integrat[ing] its monitoring and assessment activities." In addition to this, the informal structures of the AEPS and the Arctic Council, which include Indigenous peoples as Permanent Participants, provide AMAP with the particularly unique ability to not only combine Indigenous knowledge and Western science (collected domestically, regionally, and globally) into its assessments and reports, but to also bring this knowledge into the work of international bodies like the UNECE and the UNEP, where the participation of Indigenous peoples is generally restricted in the negotiations of international agreements.

One pivotal part of the success of governing POPs was the publication of the 1997 AMAP *Arctic Pollution* report, which was significant in providing evidence of the negative exposure experienced by Arctic communities to the effects of POPs (Young 2016a, 102).[141] The scale of this report would simply not have been possible had it been undertaken by any one community alone (Prior 2013). Following the publication of this report, at the AEPS ministerial meeting in Alta in 1997, Arctic states agreed "to increase efforts to limit and reduce emissions of contaminants into the environment and to promote international cooperation in order to address the serious pollution risks reported by AMAP." They also committed to "draw[ing] the attention of the global community to the content of the AMAP reports in all relevant international fora," and to "make a determined effort to secure support for international action which will reduce Arctic contamination." (Reiersen, Wilson, and Kimstach 2003). More specifically, Arctic states were encouraged to "work vigorously for the expeditious completion of negotiations" on the *Aarhus Protocol on Persistent Organic Pollutants* to the UNECE *Convention on Long-range Transboundary Air Pollution* (CLRTAP) which was being finalized at the time of the report's publication (Selin and Selin 2008, 77). Although the CLRTAP had primarily dealt with acidification, it began negotiations on the protocol after Canada and Sweden had raised the threat of POPs in the 1980s (Downie and Fenge 2003; English 2013; Watt-Cloutier 2015). The *Aarhus Protocol*, which prohibits the production of specific

[141] Other significant AMAP reports have included: "Arctic Pollution Issues: A State of the Arctic Environment Report" (1997); "Arctic Pollution" (2002); "The Influence of Global Change on Contaminant Pathways to, within, and from the Arctic" (2002); "Radioactivity in the Arctic" (200); the "Arctic Climate Impact Assessment" (produced by AMAP in cooperation with CAFF and the IASC in 2004); "Human Health in the Arctic" (2002, 2009 & 2015); "Mercury in the Arctic" (2011); "Temporal Trends in Persistent Organic Pollutants in the Arctic" (2015); "Black carbon and ozone as Arctic climate forcers" (2015); "Adaptation Actions for a Changing Arctic" (2017); "Snow, Water, Ice and Permafrost in the Arctic" (2013 & 2017); "Arctic Ocean Acidification" (2018); and more.

chemicals, sets emissions limits, and establishes codes of best conduct, was signed in 1998. It has been ratified by 31 countries.

I mention the negotiation of the *Aarhus Protocol,* because it is a crucial part of the polycentric governance response to POPs but also because of its role in helping to inform the negotiation of the 2001 *Stockholm Convention on Persistent Organic Pollutants*, providing both a conceptual approach and text on which to build upon (Bankes 2003).

Negotiations for a global, legally binding instrument to eliminate an initial list of twelve POPs – the "dirty dozen" – began in 1998 under the auspices of the UNEP and concluded with its adoption in 2001 (Buccini 2003); 120 states participated in the negotiations (for a definitive history of the negotiations see Downie and Fenge 2003; for a personal narration of the history of these negotiations see Watt-Cloutier 2015). In addition to these states, a wide range of other actors participated, including the chemical industry, public health, and environmental NGOs, Indigenous peoples' organizations, World Health Organization, the Food and Agriculture Organization, the Global Environment Facility, and the Arctic Council. This paved the way for Indigenous organizations like the ICC to bring the human dimension of POPs to these international negotiations (Watt-Cloutier 2015, 142–43). Then-ICC International President, Sheila Watt-Cloutier, took particular care to convey the compounding factor of these pollutants – the social, health, and economic context in which this cocktail of toxic chemicals would impact Inuit. Indigenous peoples were also included in both US and Canadian delegations. The ability of Arctic actors to link the concerns of Inuit together with strong scientific evidence collected by AMAP – across domestic, regional, and global scales – contributed significantly to the successful negotiation of the Convention.

The active participation of northern actors is most readily apparent in the Preamble of the Convention, "Acknowledging that the Arctic ecosystems and Indigenous communities are particularly at risk because of the biomagnification of persistent organic pollutants and that contamination of their traditional foods is a public health issue." (see Koivurova 2005, 38).

The *Stockholm Convention* was adopted for signature in May 2001, entered into force in 2004, and was amended in 2009 (to include nine new chemicals). As of September 2019, there are 184 parties to the Convention. The US is a notable non-ratifying state (Selin 2011, 41), while Denmark has entered territorial exclusion with respect to Greenland. States who *did* sign the Convention agreed to phase out the production and consumption of nine out of twelve "dirty dozen" while still allowing for essential uses (for instance, the agreement backed away from the complete elimination of DDT use, limiting its use to the prevention of malaria) and calling for a switch to less harmful substitutes and processes (Birnie, Boyle, and Redgwell 2009, 448). In addition to this, the Convention called for the reduction of unintentionally produced dioxins and furans and the safe disposal of existing stocks. Lastly, it included provisions for the addition of new chemicals; today, the list includes 28 POPs (Fiedler et al. 2019).

The success of the governance response to POPs is, in part, thanks to the broad objective of the *Stockholm Convention* to, quite simply, stop pollution, as well as its flexible and dynamic approach to implementation, compliance, and monitoring. The healthy preoccupation of the Convention's negotiators with the successful implementation of the agreement, Bankes (2003, 180) argues, is particularly reflected in its technical and financial assistance provisions. I briefly highlight some of the key features of the Convention below.

First, the Convention proclaims a precautionary approach to the protection of human health and the environment (Article 1) (for further analysis see Bankes 2003). How POPs are to be eliminated and restricted is detailed in Articles 3-6, 11 and 12. In addition to this, Annex A focuses on the elimination of the production and use of nine POPs. Annex B relates to the restriction of the production and use of DDT

(Article 3). Certain exceptions allow states to continue importing and using specific substances for a limited period of time under the conditions that they are identified in a public register, held by the secretariat, and periodically reviewed and renewed with justification (Article 4). This implies that Parties may reject these requests, thereby reversing the burden of proof. Once all exemptions have expired no additional requests can be made and the use of the specific chemical is banned entirely. All production and new uses of the original twelve POPs ended in 2009 (Fiedler et al. 2019).

A second feature is its ability to operationalize the agreement through financial and technical assistance. Substances listed in Annex A and B are to be identified, managed, and disposed of in a "safe, efficient and environmentally sound manner" (Article 6). Meanwhile, Annex C focuses specifically on unintentionally generated and released substances during the production of other compounds and thermal processes (Fiedler et al. 2019). In order to prevent the formation of these POPs and ultimately eliminate them, Parties to the Convention shall develop release inventories, apply best available techniques (BAT), promote best environmental practices (BEP), and report their progress every five years (Article 5). This includes a review of the efficacy of domestic laws and policies in meeting the obligations of the Convention. This particular aspect of the Convention – an obligation of conduct as opposed to one of result (Birnie, Boyle, and Redgwell 2009, 450) – represents a deliberate compromise between those states who sought the complete elimination of POPs and others who regarded it as unrealistic in the short term.

The implementation of the Convention – the plan, presentation, update, and execution – is up to individual Parties (Article 7). In an Arctic context, the AEPS and the AC have filled a critical governance niche by filtering comprehensive, cumulative, and analogous data sets and other information downward to Arctic states in the form of assessments and reports, which they may then translate into National Implementation Plans (NIPs). AMAP assessments and reports have served as building blocks for the NIPs of Arctic Council Member States – they identify knowledge gaps and institutional overlaps, provide non-binding policy recommendations, and allow for direct implementation (Prior 2013). For instance, the work of AMAP encouraged Denmark to upgrade from an ad-hoc to a long-term monitoring system (Stokke 2007b, 90).

At the same time, though, there is also recognition that not all Parties to the Convention are homogenous in their ability to meet the commitments outlined in their NIPs. (In this way, the *Stockholm Convention* takes a different approach to defining the Arctic than the UNFCCC – one that is cognizant of diverging levels of industrialization in the northern parts of Arctic states.) The development of the "*Multilateral Cooperative Pilot Project in the Russian Federation"* serves as a salient example thereof. In 1998, the *AMAP Assessment Report: Arctic Pollution Use* highlighted knowledge gaps relating to the presence of PCBs in Russia. The report also provided recommendations on how to gather additional scientific data, administer the collection and storage of PCBs, select and facilitate the production of alternatives, develop environmentally sound technologies, and evaluate rehabilitation methodologies. These recommendations ultimately led to the development of a three-phased project under which Arctic Council Member States committed to provide (voluntary) funding and technical expertise so that Russia could meet its commitments, both to its own NIP and to the *Stockholm Convention*, more broadly.[142] The project also provided opportunities for experimentation through the development of prototype facilities for the production PCB substitutes, and for the testing and the comparison of existing technologies for PCB

[142] The capacity of the AC to regularly monitor and collect data, as well as identify emerging trends, is logistically and financially constricted. As a result, the AC is limited to adopting initiatives supported by MS on a voluntary basis. Additionally, AMAP assessments are often based on short-term activities due to cost- and time-constraints, which then affects the decisions made by AC MS.

destruction. Later phases considered the sustainable development of the Russian economy in light of the elimination of PCBs.

Specific actions to implement the Convention globally are reported through Article 15 while Article 16 lays out a mechanism to assess the successes of those activities based on comparative analytical data on concentrations of POPs, national reports (Article 15), and non-compliance information (Article 17). To do this, the Convention set up a Global Monitoring Plan (GMP) whose mandate it is to evaluate the effectiveness of ongoing activities using regional, national, and international programs to monitor concentrations of POPs. For instance, AMAP Thematic Data Centres (TDCs) have partnered with the GMP to monitor human milk, human blood, and air pollution in the Arctic. AMAP and the GMP have also worked together to produce joint technical reports on predicting the impacts of climate change and POPs. Still, the Conference of the Parties has yet to agree on a compliance mechanism (Article 17) (Fiedler et al. 2019).

A third feature is the Convention's dynamic set-up. Although it is not a framework convention, proposals to add new annexes and list new chemicals are assessed by experts of a Review Committee who provide informed and transparent recommendations based on a risk profile related to their potentially significant adverse human health and/or environmental effects (Birnie, Boyle, and Redgwell 2009, 450).[143] The precautionary principle, noted earlier, finds itself into Article 8 of the Convention, where it references the procedure for adding new chemicals to the list (although it is silent on appropriate procedures for assessing new chemicals or re-assessing existing chemicals) (Bankes 2003). Even so, the final decision is a political one where no state party can be forced to eliminate or restrict the use of newly listed chemicals. Elements of Principle 2 of the *Rio Declaration* – the duty to prevent harm principle – are reflected in provisions relating to the domestic approval of new chemicals to be added to the list and in dealing with the unintended consequences of POPs. However, in assessing the treatment of liability in the *Stockholm Convention*, Bankes (2003, 173) notes a failure to include a substantive provision relating to liability which may reflect some of the difficulties related to negotiating such provisions, including causal connection; the nature of liability; the requirement to differentiate liability among POPs, their by-products, prohibited POPs, and DDT.[144]

Fourth, and finally, while there is no specific reference to the *Rio Declaration* principle of common-but-differentiated responsibility (Principle 7), the Convention shares some of its elements, including conditional language and commitments to financial and technical assistance for developing countries to achieve their commitments (Bankes 2003, 170). For instance, the Global Environment Facility, the financial mechanism of the Convention, was established in order to help developing countries and economies transition to meet the obligations of the Convention. This element of the Convention spoke directly to discussions during the negotiations on what appeared as a dichotomous challenge between protecting individuals, including babies and children, in the Global South from malaria (for which DDT is a preventative measure) and the health of the Inuit, particularly infants and their mothers, from the impacts of POPs (Watt-Cloutier 2015, 137).

[143] According to Annex D of the *Stockholm Convention* – "Information requirements and screenings criteria" – POPs must fulfill specific criteria relating to persistence, bioaccumulation (e.g. monitoring data in biota), long-range transport (e.g. measured levels of the chemical in locations distance from the source of its release), and adverse effects (e.g. toxicity or ecotoxicity data indicating potential damage).

[144] In addition to this, such a provision would require channeling that liability to manufacturers and shipping companies.

1.3. Analysis & Conclusion

The governance of POPs is often cited as a successful example of Arctic environmental governance. I argue that there are several reasons as to why a turn to legalization in the governance of POPs was particularly successful in achieving the decline of these toxic chemicals in the Arctic. First, there is a clear recognition of the role of system *connectivity* and its relationships to *linear cause-and-effect* between various sources of POPs, their travel northward by air and water, their accumulation in, and impact on, the Arctic environment, in wildlife, and humans. Second, unlike in the climate negotiations, "there was no real argument about the science or the reality of the problem" in the negotiations surrounding the *Stockholm Convention* (Bankes 2003) – the most significant barriers related to technical and financial assistance instead. Third, with a clear understanding of cause-and-effect and a shared governance objective of eliminating pollution, the success of the governance approach is most simply measured in the decline of most of the initial list of 12 POPs in the Arctic (Hung et al. 2016).

Fourth, the *polycentric* governance response to POPs in the Arctic recognizes the complexity of managing the problem; that no single actor can respond to the environmental, temporal, and jurisdictional mismatches that arise from the persistence, bio-accumulation, long-range transport, and adverse effects of POPs (Prior 2013). By connecting domestic, regional, and global frameworks, the AEPS and the Arctic Council have filled a particular niche in the Arctic context which has enabled a *diversity of actors* to coherently tackle the issue of connectivity, stopping the emission of POPs at various sources. Within this network, formal and informal governance have served to strengthen one another in a manner that would have been impossible to achieve through either approach alone. The formal structure of the *Stockholm Convention* has filled a distinct niche despite the existence of the *Basel* and *Rotterdam Conventions*, and the *Aarhus Protocol* of the UNECE, all of which contribute to the polycentric response. As already noted, the *Stockholm Convention*'s precautionary approach is particularly innovative in its *flexible and dynamic implementation*, compliance, and monitoring. Rather than prescribe a one-size-fits all solution, the operationalization of the agreement is up to individual parties. This is in line with Scotford's (2017) notion that environmental principles, like the precautionary principle, can in fact provide coherence and legitimacy by transcending jurisdictional boundaries while simultaneously changing behaviour in diverse jurisdictions and regions. In this way, it sets itself up to meet the law of requisite variety (see Chapters 1 and 6).

In an Arctic context, the macro-level goals of the Convention are communicated downward through the Arctic Council. The AMAP WG of the Council – which seeks to harmonize the monitoring activities of national programmes and promote inter-comparable quantitative and qualitative methods (AMAP 2004) – regularly produces assessments and reports with non-binding recommendations based on comprehensive, cumulative, and analogous data including Indigenous and local knowledge. These recommendations continue to shape the NIPs of many Arctic states. It is in this way that informal governance serves to strengthen formal governance; through the inclusion of Arctic Indigenous peoples who are significantly impacted by POPs, and by cultivating a mutually beneficial space "where actors have the ability to combine a diverse set of methodologies in gathering, assessing, and reporting relevant scientific data." What is more, Indigenous ontologies and epistemologies may also contribute to normative variation. As such, the Council also informs the work of the Convention at a global scale. Unsurprisingly then, the AMAP continues to work with the Secretariat of the Convention, today (AMAP 2019).

Fifth, and finally, a crucial element of success in the governance of POPs is the combination of the *Convention*'s broad mandate and its lack of a substantive liability provision that would require the tracing of causal connection between the effects of various POPs to specific sources in- or outside the Arctic. (This

is the precise sticking point with which the Inuit Petition was met in 2005.) Instead, the governance response to POPs foregoes wrestling with some of the constitutive and behavioural characteristics of the Arctic system, and the Earth System, more broadly, by doing what the law does best: focusing on linear cause-and-effect relationships that can be observed, mapped and governed by reason and simplicity (Rogers et al. 2013, 32–33; Arthur 2009, 211–12; see also Mitchell 2009; Cilliers 1999). In this regard, the mechanistic ontology underpinning the governance approach matches onto the complexity of this particular problem, in part, because the problem *can* be reduced.

Despite its many successes, some challenges remain. As Fiedler et al. (2019) remark, "A global treaty with so many countries involved is in a continuous challenge with procedures and political realities in countries, which hamper the achievement of perceived simple goals such as eliminating the use of PCB in 2025."

2. Case 2: The Intersection of Climate Change and Human Rights: The Inuit Petition

Arctic Indigenous peoples are increasingly drawing on a human rights-based approach – a conceptual framework that is normatively based on international human rights standards with the aim of promoting and protecting human rights – to bring attention to the tightening consequences of environmental degradation to their way of life (Prior and Heinämäki 2017). In 2005 and 2013, respectively, two Arctic-specific petitions were put forward to the Inter-American Commission of Human Rights (IACHR) – the *Petition to the Inter-American Commission on Human Rights Seeking Relief from Violations Resulting From Global Warming Caused by Acts and Omissions of the United States* (hereafter the Inuit Petition), submitted by Sheila Watt-Cloutier, and 62 other hunters and elders, and the *Petition to the Inter-American Commission on Human Rights Seeking Relief from Violations of the Rights of Arctic Athabaskan Peoples Resulting from Rapid Arctic Warming and Melting Caused by Emissions of Black Carbon by Canada*, put forward by the Arctic Athabaskan Council.

Both illustrate a clear mismatch between the nature of change in the Arctic system, as outlined in Chapter 2, and the necessary protection of the substantive rights of northern Indigenous communities as provided by traditional human rights mechanisms and Indigenous peoples' rights, referenced in Chapter 3. I focus on the Inuit Petition below and argue that the inability of the petitioners to achieve their intended outcome – to hold the U.S. accountable for a range of alleged human rights violations – can be understood as a form of governance failure – or an inability to meet the law of requisite variety – where there is a mismatch between the existing governance approach (drawing on the IACHR) and the nature of the problem (the impacts of climate change).

2.1. Complexity of the Challenge

The Inuit Petition specifically focuses on climate change and global warming caused by greenhouse gas emissions from human activities and their impacts on the Arctic environment. Naturally occurring greenhouse gases, such as carbon dioxide and methane, have the ability to trap the sun's heat, a process that keeps the Earth livable. Although a vital characteristic, this greenhouse effect becomes problematic as concentrations of greenhouse gases increase due to human activity (for instance, through the combustion

of fossil fuels), trapping more heat and causing *amplifying feedback loops* that impact both the Arctic and the Earth system as a whole.

The Arctic is warming at twice the global rate, contributing to significant geophysical and social-ecological changes in the Arctic system. They include the deterioration of (sea) ice conditions, a decline in the quantity and quality of snow, increasingly *unpredictable* weather, as well as permafrost melt leading to slumping, landslides, and severe erosion in some coastal areas (Watt-Cloutier 2005). In addition to this, such changes can lead to amplifying feedback loops where rising temperatures contribute to permafrost melt that releases methane and carbon dioxide into the atmosphere which then further contributes to warming, and so on and so forth (ACIA 2004, 38).

This emerging material reality has significant impacts on *human-environment interactions*, including on the Inuit, a linguistic and cultural group that spans four countries – Chuchotka in Russia, northern and western Alaska in the US, northern Canada, and Greenland. Phenomena, such as a reduction in sea ice, can have significant consequences for the Inuit, whose culture, economy, and identity have developed in relation to their surroundings, including to the ice and snow (Watt-Cloutier 2005, 74). Despite fine-tuned tools, techniques, and knowledge, accumulated over generations – "traditional knowledge regarding the safety of the sea ice has become unreliable. As a result, more hunters and other travelers are falling through the sea ice into the frigid water below." (Watt-Cloutier 2005). Melting permafrost is also having devastating impacts on coastal communities where erosion and slumping infrastructure may force the relocation of entire communities (see Chapter 2).

Although the area is disproportionately impacted, most greenhouse gas emissions do not originate in the Arctic.

2.2. Governance Response

The publication of the Arctic Climate Impact Assessment in 2004 – a hallmark of the work of the Arctic Council – was pivotal in sounding the alarm on the impacts of climate change on the Arctic system. Based on western science, in addition to Indigenous and local knowledge, the ACIA also highlighted the link between climate change and Arctic Indigenous peoples, including the Inuit. Within the context of these findings and a growing frustration with the governance failure of multilateral processes (Jodoin, Snow, and Corobow 2020, 192), Sheila Watt-Cloutier, together with 62 other Inuit hunters and elders based in Inuit Nunangat across Canada and Alaska, and with the support of the Inuit Circumpolar Council, filed a petition against the United States with the Inter-American Commission on Human Rights in 2005.[145] The U.S. was the world's largest cumulative greenhouse gas emitter at the time (Watt-Cloutier 2005, 103).

Developed under the leadership of Sheila Watt-Cloutier, then-President of the ICC, and in cooperation with two environmental organizations, Earthjustice and the Center for International Environmental Law (CIEL), the Petition claimed that the U.S. should bear responsibility for acts and omissions that significantly contribute to global warming and climate change, and thus violate the human rights of the Inuit — their right to be cold (Watt-Cloutier 2005; 2015).[146]

Watt-Cloutier, Earthjustice, and CIEL chose to file a petition with the IACHR, a regional human rights body of the Organization of American States (OAS) (see section 3.3.1.), for two reasons. First, because some of the Commission's previous decisions had already demonstrated a receptiveness to linking human

[145] It is important to note that Watt-Cloutier ultimately led the Petition independently of her position with the ICC.
[146] The ICC represents approximately 160,000 Inuit living in Alaska, Canada, Greenland, and Chukotka, Russia.

rights and the environment, especially in relation to Indigenous peoples (Watt-Cloutier 2015, 222–24; Osofsky 2006, 688).[147] Second, unlike the European Court of Human Rights, the IACHR has jurisdiction over the U.S., which was important given the focus of the Petition.[148] As a member state of the OAS, the U.S. is bound by the terms of the *Charter of the Organization of American States*, thereby accepting the obligation to protect the fundamental rights of individuals – an obligation which is amplified by the 1948 *American Declaration of the Rights and Duties of Man* (Harrington 2006, 518). Although a non-binding resolution, it has gained normative force through the OAS Charter and may thus serve as a basis upon which petitions, alleging human rights violations, could be filed against the U.S.

The choice to file a legal petition was regarded as one of the only means for non-governmental groups, including Indigenous groups, to address state governments at an international level. For one, because institutions like the UNFCCC, outlined earlier, remain ill-fit to address the concerns of Arctic Indigenous peoples, like the Inuit. For instance, the UNFCCC does not recognize the vulnerability of the Arctic as an area experiencing the disproportionate impacts of climate change. What is more, states remain the dominant actors leaving Indigenous peoples to seek remedies through individualistic human-rights based approaches. Second, the interpretive nature, as well as the substance and form of human rights petitions – their intersectional and multi-dimensional nature and ability to bring together different forms of law and scientific disciplines (Harrington 2006, 519; Osofsky 2006, 676, 689) – was particularly appealing and matched onto an increasingly open worldview of the Arctic system.

A lengthy document, the Inuit Petition leveraged this legal form to draw on an innovative combination of legal argumentation, scientific research like the 2001 Intergovernmental Panel on Climate Change report and the 2004 ACIA, as well as oral testimonies from Inuit communities to focus on: 1) the impacts of global warming and climate change on the Inuit; 2) U.S. contributions to greenhouse gas emissions and the state's inadequate legal and policy response; and 3) how U.S. acts and omissions violate the rights of the Inuit under the IACHR. I briefly examine each point in more detail below.

First, the Inuit Petition pointed to the complex transformation of the Arctic's physical environment as a result of individual and cumulative effects (Watt-Cloutier 2005, 67), and thereby also the reality of multiple equilibria within the Arctic system over time. The "Inuit Qaujimajatuqangit [traditional knowledge] tells the Inuit that the weather is not just warmer in the Arctic, but the entire familiar landscape is metamorphosing into an unknown land." (Watt-Cloutier 2005, 21).

Then, the Petition homed in on the consequences of U.S. contributions of greenhouse gas emissions to global warming and the state's failure to adequately mitigate emissions through international and domestic laws and policies (Watt-Cloutier 2015, 236; Osofsky 2006, 684). This included its decision to not ratify the *Kyoto Protocol* to the UNFCCC despite its knowledge of the harmful effects of following through on this decision (Harrington 2006, 513). The Petition also noted U.S. engagement in climate denialism with the aim of misleading the public about the urgency surrounding global warming (Watt-Cloutier 2005, 103–10; Jodoin, Snow, and Corobow 2020, 172).

Third, drawing on a human rights-based approach, the core of the Petition focuses on the indirect interference of U.S. behaviour on Indigenous lands with adverse effects on the human rights of the Inuit (in

[147] For instance, its 1997 report on Ecuador noted that "Indigenous peoples maintain special ties with their traditional lands, and a close dependence upon the natural resources provided therein – respect for which is essential to their physical and cultural survival." (Inter-American Court of Human Rights et al. 1997; Ksentini 1994, 77, 78–93).

[148] Although I reference some of the climate impacts experienced by Inuit across the four Arctic states that they inhabit, this Petition focuses specifically on the impacts from climate change caused by acts and omission of the US specifically, and thus restricts its signatories to the Inuit living in the U.S. and Canada.

Alaska, Canada, Greenland and Russia). It particularly "emphasize[d] the role that human rights principles and obligations should play in characterizing and responding to climate change and emphasize[d] the importance of holding governments in countries that bear greater responsibility for greenhouse gas emissions accountable for the adverse consequences of climate change for the rights of affected communities." (Jodoin, Snow, and Corobow 2020, 171). For instance, the Petition noted that the destruction of the Arctic ecosystem violates various rights guaranteed by the *American Declaration of the Rights and Duties of Man*, which serves as the basis of the IACHR (Jodoin, Snow, and Corobow 2020, 172; Watt-Cloutier 2005, 118). It also alleged that, because Inuit culture is inseparable from its material surroundings, the inability of the Inuit to use and enjoy traditional lands due to environmental change violates instruments, beyond the IACHR, that protect rights "to the benefits of culture, to property, to the preservation of health, life, physical integrity, security, and a means of subsistence, and to residence, movement and the inviolability of the home" (Watt-Cloutier 2015, 236–37). Examples of alleged property violation include damaged snow machines, sleds, and tools. The right to health and life are allegedly constrained by accidents caused by melting ice and snow. The collective rights claim of a right to subsistence is allegedly also denied through significant shifts in hunting culture because of changes in the length of the hunting season, the quantity and quality of wildlife, and methods of travel. Finally, the Petition alleged that the fundamental right to residence and movement was violated by the infrastructural damage caused by melting permafrost.

In response to these acts and omissions, the petitioners requested that the IACHR investigate U.S. contributions to climate change and global warming; declare the U.S. responsible for these violations; recommend that the U.S. reduce GHG emissions to a level that would protect Inuit culture and resources (including the environment); establish and implement a plan together with the affected Inuit communities to provide the necessary assistance for adaptation to climate change; and provide appropriate compensation or relief for damages suffered (Watt-Cloutier 2005, 118).

Despite its compilation of evidence of the geophysical and social-ecological impacts of climate change on the Arctic environment and the Inuit way of life, the Inter-American Commission decided that it would not proceed with the file in 2006. While the Commission did not dispute the human rights issues raised by the Petition (Humphreys and Robinson 2010, 141), it responded with a letter that claimed the Petition failed to meet the basic admissibility for further consideration as it "didn't enable the commission to determine whether the alleged facts would characterize a violation of rights protected by the American Declaration" (Watt-Cloutier 2015, 250). Nevertheless, the IACHR commission held a public hearing on "Human Rights and Global Warming" in 2007 with a testimony from Sheila Watt-Cloutier and the lawyers who had drafted the Petition.[149] No state appeared before the commission (Harrington 2006; Osofsky 2006).

2.3. Analysis & Conclusion

By bringing together environmental complexity with social, cultural, political and legal complexity, the Inuit Petition serves as a salient example of how different actors interpret and use international law as a tool to address cross-cutting challenges, like the impacts of climate change on Arctic Indigenous peoples. Specifically, it showcases an inability of a rights-based approach – which is generally built to respond to

[149] Press Release No 8/07, Inter-American Commission on Human Rights, IACHR Announces Webcast of Public Hearings of the 127th Regular Period of Sessions, Feb. 26, 2007, http://www.cidh.org/Comunicados/English/2007/8.07eng.htm [hereinafter Press Release No 8/07]; See Audio Recording: Audio of Public Hearings of the 127th Period of Sessions, held by the Inter-American Commission on Human Rights, May 1, 2007, http://www.cidh.org/Audiencias/Audios%20hearings%20127%20PS.htm.

social triggers – to manage an issue like climate change, where the system exhibits a complex causality between both physical and social triggers over time.[150] The outcome of the filing of the Petition with the IACHR can be understood as both a governance success and failure.

Despite the negative response of the IACHR, the Inuit Petition is often remembered as a creative success; for instigating a dialogue on the link between climate change and human rights (Peel and Osofsky 2018), and for its ability to publicize the impacts of climate change on the Arctic. The substance and form of the Petition provided a powerful means of moving away from a purely economic and technical debate to one of ethics by placing scientific discourse on climate change into human terms (Watt-Cloutier 2015, 230; Jodoin, Snow, and Corobow 2020, 169 & 173).

At the same time, the inability of the petitioners to achieve their intended outcome – to hold the U.S. accountable for a range of alleged human rights violations – can be understood as a first-order governance failure: a mismatch between the complexity of the challenge and the governance response that traditional human rights mechanisms provide. It failed to meet the law of requisite variety.

More precisely, and in partial response to my central research question, I argue that while the IACHR system provides a platform for a complex systems ontology to frame a legal petition, the mismatch arises in trying to map this ontology onto the positivist legal underpinnings of the IACHR – where international law is not more, nor less, than the rules to which states have agreed to through treaties, custom, or other forms of consent (Ratner and Slaughter 1999). So, while the petitioners recognized that law "provides one of the deepest reservoirs of symbolic resources, discourses, and institutionalized scripts available to collective actors…" (Pedriana 2006, 1727–28), the choice to employ law as a means of framing the problem also provides particular constraints, tied to the formal nature of legal instruments.[151] For instance, legal norms and discourses are often resistant to change, requiring that new framings be advanced via existing legal norms and discourses (precedents, statutes, or practices), thereby limiting the ability of law to contribute to the desired transformation.[152]

In addition to this, I highlight three specific challenges that the complexity of the problem presents for the IACHR. The first is *causation***.** Unlike negotiations surrounding the *Stockholm Convention* – where the focus was on the production of contaminants stemming from particular sources and where there is direct evidence of their damage to human health – there are political and technical barriers to positing a clear and undisputed link between the causes of climate change and specific human rights violations (Humphreys and Robinson 2010, 138–39). In the case of the Inuit Petition, establishing causal links between greenhouse

[150] An example of a response which might be more effective includes the Warsaw International Mechanism for Loss and Damage – the primary vehicle (under the UNFCCC) to avert, minimize and address loss and damage from climate change (Art. 8)– which is a reflexive legal tool for collective liability which simultaneously seeks to address issues of climate justice and differentiated responsibility.

[151] Although there are few empirical studies on whether human rights litigation leads to transformative legal, social and political outcomes, research by Jodoin, Snow, and Corobow (2020, 171) has found that the framing of the Petition has had varied resonance with different actors – with policymakers in the U.S. and Canada, the climate justice movement, transnational efforts to build links between the fields of climate change and human rights, and the Inuit communities on whose behalf the Petition was filed. They found that the petition had little resonance with policymakers and two of the Inuit communities on whose behalf it was filed. Meanwhile, the Petition shaped climate litigation and advocacy efforts moving forward (Jodoin, Snow, and Corobow 2020, 192–93).

[152] For instance, as Harrington (2006, 530) highlights, the Petition fails to bolster its claim by referencing a wide variety of sources including non-binding declarations and treaties (such as the *American Convention on Human Rights* or ILO Convention No. 169) which have neither been signed, nor ratified by the U.S. It also cites non-binding case law of the IACHR and the UN Human Rights Committee, reports from UN Special Rapporteurs, and draft instruments under negotiation (such as the UNDRIP, at the time).

gas emissions in the U.S. and human rights violations in the Arctic involves a more diffuse geography. "Unlike corporations logging on Indigenous peoples [sic] lands, the greenhouse gas emitters are physically separated from the Inuit and the harm is caused through a complex process in the oceans and atmosphere around the globe" (Osofsky 2006, 681). Also, because emissions are a consequence of everyday life, disaggregating responsibility between different actors – from the individual, to the corporation, to the state – remains a particularly difficult political and legal challenge (Harrington 2006; Humphreys and Robinson 2010). As Humphreys and Robinson (2010) write, "The task is not just hampered by the methodological difficulty of establishing which source of pollution brought about which rights violation and in what proportion, but ascertaining whether complicity lies with the provider of a source of energy (the energy company, for example), or the user and source of demand for that energy (the consumer)." What is more, the ability to prove causation in this case, would require the OAS to also hold other Arctic states, like Canada, responsible for their contributions in a manner similar to the U.S.[153]

The second challenge relates to the *diversity of actors and the emergent, multi-scalar regulatory dynamics* within which they operate. While the Petition draws on a complex systems ontology to highlight the impacts of climate change on the Inuit, there is a failure – by both the Petition and the IACHR – to apply the same ontological lens to imagine a governance solution that meets the law of requisite variety. For instance, the Inuit Petition engages multiple actors – states, NGOs, corporations, and individuals – operating at multiple scales of governance, from the local to the international (Osorofsky 2006, 686). The petitioners also hold multiple identities – as Inuit, as Canadians, as Americans, etc. – with layered socio-political and legal connections to the Arctic. Meanwhile, the U.S., as the respondent, is far from monolithic (Osofsky 2006, 680–81). The state is *emergent*, including multiple government branches – executive, legislative, and judicial – that contribute to the making of U.S. climate law and policy. So, while the executive branch sets climate policy and negotiates international agreements, the legislative branch creates statutory law that underlies U.S. energy policy and other decision-making on climate change. And although they are not included as respondents *per se*, state and local governments, as well as non-governmental actors and corporations, play crucial roles in determining national GHG emissions. This diversity of actors raises broader questions about the relationships between Indigenous peoples and the state; between different governance levels; between public and private international law; between civil and common law and various forms of Indigenous law (Osofsky 2006, 688). However, all of these questions remain unaddressed, thus contributing to the mismatch between the nature of the problem and the governance response provided.

The *scope of application* of the IACHR is also challenged by causation and the diversity of actors at play. For instance, of the 63 signatories who filed the Petition against the U.S., 49 Inuit signatories were in Canada and filed for human rights violations that occurred within the jurisdiction of Canada. This raises concerns about the extent to which international human rights instruments, like the IACHR, can hold states accountable.[154] Most international human rights instruments (including declarations with normative force)

[153] However, because the US was the largest emitter at the time, this approach would assume a sliding- scale of responsibility based on contribution to global emissions which "does not accord well with our understanding of the nature of international human rights violations…Once a State is found in violation of its human rights obligations, there is no sliding scale of responsibility. The State is found responsible." (Harrington 2006, 527).

[154] It must be noted that there *are* cases where state decisions can lead to later rights violations outside the state, which incur state responsibility under international human rights law. Such scenarios largely occur in the context of extradition and deportation cases (Harrington 2006, 525). In the case of the Inuit Petition, however, Harrington argues that it would necessitate an onerous burden of proof on the petitioners for them to show that the state knew (or ought to have known) about the potential for substantial human rights violations as a consequence of their deliberate actions within the state. In other words, the ICC would have had to have argued that the US knew (or ought to have known)

have a scope of application that holds a state party accountable for human rights violations. While the *American Declaration* does not contain an express scope, it is implied – "[a]fter all, respect for the territory of another State and the obligation of non-interference in another State's domestic affairs are basic tenets of the international legal system, as affirmed expressly as key principles by the member states of the OAS through their ratification of the *OAS Charter*." (Harrington 2006, 523–24). The inability of the current human rights system to link rights to corresponding duties and provide a remedy to the problem without ostensibly requiring the IACHR to approve a major extra-territorial extension of the scope of its application serves as a clear mismatch.

Fundamentally, this case is an example of the continued contravention of human rights in the Arctic. From the outset, Sheila Watt-Cloutier (2015, 220) – who had been a significant actor in the negotiations of the POPs treaty – recognized that confronting an issue that involved *all* states and global industries would prove to be a much greater challenge than negotiating the *Stockholm Convention*. Unlike the *Stockholm Convention*, the Inuit Petition – filed by Indigenous peoples with the support of two non-state actors – constructively raised legal concerns about the legitimacy of the Inter-American system for the regional protection of human rights (Harrington 2006, 521). While it did not achieve its legal imperative for the U.S. to reduce its GHG emissions and take international action, the Petition still highlights that the state is deeply embedded in the structure of the IACHR, is essentially its source of legitimacy, and is thereby afforded discretion in how commitments are implemented (Osofsky 2006, 690). In the context of this project, this Petition essentially showcases the mismatch between two realities: between the complexity of the Arctic system and the response provided by the current governance approach.

3. Case 3: Governing Arctic Shipping & Navigation

Arctic shipping and navigation serve as a nexus for economic, environmental, technological, social, and legal complexity. There is little knowledge about the potential impact of Arctic shipping, commercial and non-commercial, on the material environment of a rapidly changing Arctic Ocean. There is also uncertainty as to how much can be controlled; in terms of navigation, the clean-up of an oil spill, or search for and rescue. Thus, in an effort to pre-empt some potentially dangerous scenarios, institutions like the International Maritime Organization (IMO) and the Arctic Council, have developed Arctic-specific instruments, built on existing international agreements, in an effort to manage some of this uncertainty. I examine three instruments – the agreements on Arctic Search and Rescue and Marine Oil Pollution Preparedness, as well as the Polar Code – below. Unlike the previous two cases, which revisit previous governance successes and failures, this particular case is more abstract, focusing on the potential for governance failure given the current context and the available governance response(s).

that governmental and non-governmental actors within the US would lead to the human rights violations highlighted in the Petition.

3.1. Complexity of the Challenge

As noted in Chapter 2, the environmental complexity faced by Arctic shipping and navigation is most significantly reflected in ongoing *non-linear*, abrupt and potentially irreversible shifts in the Arctic geophysical system as it transitions from old, multi-year Arctic sea ice to younger, thinner, and more mobile ice. Since the late 1980s, the volume of ice floating on the Arctic Ocean has declined by at least half (Rosen 2017, 152). Some envisage the emergence of a "New Ocean" with the decline in multi-year sea ice and hold out the prospect of increasingly open northern shipping routes – the Northwest Passage, the Northern Sea Route, and the Transpolar Route – to commercial shipping, cruise ships, and fishing fleets (Farré 2014; Feron 2018; Koivurova, Kirchner, and Kleemola-Juntunen 2020). Shorter shipping routes, reduced (global) shipping emissions, and political stability due to the absence of piracy are all characteristics which scholars have argued make the Arctic a particularly attractive alternate route to the Suez and Panama Canals (Byers 2010, 40–41; Ellis and Brigham 2009; Lasserre 2014; Browse et al. 2013). Still, the volume of vessels traveling these routes does not bear out these claims (see for example Silber and Adams 2019) while the *uncertainty* of industrialization and infrastructure development remains substantial and the *feedback* associated with an increase in shipping potentially significant.

Unpredictable environmental conditions – one of the observable effects of the Arctic's complex material reality – remain the greatest hurdle to shipping and navigation through both the Northern Sea Route and the Northwest Passage (NWP) (Durfee and Johnstone 2019, 207, 226). A more precise list of challenges includes uncertain year-to-year variations in sea ice, harsh and rapidly changing weather conditions, pervasive ice, seasonal darkness and a sensitive marine environment (Stokke 2013, 66; Østreng and Eger 2013, 35; see also Larsen et al. 2016; Henriksen 2015, 364; Durfee and Johnstone 2019, 204). For instance, ships may encounter chunks of icebergs, known as "growlers", which are exceptionally hard and float low in the water, making them particularly difficult to spot (Byers and Baker 2013, 270). Variable, and often extreme, weather is another risk-factor. Gale-force winds and swells can tear grounded vessels apart, leaving passengers stranded. Meanwhile, ocean spray from cold-weather storms can freeze on the superstructure of ships, leading them to become top-heavy and capsize. These conditions, together with a rise in the number of ships seeking to travel through Arctic waters may increase the risk of accidents on one hand, and potentially contribute to improved hydrological mapping on the other hand.

The list of challenges related to Arctic shipping and navigation also includes technological obstacles, such as poor hydrographical and bathymetrical charting, a lack of communication, and non-existent marine weather information for the high seas. Given that only ten percent of Canada's Arctic waters are charted to modern standards, transit through the relatively shallow Northwest Passage (NWP) becomes particularly concerning (George 2010). As some of these gaps are addressed, though, and as they seek to withstand the environmental challenges presented by uncertain Arctic conditions, the quality of these technological systems – their basic character and behaviour – becomes incrementally more complex. Thus, as more ships seek to travel through Arctic waters, the number of interactions between environmental and technological systems rises, leading them to become *increasingly dense and tightly coupled*.

Beyond navigation, other risks associated with large vessel transit – through areas of sensitive biodiversity, supporting Indigenous subsistence practices and marine mammal populations – include collisions, oil spills, toxic cargo, waste disposal, noise pollution, the introduction of alien species, ship strikes on marine mammals, and the disruption of their migratory patterns (Earth Justice 2014). Oil spill clean-up and search-and-rescue efforts particularly highlight the environmental and social complexity of managing the risks of Arctic shipping. Clean-up efforts for major oil spills in the Arctic, such as the 1989

Exxon Valdez oil tanker that spilled more than 40 million litres of oil into Alaska's Prince William Sound (and the effects of which remain to this day), face enormous challenges due to a lack of capacity and severely limited methods for containing spills. A 2010 WWF report noted a particular response gap where, "Due to the Arctic's remoteness and extreme weather, there is also a high percentage of time when no response, however ineffective, could even be attempted." (WWF 2010). And although pollution from ships makes up only 12 percent of ocean pollution today, it is well worth worrying about.

Meanwhile, search-and-rescue in the Arctic is made complex by the limited infrastructure and capacity of Arctic coastal states. Consequently, the social and organizational complexity of coordinating search-and-rescue efforts is an emergent practice where local communities and national coast guards, among other actors, cooperate to provide assistance. U.S. and Canadian Coast Guards and local port authorities, for instance, acquire rescue equipment and train local people as first responders (Durfee and Johnstone 2019, 219). Often, local communities – primarily fishers and hunters – are the first ones on scene (see Kikkert, Lackenbauer, and Pedersen 2020).

To understand the normative dimension of how existing processes and infrastructure might react to environmental and technological challenges (Börjeson et al. 2006), governance institutions and scholarship alike turn to fictitious and real-world scenarios. For instance, in preparation for the *Crystal Serenity,* a large-scale cruise liner (with the capacity to hold 2,000 passengers and crew members) that sailed through the Northwest Passage in the summer of 2016, U.S. and Canadian Coast Guard imagined a fictitious, yet probable, scenario which played out as follows:

> A cruise ship hits an iceberg 80-nautical miles northwest of Herschel Island in the Beaufort Sea. Within three hours, rooms and levels begin to flood; crew suffer injuries (because of leaking pipes or toppled racks) and are set to Medevac. Meanwhile, the weather is set to deteriorate over the next 36-72 hours as the ship moves slowly toward land. Within six hours, the vessel's pumps lose ground. Within ten hours, multiple passengers are in distress. The vessel becomes unstable in the next 24-28 hours and the ship must be abandoned. At the 28-hour mark, the vessel loses all power and its pumps come to a halt. At the 31st-hour, the boat becomes unstable; coast guard measures offload 600 of the 1,700 passengers, and aircrafts are dispatched but will take hours to reach the ship.[155]

In a similar vein, scholars develop their own scenarios in seeking to explore the political, legal, environmental, and technological challenges associated with new shipping in the Arctic. A cross-disciplinary project at the University of Tromsø (*A-Lex*) has used a fictitious scenario of *the Oleum*, a floundering ship loaded with toxic chemicals, to explore its potential impact on the Northeast Passage during the dark months of polar night (see Larsen et al. 2016; K.G. Jebsen Centre for the Law of the Sea 2017). The scenario begins:

> "Imagine that it is November; we are in the dark months and it is bitterly cold in the Arctic. The *Oleum*, a freighter from Hamburg, is nearing Novaja Zemlya on her way towards the Kara Sea. Her cargo of chemicals is destined for an oil platform in Siberia. In the middle of the bitterly cold polar night, the winds pick up, the waves grow huge and the *Oleum* rolls and pitches perilously. Suddenly the engine stops. In despair, the captain realises that they are unable to cast anchor because of a thick layer of ice over the anchor winch. The ship drifts helplessly towards land and founders."

[155] This scenario is probable given the current state of multi-year sea ice, and an increasing number of icebergs in the North Atlantic (see also Dennis and Mooney 2016; Stewart 2013, 146; Young 2016).

The scholars wonder: "What will become of the crew? And what about the toxic cargo and the fuel that will soon sink through the icy water? How will they affect slumbering ecosystems deep in the winter-dark seas?" (K.G. Jebsen Centre for the Law of the Sea 2017).

Beyond fiction, these scenarios mirror real-world incidents. In 2004, the ship M/V *Selendang Ayu*, traveling from Seattle to the Chinese port of Xiamen, broke apart in Unimak Pass, 160 km from the coast of Dutch Harbour, Alaska, where severe weather and sea conditions are common (Ellis and Brigham 2009, 87; Byers and Baker 2013, 160). The grounded vessel spilled 1.2 million liters of fuel oil into the water; almost none of which was "recovered due to the remote location, bad weather, and a near-complete absence of oil spill clean-up equipment and personnel in the Aleutians" (Byers and Baker 2013, 160). Meanwhile, a helicopter was hit by a large wave during the rescue efforts, resulting in its crash and the death of six of the crew members on board the ship. A second helicopter was able to rescue one crew member of the *Selendang Ayu* and three members of the downed helicopter. Such rescue efforts are not guaranteed, however. In this case, two helicopters were situated at a nearby location on the US Coast Guard Air Station in Kodiak, Alaska, and dispatched in time. But the Kodiak USCG Air Station is responsible for covering a large part of the North-East Pacific – an area of 10 million square kilometres around Alaska and north of 40 degrees northern latitude – and there is little guarantee that equivalent infrastructure would be available should another accident take place.

Both fictitious and real-life scenarios, like these, point to lacunae in the existing governance response to marine access and navigation, search and rescue, and emergency preparedness and oil spill pollution prevention in the Arctic. The potential for governance failure – relating to absent or irrelevant policy, the absence of policy implementation, insufficient or incomplete knowledge, inadequate resources, a lack of policy implementation, environmental degradation, or disregard of cumulative effects – or even cascades of governance failure, as seen in the case of *Selendang Ayu* is significant.

3.2. Governance Response

While an abundance of law and regulation govern shipping and navigation globally (see Chapter 3), little of it is specific to the Arctic. Below, I focus on three Arctic-specific instruments which were legalized over the past two decades in an attempt to respond to some of the challenges outlined in the scenarios above. The significance of these new, Arctic-specific agreements is reflected in their attempt to develop a comprehensive framework by strengthening existing cooperation with the involvement of all eight Arctic states, rather than by focusing on developing new forms of liability or assigning rights. However, questions remain as to whether these agreements effectively map onto the emerging material and social reality surrounding shipping and navigation in the Arctic.

3.2.1. Governance Response negotiated under the Auspices of the Arctic Council

As noted in Chapter 3, Arctic Council task forces have served as temporary venues for the negotiation of both the 2011 *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic* (SAR agreement) and the 2013 *Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic* (EPPR agreement). The development of both harkens back to the Arctic Council's 2009 *Tromsø Declaration* which highlights some of the anticipated risks of Arctic shipping and navigation, noting that "increased marine access and navigation in the Arctic Ocean calls for [the] development and implementation of suitable national and international regulations, where appropriate, to advance the safety

of Arctic marine shipping, including marine pollution prevention, reduce accident risk, and facilitate effective emergency response." Although specific to the Arctic environment, both the SAR and EPPR agreements are anchored in existing international agreements, leading them to take on a similar legal form.

3.2.1.1. Agreement on Arctic Search and Rescue

Search and rescue in the Arctic are governed by the 1914 *International Convention for the Safety of Life at Sea* (SOLAS), the *Chicago Convention on International Civil Aviation* (1944) [hereafter the Chicago Convention], the *International Convention on Maritime Search and Rescue* (1979) [hereafter the SAR Convention], and the 1982 UNCLOS. Although they are not specific to the Arctic, I provide a brief general overview of these international agreements below.

The SOLAS Convention requires state parties "to ensure that any necessary arrangements are made for the coast watching and for the rescue of persons in distress at sea round its coasts."[156] Adopted in 1951 (and adapted since then), Annex 12 of the *Chicago Convention* deals with search and rescue with parties required to provide assistance to survivors of accidents regardless of nationality (Art. 2.1.2); "arrange for the establishment of provision of search and rescue services within their territories" (Article 2.1.1.) and on the high seas or "in areas of undetermined sovereignty."[157] In addition to this, Annex 12 "requires neighbouring states to coordinate their search and rescue organizations and, '[s]ubject to such conditions as may be prescribed by its own authorities,' each party, 'shall permit immediate entry into its territory of rescue units of other states for the purpose of searching for the site of aircraft accidents and rescuing survivors of such accidents' (Art. 3.1.3)" (Byers and Baker 2013, 274).

In a similar vein, the 1979 *SAR Convention* requires state parties to, individually or cooperatively, "participate in the development of search and rescue services in order to ensure that assistance is rendered to any person in distress at sea" (Para. 2.1.1.). It also obliges parties to develop "sufficient" and "contiguous" (and not overlapping, where practical) "search-and-rescue regions" (Para 2.1.3). The Convention further clarifies that "The delimitation of search and rescue regions is not related to and shall not prejudice the delimitation of any boundary between States." (Paragraph 2.1.7). Additionally, it emphasizes cooperation with a mix of requirements and recommendations. Similar to Annex 2 of the Chicago Convention, states are required to coordinate their search and rescue organizations and recommended to coordinate specific search and rescue operations (Para. 3.1.1.). Meanwhile, Paragraph 3.2.1. recommends that state parties "authorize, subject to applicable national laws, rules and regulations, immediate entry into or over its territorial sea or territory of rescue units of other parties solely for the purpose of searching for the position of maritime casualties and rescuing the survivors of such casualties." While cooperation is necessary, sovereign parties retain the right to deny access to territory for any reason.[158]

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[156] 1974 International Convention of the Safety of Life at Sea, chap. 5, Regulation 15, 1184 UNTS 278, available at https://treaties.un.org/doc/publication/unts/volume%201184/volume-1184-i-18961-english.pdf (last accessed: August 25, 2020).

[157] Zones of responsibility in areas of undetermined sovereignty are determined by regional air navigation agreements (Art. 2.1.1.1.)

[158] Paragraph 3.1.3. requires that any party wishing to access another state's territory for a search-and-rescue operation "transmit a request, giving full details of the projected mission in the need for it." Paragraph 3.1.4., moreover, requires that the requested party "immediately acknowledge the receipt of such a request" and "as soon as possible indicate the conditions if any under which the projected mission may be undertaken."

The 1982 UNCLOS reinforced both treaties, stating that "Every coastal State shall promote the establishment, operation and maintenance of an adequate and effective search-and-rescue service regarding safety on and over the sea and, where circumstances so require, by way of mutual regional arrangements cooperate with neighboring states for this purpose." (Art. 98(2)).

These international agreements provided the necessary groundwork for an Arctic SAR agreement when the Arctic Council's 2009 *Tromsø Declaration* first established a task force to develop and complete an international instrument on cooperation and search and rescue in the Arctic by the following ministerial meeting in Nuuk in 2011. The signed 2011 *Nuuk Declaration* recognized "the important role of the Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic for safe transport and enhancing cooperation in assisting people in distress in the Arctic" (Arctic Council 2011b). Arctic states approved the SAR agreement in May 2011, with it entering into force on January 19, 2013, following its ratification by all eight Arctic states.[159]

Building on the 1944 Chicago Convention and the 1979 SAR Convention (Article 7 (1)), the Arctic SAR agreement takes a mechanistic approach to search-and-rescue by dividing the Arctic into eight zones to make it easier for states to allow rescue vessels from another state into their waters in the case of an emergency, to make arrangements, and to obtain assistance (Art. 1). In doing so, it seeks "to strengthen aeronautical and maritime search and rescue cooperation and coordination in the Arctic," and to "promote the establishment, operation and maintenance of an adequate and effective search and rescue capability within its area" (Article 3 (3)). The agreement particularly focuses on the conduct of joint Arctic SAR exercises and training, lists information on Arctic SAR coordination centres and addresses issues relating to territorial entry by parties for SAR operations (see Article 7(3) and Article 8(1) and (2)).

Given existing international agreements, in addition to several bilateral (Canada and United States 1950; NATO 2003) and sub-regional agreements (Barents Euro-Arctic Council 2008), Byers and Baker (2013, 279) argue that a simple declaration of a continued commitment from the eight Arctic states to the 1944 *Chicago Convention* and the 1979 *SAR Conventions* (they are all party to both agreements) would have sufficed.[160] While the legal obligation of the Arctic SAR Agreement – or for that matter, new operational or resource requirements (e.g. related to positioning of equipment) – does not go beyond existing international agreements, it adds a regional commitment to cooperation and coordination including information-sharing services; procedures, techniques, equipment, and facilities; joint research and development initiatives; reciprocal visits by experts; and joint search-and rescue-exercises. This observation is supported by a series of joint exercises carried out by Arctic states and facilitated by the EPPR WG of the Arctic Council (Smieszek 2020, 65–66).

3.2.1.2. Marine Oil Pollution Preparedness

Similar to the process behind the SAR agreement, the 2011 *Nuuk Declaration* established an Arctic Council Task force to develop an international instrument on Arctic marine oil pollution preparedness and response, which would eventually become the EPPR agreement. The EPPR agreement builds on the UNCLOS (1982), the *International Convention Oil Pollution Preparedness Response and Cooperation*

[159] Although not referenced in the Arctic SAR agreement, the 1914 *International Convention for the Safety of Life at Sea* (SOLAS) requires parties "to ensure that that any necessary arrangements are made for coast watching and for the rescue of persons in distress at sea round its coasts."

[160] See Byers and Baker (2013, 275–76) for a brief overview of bilateral and sub-regional agreements on search-and-rescue in the Arctic.

(OPRC) (1990), and the *International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties* (1969). All Arctic states have ratified the OPRC, a treaty negotiated within the framework of the IMO. Parties to the OPRC are required to establish measures for dealing with pollution incidents, such as stockpiling oil spill equipment, developing cleanup plans, and holding exercises. In addition to this, state parties are obliged to cooperate in the event of an oil spill, which may include equipment, when requested by another party. The OPRC also promotes the development of bilateral and multilateral agreements for oil pollution preparedness and response, like the Arctic EPPR agreement.

Prior to the signing the EPPR agreement, the Arctic Council developed and adopted a set of *Arctic Offshore Oil and Gas Guidelines* in 1997 (which were subsequently updated in 2002 and 2009). These guidelines included general principles and detailed recommendations which fell short, in part, due to their non-binding nature and the associated compliance issues (Byers and Baker 2013, 212–13). The Arctic Council task force, in turn, negotiated a treaty on marine oil pollution preparedness and response which was signed in 2013. Similar to the SAR Agreement, the Arctic EPPR agreement takes a mechanistic approach in dividing the Arctic Ocean into eight zones for the purpose of oil spill clean-up. More specifically, the agreement seeks to "strengthen cooperation, coordination and mutual assistance among the parties on oil pollution preparedness and response in the Arctic in order to protect the marine environment from pollution by oil" (Preamble) and applies to *all* pollution incidents occurring within the sovereign jurisdictions of the eight Arctic states (Art. 3(1)). Some of its provisions are designed to facilitate joint response to oil pollution incidents including requirements for cooperation and the exchange of information (Art. 12) and joint exercises and training (Art 13). In accordance with Article 4(1) and 5, state parties are to maintain national systems which can promptly and effectively respond to oil pollution incidents (Arctic Council 2013b). In addition to this, non-binding operational guidelines further "clarify and simplify processes for requesting assistance and allow for expedition or waiver of the usual visa and customs requirements to allow personnel and equipment to be moved quickly in an emergency" (Durfee and Johnstone 2019, 222).

3.2.2. Analysis

With the SAR and EPPR agreements both pursuant to existing international agreements, their mechanistic approach – drawing on state sovereignty and formal legal rationality to draw discernible boundaries, among other things – strengthens existing cooperation, but does not necessarily match the governance challenges presented by the emerging material, social and technological reality of the Arctic, outlined above. Although both focus on preparedness, planning, adequate resources, and training to respond to a variety of emergencies in Arctic conditions, the potential for both first-order governance failure, in relation to space and time, and second-order governance failure, relating to a mismatch between the problem solution and the governance capacity, including administrative and political resources (Howlett and Ramesh 2014, 322), remains.

Scholars and practitioners identify various governance gaps in practice. First and foremost, there is no mention of the complex environment within which search-and-rescue operations occur; this includes references to the *thermodynamic openness* of the Arctic system (and a shift from closed to increasingly open Arctic waters) and its observable effects, like *unpredictability* or *non-linearity*. Second, there is a general concern and often sobering conclusion related to the *emergent* nature of coordinating search and rescue services among state and non-state actors; they are often too far from immediate assistance after an accident. In response to *Crystal Serenity*'s 2016 voyage, Robert Papp, former Coast Guard Commandant

and U.S. Special Representative for the Arctic, expressed concerns about existing institutions and infrastructure (Dennis and Mooney 2016; George 2016; Haecker 2016; Montgomery 2016; Nunez 2016; U.S. Department of Homeland Security 2016). Others have similarly noted the incapacity of both the Canadian and U.S. coast guard to respond to a potential accident, even suggesting that an accident would "break the Canadian search-and-rescue system" (Dennis and Mooney 2016; Nunez 2016; Waldholz 2016). As a more specific example, Kirchner and Pääkkölä (2016) point to a *diversity* of experiences which remain unaddressed within the SAR agreement; specifically, they wonder how thousands of potentially elderly passengers on a cruise ship, like the *Serenity*, might cope with variable and cold weather conditions, including low sea and air temperatures, in a search and rescue situation. The likelihood of finding persons depends on several criteria; the quality of the initial position datum of a missing person; effective models of the drifting motion of life-saving equipment and persons in the sea; the quality of technology-based search systems and predefined search patterns; the appropriate training of human lookouts on ships, helicopters and airplanes; as well as on-site weather (e.g. waves, wind, temperature in sea and air, precipitation and fog) and light conditions (e.g. day/night, summer/winter) (Larsen et al. 2016).

In terms of marine oil pollution preparedness and response, significant knowledge gaps regarding methods of containment, dispersal, and clean-up of a spill of heavy oil still remain despite the development of the EPPR agreement. Similar to the SAR agreement, other lacunae relate to distance from infrastructure and support services in coping with major pollution; limited accessibility due to seasonal ice pack; operations in sub-zero temperatures; rate of natural oil evaporation and biodegradation; and ecosystem losses to local economies which could lead to temporal and spatial governance failure (Emmerson, Lahn, and Lloyd's 2012; World Energy Council 2015). For instance, a lack of nearby infrastructure (including airports, docks and ports, and roads) in a location like the Bering Strait could delay and complicate access in the case of an emergency. Only one U.S. Coast Guard classified oil spill removal organization covers the Aleutian Islands and Bering Strait region. In addition to this, community members are usually the first on scene before professional oil spill responders or the Coast Guard arrive, but do not necessarily have access to, or are not trained for, the use of equipment to protect their coastline or offer assistance to a person in distress.

Nevertheless, both the SAR and EPPR agreements have served a broader political purpose as the first legally binding agreements negotiated under the auspices of the Arctic Council. As such, they have sought a more holistic approach to identifying risk by including the Permanent Participants of the Arctic Council in the negotiating processes of these agreements (Durfee and Johnstone 2019, 222). However, this does not mean that the complex social effects of search and rescue or marine oil pollution on local communities, especially Indigenous communities and their subsistence cultures, is necessarily reflected in the provisions of these agreements (see Kämpf and Haley 2014, 157). Instead, the agreements primarily serve the purpose of producing legal formality as a means of reinforcing existing agreements.

3.2.3. Governance Response negotiated outside of the Arctic Council

As noted in Chapter 3, Arctic states have also developed a formal document outside the Arctic Council. I briefly provide an overview of its governance approach and analysis of its ability to respond to the challenges below.

3.2.3.1. The Polar Code

The abovementioned *Tromsø Declaration* (2009) of the Arctic Council encouraged "active cooperation within the International Maritime Organization (IMO) on [the] development of relevant measures to reduce the environmental impacts of shipping in Arctic waters." It also urged for the completion of up-to-date IMO *Guidelines for Ships Operating in Arctic Ice-Covered Waters*, that its "relevant parts be made mandatory, and global IMO ship safety and pollution prevention conventions be augmented with specific mandatory requirements or other provisions for ship construction, design, equipment, crewing, training, and operations, aimed at safety and protection of the Arctic environment." Two years later, the 2011 *Nuuk Declaration* urged the completion of the *Polar Code*.

The IMO adopted the legally binding *International Code for Ships Operating in Polar Waters* in 2014, which then entered into force in 2017 (although parts remain non-binding). The *Polar Code* governs shipping in the Polar regions. Similar to the SAR and EPPR agreements, the Code is implemented through existing international agreements – the *International Convention for the Safety of Life at Sea* (Chapter XIV) and the *International Convention for the Prevention of Pollution from Ships* (SOLAS) (through an amendment to one of its annexes) – by setting goals and functional requirements for ship structure and operational safety.[161] It contains two parts which include mandatory and recommended sections; one on maritime safety the other on pollution prevention.

Prior to the Polar Code, the IMO had adopted two non-binding guidelines – the 2002 and subsequent 2009 *Guidelines for Ships Operating in Arctic Ice-Covered Waters* to regulate transportation infrastructure — tankers, bulk carriers, and cruise ships. These guidelines "emerged after more than a decade of technical, expert-driven, and consensus-oriented negotiations within the IMO framework." (Stokke 2013). Nevertheless, there were still substantive limitations like the exclusion of fishing and naval vessels, or area definition based on the exclusion of vessel traffic along the coastline westwards of Murmansk (which is not ice-covered, but still presents cold-water challenges) (Stokke 2013, 77). Carrying little weight and subverting the involvement of national legislatures, these guidelines were considered weak in obligation and delegation (Skjærseth, Stokke, and Wettestad 2006).

The development of the *Polar Code*, in turn, followed the 2009 *Arctic Marine Shipping Assessment* – produced by the PAME WG of the Arctic Council – which noted that, "there is a general lack of uniform, mandatory, and non-discriminatory Arctic shipping regulations and mariner (ice navigator) standards for the Arctic Ocean, and the IMO has not developed or adopted specially tailored (and mandatory) standards for vessels operating in the Arctic." (Ellis and Brigham 2009). Once again, there was a desire to respond to both the emerging material and social reality of the Arctic system.

The *Polar Code* signaled the political leadership of Arctic states by providing a salient alternative to existing area-based management instruments under the IMO (Stokke 2013, 78). Considered to be "a shadow of the earlier drafts," with softer provisions than those of coastal state regulation, the *Polar Code* aims to harmonize global shipping regulation.[162] More specifically, it seeks to provide for "safe ship operation and the protection of the polar environment by addressing risks present in polar waters and not adequately mitigated by other instruments of the Organization." In doing so, it acknowledges the uniqueness of polar waters, as well as inadequate charts for coastal navigation (3); the vulnerability of ecosystems to ship

[161] International Convention for the Safety of Life at Sea 1974, 1184 U.N.T.S. 278.

[162] The 25-state Working Group charged with the Code's development, which included all eight Arctic states, intentionally avoided "several potentially controversial issues, making the problem of reaching agreement far less malign" (Stokke 2013, 77).

operation (4); and makes explicit that "any safety measure taken to reduce the probability of an accident, will largely benefit the environment" (5). As noted, the Code establishes minimum standards for design and construction of ships in Polar waters and promotes maritime safety by setting minimum standards for equipment, training of crew, and search-and-rescue capabilities. Ships are also required to carry a *Polar Water Operational Manual* with information intended to help crew and ship owners make informed decisions about operating in Arctic (and Antarctic) waters (Henriksen 2015, 369). In addition to this, the Polar Code seeks to protect the environment with special rules that restrict the discharge of oil, noxious substances, sewage, and garbage (Durfee and Johnstone 2019, 223). Still, parts of the *Code* remain non-binding. There is also a notable conflict between the Polar Code and *Article 234* of the UNCLOS (see section 3.1.2.); between the sovereignty, identity, and national security stewardship that underpins coastal state jurisdiction under Article 234 of the UNCLOS and the liberal international world order and global security which underpins freedom of navigation under the *Polar Code*.

3.2.3.2. Analysis

As with the SAR and EPPR agreements, lacunae remain in practice and some scholars fear that the Code is insufficient to protect the unique Arctic marine environment or the safety of shipping crews, passengers, and local communities. I argue that despite its acknowledgement of the uniqueness of polar waters, there are opportunities for second-order governance failure; a mismatch between the problem solution – the *Polar Code* – and the necessary administrative reach and resources to implement it. I outline some of the more specific issues of fit below.

Most prominently, the Code is not applicable to state-owned or operated vessels, smaller vessels, lesser boats, and fishing boats (Henriksen 2015, 368). In essence, this means that there are vessels operating within *unpredictable* Arctic waters with inadequate ice-strengthening and structural stability (Seas at Risk 2014; Earth Justice 2014; see also Mathiesen 2014). Lawson Brigham (2011) also reminds us that, despite the *Polar Code*, a "lack of infrastructure will continue to undermine safe and efficient Arctic shipping. We need more public and commercial investments, and new public–private ventures, to rapidly develop this crucial safety net for the region." Solberg et al. (2017) concur, doubting that there is adequate equipment to see the *Polar Code* through its implementation.

There is also no ban on heavy fuel oil (as there is in the Antarctic) which, as I outlined above, poses substantial environmental risks in the case of an oil spill, given that it does not evaporate as quickly as lighter alternatives, thereby complicating an already uncertain clean-up (Durfee and Johnstone 2019, 223).

And while the Code sets higher technical standards for ships operating in Polar waters, it does a poor job in accounting for human error – a concern given a tightening *human-environment link*. The operational environment of the Arctic Ocean, Kirchner and Pääkkölä (2016, 233–233) argue, places seafarers and passengers in precarious conditions; "the risk of body cooling, generalized hypothermia and skin freezing is particularly high and these effects become more intensive due to high air velocities which increase body cooling." This can lead seafarers to experience significant physical and mental limitations in decision-making in polar environmental conditions (234). This is particularly poignant given that many of the expected seafarers originate outside the Arctic, from areas like India or the Philippines, with little training for and/or experience of operating in Polar conditions (225). With this reality in mind, they argue for an equivalent legal instrument modelled on the Medical First Aid Guide for Use in Accidents involving Dangerous Goods — a Polar Safety Data Sheet or Polar Health Data Sheet, for instance – for seafarers to reference (235). They specifically propose an Arctic Seafarer Training Recommendations Amendment

(ASTRA) to the STCW Convention (in line with the regulatory technique employed by the STCW) as potential preventative measures.

3.3. Conclusion

In the seminal book *Normal Accidents*, author and Yale sociologist Charles Perrow dedicates a chapter to the analysis of the social side of technological risk in marine transport, writing that it "appears to be an error-inducing system, where perverse interconnections defeat safety goals as well as operating efficiencies."[163] Perrow (1984, 174) also argues that "improving or changing any one component will either be impossible because some others will not cooperate, or inconsequential because some others will be allowed more vigorous expression." I argue that this observation extends further to the governance responses outlined above. They provide an impression of control (Kämpf and Haley 2014, 156) – by setting technical standards or coordinating plans – but do not necessarily suffice in tackling the potential cascade of failures between the specific uncertainties related to Arctic shipping and navigation, the unpredictable nature of the Arctic material environment, and technological malfunctions (Perrow 1984, 20).

The case of Arctic shipping and navigation, in particular, serves to illustrate instances of codification and reductionism through law as a means of stabilizing a system undergoing significant, large-scale changes. As is visible in the *Tromsø Declaration* (2009), there is a clear recognition that prior instruments were insufficient in meeting the law of requisite variety. Consequently, the three agreements above all seek to define precise rules for responding to new and increasing volumes of anomalies within the Arctic's material environment. Still, lacunae remain despite these agreements, which leads me back to my central research question: is the emerging material reality of the Arctic system fundamentally incommensurable with the functional requirements of the law that seeks to govern it?

4. Conclusion

While reports and assessments on the state of the Arctic material environment increasingly draw on a complex systems ontology, Arctic environmental governance generally focuses on geography or sector (or issue area), as opposed to the Arctic system as a whole. This dissonance makes it particularly difficult to map the reality of the Arctic environment (see Chapter 2) onto the current governance approach and its response to ongoing changes (see Chapter 3). Writing this chapter, I was particularly curious to explore whether the normative evolution toward the legalization of Arctic environmental governance, noted in Chapter 3, matches onto the complexity of three different challenges: the governance of POPs, the intersection of climate change and human rights, and the governance of Arctic shipping and navigation. In these particular cases, actors have chosen to either draw on existing instruments or develop new legal instruments. In some cases, this choice has led to governance success. In others, it has failed to deliver the desired outcome, or has the potential to do so.

In looking at the characteristics that have contributed to some of the differences in outcome, an underlying ontological issue becomes evident: the dissonance between the reductionism of law, which is

[163] Essentially, Perrow's (1984, 176) *Normal Accidents* argues that "The very notion of systems accident loses some of its distinctiveness here. There are so many sources of failure, they are encountered continuously, often as a matter of course, and become indistinguishable from normal operations much of the time." (176)

built on a Newtonian ontology of linear change and equilibrium that essentially rejects integration, ambiguity, and paradox (see Beinhocker 2006; Unger and Smolin 2015, 49), and the nature of change in the Arctic system which is increasingly non-linear and complex (Arthur 2009, 211–12).[164] The law seeks to understand the world as a collection of separable, independent parts with linear cause-and-effect relationships that can be mapped and governed by reason and simplicity (Rogers et al. 2013, 32–33; W. Arthur 2009, 211–12; see also Mitchell 2009; Cilliers 1999) – or in the case of the Arctic, by geography or sector. This approach suited to managing some issue areas, like the governance of POPs, where there is a clear recognition of linear cause-and-effect. Yet this mechanistic ontology is a mismatch in cases like the Inuit Petition, where political and technical barriers to positing a clear and undisputed causal link between the causes of climate change and specific human rights violations pose a significant challenge to traditional human rights mechanisms, like the IACHR. Similarly, when it comes shipping and navigation through unpredictable Arctic waters, the development of new Arctic-specific rules, regulations, and standards – many of them building on, or re-affirming, existing international agreements – simply leads to more complex and conditional sets of rules (Bleiklie 1983; see also March and Olsen 1989, 28) and not necessarily to better governance (see Mayrand 2014, 26; see also Bachand 2006, 26).

In fact, in cases where there is a mismatch, non-linear, abrupt and typically irreversible shifts or flips in the Arctic system could ultimately exacerbate the gap between current and necessary governance in the Arctic. If this is the case, then why are policymakers and scholars alike turning to positivist law as a solution?

[164] In this way, the law is not unlike other fields of research including economics, philosophy, psychology, and politics (Arthur 2009, 211–12; see also Beinhocker 2006)

Chapter 5: Theoretical Underpinnings of Current Governance Responses

The differences between the polar regions and other parts of the earth create problems which appear to require special development of international law.

— Samuel Whittemore Boggs, Geographer of the State Department, 21 September 1933

"Despite evidence of the fundamentally changing nature of the region, most Arctic states maintain that everything is fine, and that the existing rules and governance systems are adequate to deal with the changes. This is simply wrong. The Arctic is a complex system which, even if not in the midst of such fundamental changes, requires new forms of governance and thinking."

— Rob Huebert, 2009

"The Arctic is in crisis. The ice and the permafrost – the foundations of its highly specialized ecosystems – are literally melting away, and with them the traditional way of life of the Inuit. A vast, ice-bound, impenetrable ocean is being transformed into a new Mediterranean Sea, a "middle" over which the world's powers will trade. Easier access and rising oil, gas and mineral prices will spark twenty-first century gold rushes, challenging the political will and governance capabilities of governments who, for decades, have largely ignored the Arctic."

— Byers and Baker 2013

In Chapter 3, I highlighted an increase in the number of formal and informal agreements relevant to Arctic environmental governance over the last thirty years, including the "increasing relevance of treaties" (Koivurova 2014) over the past two decades. The subsequent chapter provided several illustrations of the application of new and existing legal agreements in response to complex challenges in the Arctic, including two that present a visible mismatch between the nature of change in the Arctic system, outlined in Chapter 2, and the current governance approach, outlined in Chapter 3. In this particular chapter, I seek to explore *why* some actors are turning to law as a solution to increasingly complex challenges in the Arctic when it does not necessarily lead to greater effectiveness (Finnemore and Toope 2001, 756; see also Mayrand 2014, 26).

I argue that the choice to move toward law is, in many ways, an obvious one – a natural extension of the theoretical underpinning of a multi-decadal debate on what Arctic environmental governance *should* be. In Chapter 2, I first mentioned that there are two dominant sides to this debate: one proposing an Arctic Treaty System and the other focused on the idea of an integrated Arctic regime complex. Both debates are descriptive, focusing on how best to characterize and understand the Arctic, and normative, in terms of their proposals for how the Arctic should be governed. Rarely, though, do these debates ask questions about, let alone address, some of the fundamental conditions of the Arctic system, such as who – other than the state – has rights or whether the functional requirements of law are fundamentally at odds with accelerating, non-linear change in the Arctic system.

In both debates, actors – particularly scholars and policymakers – seek to find alternative solutions to current governance challenges within their conventional toolbox, one that builds on a mechanistic ontology.

Neither debate has necessarily arisen in direct response to the significant changes outlined in Chapter 2, although they received heightened attention following the publication of the 2004 *Arctic Climate Impact Assessment*, a significant decline of Arctic sea ice, and the planting of a Russian flag on the Arctic seabed in 2007 (Smieszek 2019c, 60).

The first part of this chapter focuses on the legal positivist underpinnings of these two dominant debates. I outline both the content and drawbacks of each debate. Specifically, I argue that legal positivism fails to account for or downplays complexity. The latter part of this chapter, I seek to understand what remains missing. In doing so, I explore insights from scholarship on interactional legal theory, legal pluralism, legal autopoiesis, and most recently the intersection of law and resilience. In the second part of this chapter, I conclude that elements of complex systems theory, including concepts and analytical tools, could provide an alternative understanding to current, dominant theoretical debates in Arctic environmental governance and to the study of international law as well.[165]

1. Theoretical Underpinnings of Current Governance and Responses

Current governance responses to accelerating, non-linear change in the Arctic system follow a legal positivist theory of law, which is essentially an ontological theory about the grounding of legality (see Gardner 2001; on the ontology of law, see Kaufmann 1963; Marmor 2019). Dominant since the late 19th century, legal positivism has become the lingua franca of many international lawyers and international relations scholars (Brunnée and Toope 2010, 10; Cox and O'Neil 2008, 212; see also Ago 1997). In short, it can be summarized as a range of theories that describe the law "as it is" (Ratner and Slaughter 1999). It is not more, nor less than the rules to which states have agreed to through treaties, custom, or other forms of consent (Ratner and Slaughter 1999; see also Cox and O'Neil 2008, 212). In this vein, international law conforms to the "rule of recognition" under Article 38(1) of the Statute of the International Court of Justice. Essentially, this means that "A completely ineffective rule may be a valid one – as long as it emanates from the rule of recognition but to be a valid rule, the legal system of which the rule is a component must, as a whole, be effective." (Wacks 2014, 39; see also Hart 1997).

Classical legal positivists, such as John Austin and Jeremy Bentham, understand international law as a unified system of rules, deliberately and explicitly created by states, who are seen as the only subjects of international law (Simma and Paulus 1998; Cox and O'Neil 2008, 212).[166] In this context, Indigenous

[165] As I outline in Chapters 1 and 2, there is no coherent, all-encompassing theory of complexity. Numerous research traditions including mathematics, physics, biology, cybernetics, meteorology, etc. – with diverse methodological agendas – share the assumption that diverse real-world phenomena emerge out of complex interactions between various parts across scales. Increasingly, complex systems theory is also applied to research in the social sciences, to better understand the structures and dynamics of political, economic, and legal systems. See Galaz (2014, 17); see also Mitchell (2009); Murray, Webb, and Wheatley (2019). In the context of the Arctic, both natural and social scientists have drawn on complexity theory to better understand both geophysical and social-ecological components of the Arctic systems (see for example Stockholm Environment Institute and Stockholm Resilience Center 2016; "Arctic Resilience Interim Report" 2013; Arctic Monitoring and Assessment Programme 2017). However, we know significantly less about how institutions of governance, including the law manage, change and complexity therein.

[166] John Austin understood it as being based on command, further stating that those with binding legal authority are those who are "determinate rational being[s] or bod[ies] that the other rational being are in the habit of obeying." (as cited in Borrows 2010). Following from this, John Borrows argues that positivistic laws may be formally proclaimed in an Indigenous context, as well. For a discussion of positivism and Indigenous exclusion, see Oguamanam (2004, 355–56) and Anaya (2004).

peoples have no status or right in international law aside from the rights conferred by the colonial state or those derived from citizenship or membership in a state (Oguamanam 2004, 356–57; see also Anaya 2004). This system of positivistic rules is understood as an "objective" reality where there is a clear distinction between 'ought' (that which is morally desirable) and 'is' (that which exists) (Wacks 2014, 26). Legal positivism also demands rigorous tests of legal validity based on precision and formality, and makes a dichotomous distinction between binding and non-binding prescriptions, and therefore between hard and soft law (which it argues does not exist) (Weil 1983, 414–18).[167] In many ways, a legal positivist ontology fits within the mechanistic ontology (see Chapter 1) that downplays and fails to account for complexity.

Modified, modern legal positivists take an instrumental view of the law instead (Ratner and Slaughter 1999; see also Simma and Paulus 1998; Cox and O'Neil 2008, 204–5). They focus on the ways in which states use the law to express their will; in this sense, the law becomes a means of pursuing state interests and values dependent upon external factors, such as transaction costs (Abbott and Snidal 2000, 421; Mayrand 2014, 31; see also Keohane 1990; Slaughter 2000). Similar to classical legal positivism, legal validity is derived through formal consent. It is further signified by state-centricity, instrumentalism, and the separation of law and morality.

More specifically though, much of the current discourse surrounding Arctic environmental governance is framed by an institutional theory of legalization put forward by Abbott et al. (2000) in "Legalization and World Politics," a special issue of the journal *International Organization* (IO) in Summer 2000. In the framing chapter of this particular volume of *IO*, Abbott et al. (2000) introduced a nuanced gradation of law and legalization along a continuum with three technical and formal dimensions of law: obligation, precision, and delegation (Goldstein et al. 2000; see Figure 13).[168] Legal *obligation* is defined as states being "legally bound by a rule of commitment in the sense that their behaviour thereunder is subject to scrutiny under the general rules, procedures and discourse of international law, and often of domestic law" (Abbott et al. 2000, 401). Meanwhile, *precision* is defined as a feature of rules that "unambiguously define the conduct they require, authorize or proscribe;" *delegation* provides third parties with "authority to implement, interpret

[167] For a discussion on how legalized rules and institutions operate differently from non-legalized rules and institutions, see Slaughter (2000); see also Bianchi (2014, 211); Brunnée and Toope (2010).

[168] The concept of legalization is used by scholars in both international relations and international law. In relation to the specific conception of law and legalization presented in this special of *International Organization* (Summer 2000), Goldstein (2000, 387) write:

> "By developing a framework for the study of legalization, we are able to unite perspectives developed by political scientists and international legal scholars and engage in a genuinely collaborative venture. We view law as deeply embedded in politics: affected by political interests, power, and institutions. As generations of international lawyers and political scientists have observed, international law cannot be understood in isolation from politics. Conversely, law and legalization affect political processes and political outcomes. The relationship between law and politics is reciprocal, mediated by institutions."

In response, Finnemore and Toope (2001, 744) have argued the framing chapter of the special issue was unclear in highlighting whether legalization is a dependent or independent variable. They note:

> If legalization is a phenomenon to be explained, what other factors might explain it, and how important are they? If legalization explains aspects of state behaviour, what other independent variables should be considered in assessing legalization's role, and how might these interact with legalization? Equally important for the authors, do the three defining features of legalization all have the same causes, or cause the same effects, and how would we know if they did (or did not)?

and apply the rules; to resolve disputes; and (possibly) make further rules." All three of these characteristics may or may not be displayed.

	Soft Law		Hard Law
Obligation	Expressly nonlegal Norms	⟷	Binding rule *(jus cogens)*
Precision	Vague Principle	⟷	Precise, highly elaborated rule
Delegation	Diplomacy	⟷	International court; organization; domestic application

Figure 13: Legalization Continuum (see Abbott et al. 2000, 404)

On one end of their legalization continuum, hard law exhibits high levels of obligation, precision, and delegation. It includes formal, precise, legally binding obligations which delegate authority to state sanctioned institutions for interpreting and implementing the law (Ratner and Slaughter 1999, 293; see also McCoubrey 1999). These obligations are a crucial factor that distinguishes law from other types of norms (Soltvedt 2017, 75; Abbott 1999, 364). It seeks to order relations (often hierarchically), centralize decision-making, reduce transaction costs, strengthen credibility, resolve incomplete contracting, expand on existing political strategies, and enhance enforcement. In this way, hard law provides predictable rules and stable institutions (Brunnée and Toope 2008, 7; see also Garrett and Weingast 1993). It also makes the region legible by mapping its terrain, establishes property rights, and regulates access to and ownership of resources (Scott 1998). In other words, it reinforces the very foundation of statehood, principles of sovereignty, recognition, territorial competence, non-intervention, and so on. As is clearly evident in Chapter 3, the UNCLOS serves as a paradigmatic example of a positivist document and legal system which is highly bounded and thus less likely to deal with change.

Within Arctic scholarship, harder legalization often frames a discourse of geopolitics, high politics, and a race for resources (see Blunden 2013, 121; Knecht and Keil 2013, 181; Huebert 2009; Sale and Potapov 2010; Borgerson 2009b; 2009a; Prior 2017). Based on this narrative, Arctic and non-Arctic states compete for control over the region's vast natural resources (including oil and natural gas), and the region becomes a theatre for remilitarization. It anticipates, as well as generates the conditions for, a region where Arctic states assert their jurisdictional claims outside international law, as when Russia plants its flag on the Arctic seabed, Canadian leaders travel north to champion national sovereignty in the region, or U.S. officials question existing delimitations of waterways like the Northwest Passage. In this case, the widespread conviction among scholars and policymakers alike is that "unless there are good reasons for using an informal instrument, a treaty is usually to be preferred" (Aust 1986, 792). In this sense, it is unsurprising then that Arctic coastal states would turn to the UNCLOS – which was negotiated at a time when the Arctic was perceived as a frozen desert (Koivurova, Kirchner, and Kleemola-Juntunen 2020, 61) – to maintain stability and control as Arctic sea ice declines and the previously inaccessible area begins to open, in both geophysical and Westphalian terms (Ilulissat Declaration 2008).

Located at the other end of this continuum, soft law consists of informal, non-binding norms, procedures, and instruments weakened in various combinations along one or more of the three dimensions of legalization (Goldstein 2000; Abbott and Snidal 2000, 422; Sands 2003, 124).[169] Appearing in an "infinite variety" of forms (Chinkin 2000), soft law includes declarations, guidelines, or action programmes, like those produced by the Arctic Council. The informal and flexible nature of soft law bypasses the negotiation and transaction costs associated with legally-binding agreements (Abbott and Snidal 2000, 435; Goldstein 2000; Chinkin 1989, 852; Chinkin 2000), promotes self-regulation (Chinkin 1989, 852), and is thus regarded as more accommodating of change and uncertainty (Knight 1992, 128; Abbott and Snidal 2000, 441–441; Chinkin 1989, 852–53; Prior 2017). Fitting with the notion that norms do not have to be legal to have a powerful influence over states (Finnemore 2000, 702), soft law is often viwed by positivists as the preferred 'stop' on the way to harder legalization (Goldstein 2000, 456; Pollack and Shaffer 2012, 251; Finnemore and Toope 2001, 105), thereby allowing the law to generate fidelity (Abbott and Snidal 2000, 423; Finnemore and Toope 2001, 744–45; Brunnée and Toope 2008, 32).

Some Arctic scholarship places a particular emphasis on the informality of the Arctic Council; often ascribing successful, multi-decadal international cooperation, the inclusion of Arctic Indigenous peoples, and the production of scientific assessments and reports to this soft law approach (see Smieszek 2019c). It is through these characteristics that the Arctic Council has become the dominant pan-Arctic hub for interactions surrounding Arctic environmental governance, one that actors can turn to for both scientific cooperation and the negotiation of international agreements. In fact, these are the many qualities for which the Arctic Council was nominated for a Nobel Peace Prize (Quinn 2018).

Nevertheless, for those outside the law, "even more than for lawyers, positivism promises easy intelligibility: law can be found, defined and labelled." (Brunnée and Toope 2010, 10). The above legalization frame, which underpins much of the literature surrounding Arctic law and governance is a "clear example of this tendency." (Brunnée and Toope 2010, 10, fn 23). At the same time, legal positivism raises questions as to whether the legalization frame is, in fact, equipped to address normative variation within a complex system, like the Arctic. If so, does it contribute to the current stock of solutions? Or, does it simply serve to reinforce the dominant worldview?

2. Seeking Alternative Governance Responses: Unpacking Dominant Theoretical Debates

The discourse surrounding Arctic law and governance has grown significantly over the past two decades (Pelaudeix 2014). Although this research adopts a wide range of analytical frameworks across various levels of governance and issue areas, nearly all discourse on the role of international law in the Arctic — both descriptive and normative — invokes a legal positivist ontology.

[169] It is important to note, however, that there is also a vibrant debate on the usefulness of soft law with some scholars arguing that it produces a false dichotomy (Raustiala 2005, 586), deprecates the currency of law (Hillgenberg 1999, 500), and can serve as a "smokescreen for states to strengthen their own position (Klabbers 1996, 391,387; Shaffer and Pollack 2010, 744). For instance, Prosper Weil (1983, 423) has "warned of the growing use of soft law instruments, which potentially can relativize and 'destabilize" international law norms and turn the legal system into an instrument no longer able to manage sovereign relations." At the same time, scholars like Handl et al. claim that "[e]ven if soft law does not harden up, (...) [it] performs important functions, and, given the structure of the international system, we could barely operate without it" (Handl et al., 376).

Legal positivist theory underpins both volumes of the *Polar Law Textbook* edited by Natalia Loukacheva (2010, 2013); *International Law and the Arctic* (Byers and Baker 2013), authored by Michael Byers; *Governing Arctic Change: Global Perspectives,* edited by Sebastian Knecht and Kathrin Keil (2016); *The Arctic in International Law and Policy*, a collection of Arctic legal and policy documents compiled and edited by Kristina Schönfeldt (2017); *Arctic Governance: Law and Politics,* edited by Ida Folkestad Soltvedt and Svein Vigeland Rottem (2017); and the most recent textbook on *Arctic Governance in a Changing World,* co-authored by Mary Durfee and Rachel Lorna Johnstone (2019). Legal positivism is often also applied in journal articles, including the work of Canuel (2014), Carpenter (2009), Eichbaum (2013), Haftendorn (2013), Koivurova (2012), Molenaar (2014), Nowlan (2001), Smieszek (2019), Stokke (2007), Rossi (2015), Young (2000, 2011), VanderZwaag (together with Koivurova 2007; and together with Koivurova and Moleenar (2009)), and Verhaag (2002), among many others.

Interestingly, legal positivism – and the mechanistic ontology that accompanies it – often also underpins the discourse on international law in the Arctic, even in Arctic assessments and reports, many of which draw on a complex systems ontology to study changes in the Arctic's material environment. These include many of the documents produced by the Arctic Council, such as the 2016 Arctic Resilience Report and both 2004 and 2014 Arctic Human Development Reports, in addition to the work of various non-governmental organizations like the WWF.

While some of this literature argues that current approaches to Arctic environmental governance are sufficient (see for example Koivurova 2016, 84; Ilulissat Declaration 2008), others disagree (Koivurova 2008a, 14; Byers 2010, 128–29; Mayrand 2014, 11; see also Young 2016b; Prior 2017). Within this literature, two dominant debates on alternative approaches to Arctic environmental governance stand out: the first proposes an Arctic Treaty System; while the second focuses on the need for a more strongly integrated Arctic regime complex.[170] A significant aspect of both debates is their desire to reform the Arctic Council (Smieszek 2019c, 83). I outline both the content and drawbacks of each debate in chronological order and framed in terms of their ability to match increasing complexity in the Arctic system, below. As noted earlier, both debates are descriptive, focusing on how best to characterize and understand the Arctic, and normative, in terms of their proposals for how the Arctic should be governed.

2.1. An Arctic Treaty

Over the past four decades, various actors — including scholars, non-governmental organizations, Arctic parliamentarians, and the European Parliament — have proposed the idea of an Arctic Treaty (System). While there is no prescription as to what such a Treaty should look like, it would essentially be an overarching, legally-binding agreement applicable to five coastal or all eight Arctic states, covering several regional policy areas, and substantial geographic parts of the Arctic (Koivurova 2008a, 20).

Stemming from the field of international law, and drawing on legal positivist theory, this largely theoretical debate describes the current landscape of Arctic environmental governance as a fragmented

[170] Smieszek (2019a, 121) groups proposals for the AC into three clusters: legal reforms, organisational reforms, and functional reforms. In evaluating their applicability and usefulness to the Arctic Council, given ongoing changes in the Arctic, Smieszek concludes that the proposed ideas can largely be attributed to the (often implicit) assumptions made by proponents about international relations and the nature of states rather than the conditions of the Arctic. "Far from offering solutions," Smieszek notes, "their continuous application in particular circumstances might even impede progress in addressing present and future challenges."

(non-)system.[171] More specifically, it argues that an informal institution like "[t]he Arctic Council is disproportionately influential for what is structurally no more than a roundtable for discussion with no lawmaking powers or compliance mechanisms" (Durfee and Johnstone 2019, 77). As a consequence, this debate generally contends that the legalization of Arctic environmental governance – at the pan-Arctic and international scale – would provide greater normative pull because legal rules would generally only be subject to change as a result of fluctuations within state-held interests, thereby ensuring certainty (Byers 1997, 204). In this sense, legalization would provide an unprecedented level of certainty of legal outcomes (rather than geophysical outcomes), and is the "principal method by which actors can increase the credibility of international regimes, international agreements, and their commitment." (Abbott and Snidal 2000; see also Lipson 1991, 310). However, once again, it must be noted that this idea of a treaty did not necessarily arise in response to geophysical and social-ecological changes occurring in the Arctic system *per se*.

The specific proposals, outlined below, draw inspiration from the 1959 Antarctic Treaty System (ATS) while others argue for an Arctic Framework Convention akin to the United Nations Framework Convention on Climate Change.

2.1.1. Proposals for an Arctic Treaty: Drawing Inspiration from the Antarctic Treaty System

The idea of an Arctic (Basin) Treaty was first proposed by Canadian Professor Maxwell Cohen in 1971 just as the new law of the sea convention (UNCLOS) was emerging, and shortly after Canada's adoption of the *Arctic Water Pollution Prevention Act* in 1970. Cohen (1970, 79) argued that "the most urgent objective of Canadian policy…" was the development of a formalized Arctic Basin Treaty between the five Arctic coastal states. The agreement he suggested sought a broader reform of international law, pointing specifically to the institutional failure of the emerging law of the sea to handle issues relating to the economy, development, environmental protection, scientific activities, and Indigenous peoples in the Arctic. In other words, he argued that it did not meet the law of requisite variety. Many of these functional gaps were eventually settled under the current version of the UNCLOS (1982) signed by all Arctic states and ratified by all but the United States. As noted in Chapter 3, this broad-ranging and legally-binding agreement includes, among other things, a framework for the settlement of maritime boundaries, an authorization for Arctic coastal states to develop special regulations for ice-covered waters (Article 234), provisions covering marine pollution from all sources: land-based, sea-bed activities, dumping vessels and the atmosphere.

Even so, the Arctic Treaty debate resurfaced in the early 1990s. Following the signing of the 1991 Arctic Environmental Protection Strategy, and prior to the development of the Arctic Council (see Chapter 3), Donat Pharand published "The Case for an Arctic Region Council and Treaty Proposal" (1992) together with a draft international treaty on which the suggested Council should be built.[172] In this article, Pharand argued that — given the many new environmental, political and social challenges requiring international cooperation — the Arctic region needed an Arctic Region Council built on an Arctic Treaty (Pharand 1992).

[171] Although not all treaties are necessarily positivist in nature, I argue that the debate surrounding a single, hierarchical treaty for the Arctic system – where social control emanates from the *de facto* sovereign – is.

[172] Pharand"s proposal was introduced by Canada at the 1991 ministerial meeting in Rovaniemi, Finland, which adopted the AEPS through the Rovaniemi Declaration, the starting point of the initiative which ultimately culminated in the establishment of the Arctic Council.

He was certain that, despite their merit and intention, such a Council could not be founded or be constituted by declarations, strategies, and plans alone. In line with a classical legal positivist school of thought, Pharand argued that a legally binding agreement would not only curb uncertainty but would oblige states to follow through on their commitments, or be brought before the International Court of Justice, as specified by Article 33 of the UN Charter.

Pharand's 1992 draft international treaty for an Arctic Regional Council drew particular inspiration from the ATS (as would later proposals for an Arctic Treaty). First, by calling attention to environmental protection and conservation, with an emphasis on regional cooperation for the interest of all of humanity, the preamble echoed the dedication of the ATS. The choice of 60 degrees north latitude as the delineation of the Arctic paid homage to the ATS, as well (Koivurova 2008a, 18). Although only distantly similar, Pharand (1992) suggested that the membership of the Arctic Region Council consist of founding members and "Admitted Members". The proposal also called for a plenary body, an Assembly that would consist of members who would be responsible for deliberation on the policy orientation of the Council. Meanwhile, a Commission of the eight founding members and four elected Admitted Members would be responsible for implementing these policies. Finally, similar to the ATS, the proposal suggested a review conference at the 25-year anniversary of the treaty (Koivurova 2008a, 18).

This debate subsided following the development of the Arctic Council in 1996 (see Chapter 3).

Nearly a decade later, in 2001, Linda Nowlan proposed an "Arctic Legal Regime for Environmental Protection" as a part of a series of papers for the *World Conservation Union*.[173] The debate was reignited. An Arctic Treaty, she argued, would build on and strengthen existing governance structures like the Arctic Council by providing them with clear jurisdictional lines, dispute settlement procedures, steady funding, and a permanent secretariat (see also Koivurova 2012a, 141; 2008a, 14; see also Mayrand 2014, 22). More specifically, Nowlan's treaty proposal contained principles, substantive legal obligations, as well as some innovative features like the implementation of Impact Benefit Agreements — all accounting for the uniqueness of the Arctic and its Indigenous peoples. More specifically, it transposed the five annexes of the 1991 *Madrid Protocol* — Impact Assessment, Conservation of Antarctic Flora and Fauna, Waste Disposal and Waste Management, Prevention and Management — to the Arctic. Legal positivism served as the theoretical underpinning of Nowlan's proposal as well.

Like Pharand, Nowlan (2001, 66) drew on the ATS because it is a well-developed regime with "forty years of experience…when designing an invigorated Arctic regime;" though Nowlan (2001, 1) also recognized that the Arctic and Antarctic are in many regards polar opposites. For one, the sovereignty of the eight Arctic states, together with the rights and obligations granted to Arctic coastal states under UNCLOS, leave little room for the development of a collective model of governance, similar to the ATS (Koivurova 2008a, 21). What is more, as I highlight in Chapter 3, Arctic environmental governance draws on a host of existing international legal regimes (Koivurova 2012a, 137) while the ATS applies its own environmental instruments. As with Pharand's proposal, it was not adopted.

In 2005, the WWF proposed a preliminary, yet concrete, Arctic Treaty applicable beyond the national maritime jurisdictions of the five Arctic coastal states to the high seas. In terms of its substantive content, the WWF suggested that existing standards be based on the UNCLOS, the Straddling Stocks Agreement, and the now-agreed-upon *Polar Code* (Koivurova 2008a, 20). It would include a network of marine protected and special management areas; ecosystem-based management modelled on the 1980 Convention

[173] In this paper, Nowlan proposed an Arctic Treaty with a different approach from the Arctic governance structures at the time, noting that its intent was not to "make the Arctic a nature reserve but to allow for sustainable use and development" (Nowlan 2001, 1).

on the Conservation of Antarctic Marine Living Resources (see also Rayfuse 2007); a stronger set of regulations for the construction and operation of ships in increasingly open Arctic waters; fishery management policies; as well as regional standards to reduce and respond to the risk of the potential transboundary effects of oil spill pollution (Koivurova 2008a, 20). The WWF proposal further suggested a (contentious) dispute resolution clause, excluding territorial disputes from its ambit (Koivurova 2008a, 20). Finally, while the proposed Treaty would subsume the Arctic Council, it would continue to support and supervise the Council's scientific work, among other things. This idea was cast aside as well.

A year later in 2006, at the Conference of the Parliamentarians of the Arctic (see Chapter 3, section 2.3.), the question of whether an Arctic Treaty is necessary was explicitly asked, although not explored further (Mayrand 2014, 20). And most recently, in 2008, the European Parliament put forward a resolution on Arctic governance in which it suggested that:

> [T]he Commission should be prepared to pursue the opening of international negotiations designed to lead to the adoption of an international treaty for the protection of the Arctic, having as its inspiration the Antarctic Treaty, as supplemented by the Madrid Protocol signed in 1991, but respecting the fundamental difference represented by the populated nature of the Arctic and the consequent rights and needs of the peoples and nations of the Arctic region; [the Arctic Parliament] believes, however, that as a minimum starting-point such a treaty could at least cover the unpopulated and unclaimed area at the centre of the Arctic Ocean.

Like the proposals put forward by Pharand, Nowlan, and the WWF before it, the resolution of the European Parliament remained largely rhetorical – as a means of noting existing gaps and shortcomings in the adherence to global instruments, and in following-up on their implementation at regional and national levels (Corell 2006; Molenaar 2012, 556).

2.1.2. Proposals for an Arctic Framework Convention

Moving beyond the suggestion of an Arctic Treaty, other scholars proposed the development of an Arctic Framework Convention (see Koivurova 2008a, 25; Nowlan 2001; Rayfuse 2007). Framework conventions are constitutive arrangements that focus on the creation of governance systems defined in functional terms, spatial terms, or both. They formulate broad principles, frame rights and duties, and establish authoritative bodies. While these bodies are not regulatory in character, they provide an institutional platform for substantive regulatory systems to develop, instead (Young 2011, 327). For instance, the UNFCCC, together with its 1997 *Kyoto Protocol* and the 2015 *Paris Agreement*, enables individual states to decide whether or not they want to participate in an international treaty agreement and under what conditions, all the while maintaining weak enforcement mechanisms (Stockholm Environmental Institute and Stockholm Resilience Center 2016, 61; Brunnée 2017).

In an Arctic context, scholars argue that there are several benefits to a framework approach. For one, unlike other tedious negotiation processes, it formalizes what already exists without necessarily requiring substantial alteration (Nowlan 2001, 59), thereby providing actors with the shortest possible time frame to legalize Arctic environmental governance (Koivurova 2008a, 23). Furthermore, this approach provides some form of adaptation, interaction, and flexibility in terms of mechanisms (Brunnée 2017). The process of developing such a framework convention would likely be guided by the foreign ministers and legal offices of the eight Arctic states (Koivurova 2008a, 25).

Under an Arctic Framework Convention, the current membership of the Arctic Council and its decision-making procedures would be formalized; certain guiding principles relating to environmental protection

and sustainable development would be added; a mandate would be given to the Council to adopt protocols to counter threats to environmental protection and challenges to sustainable development, such as commercial shipping or oil and gas development, on the basis of scientific assessment (Koivurova 2008a, 23–24; see also Nowlan 2001; Rayfuse 2007).

To provide a more specific example, in "Melting Moments: The Future of Polar Oceans Governance in a Warming World", Rosemary Rayfuse (2007) envisions an Arctic Ocean Treaty Framework.[174] Rayfuse outlines the idea for a comprehensive treaty regime for the Arctic Ocean — for areas beyond the national jurisdiction of the five coastal states — modelled after the 1980 Convention on the Conservation of Antarctic Marine Living Resources (Koivurova 2008a, 19). An Arctic high seas treaty, she argues, could establish a "Regional Oceans Management Organization" for the Arctic Ocean that would represent a precautionary and innovative approach to Arctic oceans management. It would "place Arctic high seas management at the forefront of high seas governance and provide the Arctic States with a mechanism to protect their interests while being seen to protect those of the international community as well." (Rayfuse 2007, 215). Still, over a decade later, this proposal remains theoretical.

2.1.3. The Drawbacks of Arctic Treaty Proposals

Despite "growing needs for governance in the Arctic" (Young 2011, 332) there is a general consensus, among scholars and policy-makers alike, that the prospect of a legally-binding agreement like an Arctic Treaty is unlikely in the foreseeable future. In fact, many of those who have suggested the development of such a Treaty have either voiced their concerns within their own proposals or dropped the idea over the course of time. There are several reasons for this, some of which relate to a failure of these proposals to match, or even address, the complexity of the Arctic system as a whole.

Generally, there is concern that an Arctic Treaty, in the various forms suggested, would not provide a more coherent solution to existing governance gaps, thereby continuing to maintain a fragmented system of Arctic environmental governance which is, at times, incapable of responding to complex interactions and feedback between human-environment systems. There are more specific concerns, as well.

First, the notion that a group of states beyond the Arctic, as suggested in Pharand's proposal, could agree upon, ratify, and maintain support for a comprehensive agreement for the Arctic is highly optimistic given the national jurisdictions of Arctic states (Koivurova 2008, 21; Young 2011, 328). For instance, there is also little reason to believe that Arctic states would turn to such a framework rather than the UNCLOS given the weight of the latter in international oceans governance. It is also unlikely that the U.S. – a strong supporter of the flexible nature of soft law in the Arctic (Bloom 1999, 721) – would ratify an Arctic Ocean framework convention as an alternative to UNCLOS, which it has yet to sign (Young 2011, 328). Here, the path dependency of the decision to develop the Arctic Council as a non-binding institution constrains the implementation of an Arctic treaty, even if the Council may prove to no longer be relevant for its original purposes.

Second, while most of the proposals recognize that harder legalization can elicit compliance (Young 2011, 331) and reinforces the role of the state, many acknowledge that it would also limit the behaviour

[174] For additional background, Young (2011, 328) writes that those who argue that there is a need to negotiate a distinct Arctic Ocean framework subscribe (implicitly, if not explicitly) to the idea that the UNCLOS is deficient as a framework agreement covering the Arctic Ocean; that it is reasonable to expect some appropriate set of actors to reach agreement on the terms of an Arctic Ocean framework agreement; and that parties to such an agreement would exercise the political will needed to make use of such an agreement to address a range of emerging Arctic issues.

and sovereignty of non-state actors (Abbott and Snidal 2000, 422; Ratner and Slaughter 1999). The current heterogeneous system of Arctic environmental governance would be replaced by a hierarchical imposition of social control emanating from a *de facto* sovereign, a theoretical '*Grundnorm*' (which refers to the basic norm, order, or rule that forms an underlying basis for a legal system), or 'rule of recognition' and thereby fail to address normative variation. In other words, this form of substantive law may impose a particular worldview of the Arctic over a shared understanding developed through regularized interactions (Brunnée and Toope 2010). To meet this structure, a potential Arctic treaty would have to essentially distort itself to fit this positivist framework.

Third, there is significant concern that a legalized agreement would demote the status of Arctic Indigenous peoples to a status akin to non-governmental organizations, given that Indigenous peoples are not entitled to be party to a treaty under the international law of treaties (Ingimundarson 2014; Koivurova 2008, 2010, 151; Young 2011, 331). This is visible in the UNFCCC where Indigenous peoples – many of whom are disproportionately impacted by climate change (see for example Kuptana 1996; Watt-Cloutier 2015; Ford 2012; Atapattu 2013; Tsosie 2007; Gordts 2016) – are unable to participate in decision-making and are instead forced to draw on human rights mechanisms to hold states accountable and seek remedy for the impacts experienced. However, as is visible in the Inuit Petition highlighted in Chapter 4, even human rights mechanisms are not necessarily designed to address complex causality as we see it in the Arctic.

Fourth, scholars are concerned with an already overcrowded governance landscape where the current patchwork of formal and informal governance institutions (see Chapter 3) consider the special needs of the Arctic and are potentially better equipped and less costly when compared to a new Arctic Treaty. In complexity terms, these scholars suspect that an Arctic Treaty may not meet the *law of requisite variety*. An accompanying concern relates to the sovereignty, negotiation, and maintenance costs associated with a comprehensive treaty system or framework agreement and the respective permanent secretariats that would accompany them (Nowlan 2001; Young 2011, 331). The necessary protracted negotiation of the substantive provisions of an Arctic Treaty between a high number of states, globally, in order to reach an agreement and meet the requirements for entry into force, is laborious and time consuming.[175] There is also little knowledge on how the development of an Arctic Treaty would necessarily impact other components of the current system of Arctic environmental governance. Pulling a lever on one part of the system may have significant consequences for other parts (Slaughter and Hague Academy of International Law 2000, 191–92).

Fifth, issues of fit arise as well. Following from the previous point, the process surrounding a legally-binding agreement can set up a "serious mismatch between the pace of change in major biophysical and socio-economic systems in the region and the ability of the associated governance system to evolve and adjust to keep up with these dynamic processes" (Young 2010, 184). This is especially the case where future states are unpredictable over relevant time horizons. As I outlined in Chapter 4, signs of a mismatch between the nature of change in the Arctic system and its current governance responses are already leading to governance failure in some cases. There is simply no guarantee that an Arctic Treaty would be more effective in managing a complex and dynamic system (Young 2011, 331; Knecht and Keil 2013, 307; Mayrand 2014, 26; see also Stockholm Environmental Institute and Stockholm Resilience Center 2016, 61), or could, for that matter, be negotiated in a time frame that is commensurate with a rapidly changing Arctic environment.

[175] See also Stockholm Environment Institute and Stockholm Resilience Center (2016, 61) for a discussion on the precarious ability of a framework convention to ensure a desired outcome.

Sixth, from a theoretical standpoint, none of the proposals for an Arctic Treaty examined *why* existing institutions – with normative features like governing principles, specific rules, as well as compliance and dispute resolution mechanisms – have had few results (Mayrand 2014, 27; see also Smieszek 2019c). More precisely, there appears to be no observable causal relationship between positive sources of international law, compliance with this law, and/or its effectiveness in solving Arctic-specific issues (Mayrand 2014b, 21). In other words, we know very little about how international law currently responds to change and complexity in the Arctic system.

Ultimately, few of these proposals have contributed to structural change or policy-change; Pharand's Arctic Region Council was one of the few proposals to be introduced into policy discourse. Nevertheless, positivism continues to underpin and influence the trajectory of Arctic environmental governance today, and the idea of an Arctic treaty always appears at real or perceived inflection points.

2.1.4. Postscript: Other, Similar Proposals

In addition to the Arctic Treaty, other, similar, though less-dominant proposals for alternative governance approaches have come and gone over the past four decades. These include, among others, proposals for an Arctic regional seas agreement and a focus on the Arctic as a common heritage of humankind (Koivurova 2008a).

In 2005, Hart B. Dubner suggested that the Arctic should be turned into an international environmental reservation where Arctic states would presumably be prohibited from developing resources within their territorial seas and only limited activities related to science and tourism would be permitted. Arctic coastal states would also be banned from claiming and exploiting resources on their respective portions of the continental shelf.

In 2007, the Executive Director of the European Environmental Agency proposed the negotiation of a Polar Ocean Protocol to UNCLOS, transferring the negotiation of such an agreement to the UN General Assembly (McGlade 2007).

The subsequent year, in 2008, given its observation of the fragmentation of international law, a lack of effective instruments, the absence of an overarching framework for policy-setting in the Arctic, as well as gaps in participation, implementation and geographic scope, the European Commission (E.U. Parliament 2008, 4) suggested that actors: "[e]xplore the possibility of establishing new, multi-sector frameworks for integrated ecosystem management. This could include the establishment of a network of marine protected areas, navigational measures, and rules for ensuring the sustainable exploitation of minerals." (Koivurova 2010, 152). In a similar vein, scholars, policy-makers, and non-governmental organizations have all proposed variations on a Regional Seas Agreement for the Arctic, a cooperative intergovernmental framework for ocean management and conservation that emphasizes ecosystem-based management and spatial planning (Young 2010).

Although often ignored by Arctic states and policy-makers, there is also a buoyant discourse surrounding the Arctic as a global commons, which is generally driven by non-Arctic states like China, seeking to be a part of the management of the "global Arctic" (Knecht and Keil 2013, 185; Le Mière and Mazo 2013, 144; see also Tonami 2013). This discourse is particularly linked to the idea of an open Arctic. Generally, an area of common concern — in this case, the Arctic high seas beyond the national jurisdictions of Arctic states — is available for unilateral use and exploitation by the international community of states (as an extension of humanity as a whole) and thus, not only bestows transboundary benefits but also transboundary burdens on all states (Vienna Convention on the Law of Treaties Art. 25; see also Currie

2008, 267–68; Shelton 2009, 34–35; Clapp and Dauvergne 2005, 71). Although it is often disregarded, a commons approach is significant in its ability to recognize the difficulty in designating "specific points in [the] Arctic space as either definitively 'inside' or 'outside'," and the importance of state and non-state actors in governing the region" (Gerhardt 2010).

All of these proposals remain rhetorical and do not necessarily compel actors to make the suggested changes.

2.2. An Arctic Regime Complex

Scholars who believe that the negotiation of a comprehensive Arctic Treaty is neither feasible, nor necessary, often turn to a second, dominant theoretical debate that "explores the prospects for the development of an Arctic regime complex" (Young 2012). Unlike the first debate which is significantly normative, this debate is more descriptive. Its primary advantage lies in its ability to provide a greater understanding of the *status quo*; and in its ability to provide an easy-to-grasp overview of the polycentric, or fragmented, nature of current governance approaches in the Arctic.

Building on regime theory in international relations scholarship, this debate envisions the landscape of Arctic governance as a regime complex.[176] A regime includes "principles, norms, rules and decision-making procedures around which actor expectations converge in a given issue-area." (Krasner 1983, 2; see also Levy et al. 1996, 274; see also Slaughter 2000). Regimes vary along various dimensions, including their geographic coverage, membership, and functional scope. They also vary in terms of decision-making procedures, revenue sources, and their degree of formalization (Young, 1999). Organizations often emerge in pursuit of the rules and norms set out by these regimes (Breitmeier et al., 2006: 4). They also perform a variety of regulatory, procedural, programmatic, and generative tasks. As such, regimes can be understood as actors and tools in their own right, affecting collective outcomes through various causal pathways and mechanisms (Stokke 2001; Smieszek 2019c, 37; 2019b, 5). Much of the existing analysis of regimes is focused on governmental and inter-governmental institutions (Breitmeier, Young, and Zürn 2006).

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[176] Starting in the 1970s, and gaining momentum in the 1980s, regime theory was developed in response to the formalism of mainstream research on international organizations (Breitmeier, Young, and Zürn 2006), in response to the challenge posed by collective action problems , and in an effort to understand the political challenge associated with a decline in the ability of the US to function as the dominant actor in international society (Keohane 1984). It seeks to answer the following question: "how is it possible for utility-maximizing actors to cooperate effectively under conditions of interactive decision making where there are incentives to cheat but no central political authority of the sort we would think of as a government?" (Young 1999, 189). See Smieszek (2019c, 33).

As "a more expansive vein of institutionalist scholarship, [regime theory] incorporates information and ideas as well as power and interests and acknowledges significant roles for private and supranational actors (Abbott & Snidal 1998) and domestic politics." In Abbott 1999. With this particular focus, international regime scholars have significantly advanced the understanding of important roles and contributions of international institutions to international society. (Smieszek 2019c, 66). See also Krasner 1983; Hasenclever, Mayer, and Rittberger 1997. For a more comprehensive review of regime theory see Haggard and Simmons 1987; Young 1986; Abbott 1989. Regime theory has been applied to the study of various issue areas including human rights, trade, and the environment.

In the 1980s and early in the 1990s, regime analysis focused on conceptual questions related to the definition and identification of regimes; their formation, the conditions under which regimes are formed and designed to deal with particular problems, and when they succeed or fail (Haas and Haas 1990; Hasenclever, Mayer, and Rittberger 1997; Krasner 1983; Litfin 1994; Ostrom 1990; Osherenko and Young 1989). The 1990s saw an increase in scholarship on regime effectiveness and performance (Smieszek 2019c, 36–37). This included several large-scale studies one environmental regimes.

Although regimes are often described in regulatory terms, this does not preclude other forms of informal state cooperation (Smieszek 2019c, 72; Young 2011). Malgorzata Smieszek (2019b, 24–25; 2019b, 83), for instance, describes the Arctic Council as an informal international regime – "arrangements concluded *by states* by means of *non-legally binding instruments* such as political declarations, memoranda of understanding, joint communiqués, and so forth to govern spatially and/or functionally delineated areas."[177] Informal international regimes differentiate themselves from formal ones by operating without a distinct legal personality that can speak on behalf of members (Smieszek 2019c, 77). At the same time, though, this reality does not prevent such regimes from being endowed with formal structures, like the Arctic Council Secretariat, whose status is regulated "akin to the status of other diplomatic missions under the Vienna Convention on Diplomatic Relations" (Graczyk and Koivurova 2015, 310).

A regime complex, in turn, connects partially overlapping, specific, and narrow formal and informal regimes within a particular geographic territory (Crawford and Nevill 2015, 259) or issue area (Keohane and Victor 2011; Raustiala and Victor 2004, 279) without any overall architecture to structure the whole set (Slaughter 1993; Keohane 1997, 488).[178] Regime scholars often locate these regime complexes along an integration-fragmentation continuum between comprehensive international regulatory institutions, which are often focused on a single integrated legal instrument with hierarchical rules, and highly fragmented arrangements, with no identifiable core and weak or nonexistent linkages between regime elements (Keohane and Victor 2011; see also Abbott 2012).

Oran Young (2012, 404), one of the key proponents of this idea, argues that elements of an Arctic regime complex are already in place while other elements are under construction. As highlighted in Chapter 3, this Arctic regime complex connects a wide range of formal international legal regimes and informal intergovernmental fora (or informal international regimes) that manage various issues pertaining to the Arctic area. This includes a variety of foundational arrangements like the UNCLOS; international environmental regimes, including their respective multilateral environmental agreements and principles of international environmental law; international human rights instruments and Indigenous peoples rights; as well as Arctic-specific agreements; intergovernmental fora like the BEAC or the Arctic Council; non-governmental organizations; scientific networks; etc. There is some level of nesting within these elements; for instance, Arctic-specific agreements like the SAR agreement or the EPPR agreement are designed to be nested within existing international agreements, like the Convention on Life at Sea (Young 2016a, 112). I provide a non-exhaustive illustration of the current complex of Arctic environmental governance broken down by scale and formality, below (see Figure 14). Ongoing studies on the level of interplay between these elements remains scarce, however (Young 2012, 404).

[177] Smieszek (2019c, 24–25) notes that the use of the term "informal", as opposed to "soft-law", seeks to steer away from a discourse where legally-binding norms are, by default, considered to be superior to non-legally binding ones. This discourse, as I have noted earlier, focuses on "questions of compliance and enforcement of international norms, which view regimes chiefly in terms of their regulatory functions, and which are mostly preoccupied with enhancing soft-law mechanisms via legally binding means."

[178] In their work on the regime complex for climate change, Keohane and Victor (2011) explore a continuum between comprehensive international regulatory institutions, single integrated legal instruments with hierarchical rules, and highly fragmented arrangements, with no identifiable core and weak links between regime elements. They locate the climate change regime complex – loosely coupled sets of narrow regimes – between these two extremes, arguing that it is more likely to persist than efforts to build an effective, legitimate, and adaptable comprehensive regime (R. Keohane and Victor 2011; Meadowcroft 2002). See also Alter and Meunier (2009) on different types of regime complexes.

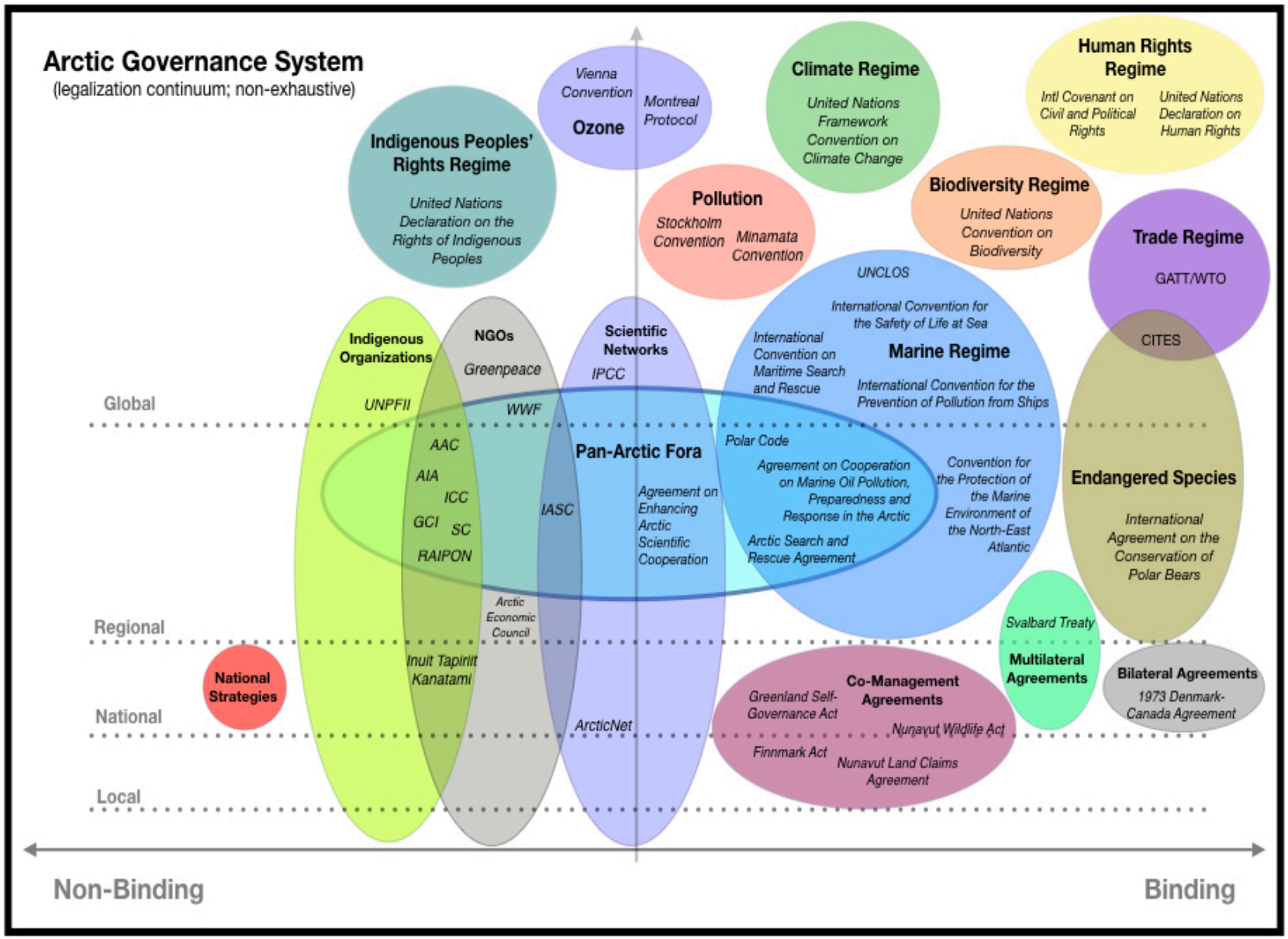

Figure 14: Non-exhaustive Regime Complex of Arctic governance placed along legalization continuum.

I argue that, like the discourse surrounding an Arctic Treaty, this second debate builds on a foundation of legal positivism.[179] It draws on a neoliberal institutionalist understanding of legalization, between hard and soft law, to describe particular elements of the Arctic regime complex (Mayrand 2014, 31; Young 2011, 331).[180] The law, as such, is understood in rationalist and instrumentalist terms, as a policy choice dictated by the strategic interest of the state with the aim of seeking stability (Koskenniemi 2007, 23; see also Slaughter and Hague Academy of International Law 2000; see also Brunnée and Toope 2008, 7; Bradford 2007). Still, this second debate, surrounding a prospective Arctic regime complex, shies away from suggesting an overarching hard law approach to Arctic environmental governance akin to an Arctic Treaty. Instead, it encourages the stronger integration of various elements of the Arctic regime complex, relative to its current iteration because coherent regime complexes, with compatible and mutually reinforcing elements, are likely to be more effective (Keohane and Victor 2011, 19). (Scholars similarly argue that regimes are more effective when coherent (Bulkeley and Betsill 2003).)

Specifically, proponents argue that stronger integration would leave Arctic environmental governance more amenable to uncertainty and change because it avoids the requirement of ratification (Smieszek 2019c, 74–75), and would be more accommodating of non-Arctic states and non-state actors, than a highly integrated regulatory system, like an Arctic Treaty (Keohane and Victor 2011, 16; Young 2010; Young 2012; Smieszek 2019c, 78).[181] What is more, it contends that further integration within the Arctic regime complex could address two critical shortcomings in its current institutional arrangement: fragmentation and a lack of coherence, with nothing resembling a master plan (Young 2016c, 216; Keohane and Victor 2011).[182] The fragmentation of Arctic environmental governance is two-fold: jurisdictional and sectoral. Jurisdiction seeks to make the Arctic legible, fragmenting the land area by the territory of Arctic states and their devolution therein. As noted in Chapter 3, parts of the Arctic seabed are expected to come under the jurisdiction of Arctic coastal states over the coming decades, subject to the review of their individual submissions to the Commission on the Limits of the Continental Shelf. The Arctic Ocean is even more complex with over half of its waters – falling within the territorial seas and EEZs of the five Arctic coastal states and roughly 2.8 million square kilometres designated as the high seas – subject to provisions set forth in Part VII of the UNCLOS. Such complex jurisdictional fragmentation can impede efforts to manage human activity effectively, efficiently, and equitably. Meanwhile, sectoral fragmentation may simply be insufficient in managing the nature of change in the Arctic system (see Chapter 4). Oran Young (2016) points to the fragmentation of Arctic Ocean governance as a pertinent example thereof:

[179] For a concise overview of legal positivism and regime theory, see Bradford (2007).

[180] Neoliberal institutionalism, more specifically, recognizes "the fact that world politics at any given time is to some extent institutionalized, both through '[f]ormal international organizations and codified rules and norms ('international regimes')" and through less-formalized patterns of behavior "recognized by participants as reflecting established rules, norms and conventions."(Keohane 1990, vii). In Burley (1993, 221).

[181] For instance, it allows for the continued inclusion of Arctic Indigenous peoples. It also gives non-Arctic states, like China, the continued ability to influence Arctic environmental governance through international regimes, such as the UNFCCC or UNCLOS, even though they are not a Member State of the Arctic Council (Ingimundarson 2014, 195).

[182] Keohane and Victor (2011, 19) identify "coherence" as one of six criteria for evaluating regime complexes on a spectrum from dysfunctional to functional. Elements of a regime complex can be coherent — compatible and mutually reinforcing; incompatible and mutually harmful; or somewhere in-between these extremes. Highly fragmented regime complexes can have dysfunctional tendencies that yield gridlock, lead to governance failure, and hinder innovation (Keohane and Victor 2011, 17).

> …the IMO is the lead agency regarding commercial shipping; each of the coastal states handles offshore energy development within its own EEZ, and efforts are currently underway to put in place some sort of issue-specific international regime capable of dealing with the possible development of commercial fishing. In many cases, the resultant interactions are dealt with on an ad hoc basis with the outcomes arising in specific cases determined as much by bureaucratic politics and the distribution of bargaining power among the key players as by principles of rational management or stewardship…

With no comprehensive plan, this approach leaves much to be desired and proves ripe for tension as the Arctic Ocean increasingly opens up and the worldviews of key actors begin to diverge (see Chapter 6).

In line with these concerns, the second shortcoming of the current Arctic regime complex relates to its general incoherence (beyond Arctic Ocean governance *per se*). Scholars within this theoretical debate worry that a multitude of competing and overlapping international regimes, attending to a broad range of Arctic challenges, might impinge on the overall effectiveness of the Arctic regime complex. Less focus is given to how this incoherence may interact with the broader environment which the regime seeks to govern, or whether an incoherent regime is more likely to lead to governance failure.

A critical challenge in moving forward, then, centres on efforts to further internal coherence within the current iteration of the regime complex; to move it along the fragmentation-integration continuum toward integration (Young 2016b, 219; see also Rayfuse 2007, 2008, 2009). Such a shift will be difficult to achieve, given that it "lacks both a guiding discourse that can provide an overarching cognitive framework within which the complex can develop and a mechanism for applying this discourse to specific initiatives pertaining to Arctic governance." (Young 2012, 402). As I highlighted in Chapter 4, this reality can slow down the development of existing institutions specific to the area; the 2017 *Polar Code* ran into several barriers and delays during the course of its negotiation before it was accepted under the IMO (Young 2011, 331). Meanwhile, existing instruments straddling both jurisdictional and sectoral fragmentation, like the SAR agreement, can be daunting to implement in practice (Young 2012, 402).

While Young (2012, 403) admits that there is no magic formula, his work provides some normative guidance in identifying steps for further integration. First, he argues that, in order to avoid the jurisdictional fragmentation of the Arctic regime complex, scholars should seek inspiration from the discourse surrounding the Anthropocene — underpinned by literature on the resilience of complex and dynamic social-ecological systems and planetary stewardship — and conceive of the Arctic as a large social-ecological system (Young 2012b, 404). Second, it is crucial that scholars not only recognize the inner logics and dynamics of individual regimes, but seek to better understand the interplay between a spatially-defined Arctic regime and a variety of functionally defined regimes whose operation affects the area (Young 2012; Young 2016c; Mearsheimer 1994). This knowledge could help various actors devise a more effective governance system that includes mechanisms for identifying gaps and overlaps, thereby also helping to resolve tensions and conflict (Young 2016b, 219). Third, the Arctic Council should be recognized as the primary venue for actors to address Arctic governance issues and be strengthened in order to facilitate regime interaction (Young 2012, 2016, 222; Ingimundarson 2014, 184). At this time, though, the Council is not configured in a manner that makes it the appropriate body to deal with particular issues (Young 2012, 403). Consequently, a more integrated Arctic regime complex, with the Arctic Council at the helm, will have to develop a more coherent operational discourse. Finally, unlike the discourse surrounding an Arctic Treaty, Young (2012b) advocates for effective mechanisms that would allow non-Arctic states and non-state actors to participate in the building and operation of this emerging Arctic regime complex.

2.2.1. Drawbacks to an Arctic Regime Complex

As noted, this second, dominant theoretical debate is more process-oriented than the first. Nevertheless, it still lacks a clear vision or any actionable recommendations for moving forward or managing change and complexity.[183] Several drawbacks stand out in particular.

First, I note a structural difficulty is positing the idea of an integrated Arctic regime complex as an alternative to an Arctic Treaty as the theoretical underpinning of both builds on a legalization continuum, meaning that the former essentially requires formalistic determinations like establishing hierarchy or jurisdiction. In this regard, both debates can be viewed as highly complementary.

Second, this debate tends to conflate law and politics by using "scientific and empirical methods to explain what international law is, why states comply with it, or whether it is effective." (Mayrand 2014, 28, 32).[184] While this provides a strong understanding of political interaction between different regimes, it fails to explore the ways in which these regimes are constructed at key historical moments in time (including their deeper ideological and societal conflicts), their internal logics for interpreting and resolving problems (including their structural and normative biases), how and when a regime is likely to change, how their respective legal forms may pull regimes in different directions, or how shifting one lever (or element) within a regime complex might impact the system of Arctic environmental governance as a whole (Burley 1993, 225). Specifically, it provides little insight into how the functional differentiation of each regime might exhibit "path dependency, higher transaction costs, 'tunnel vision' and even solipsistic and imperial' tendencies" (Koskenniemi 2012, 318) which could ultimately hinder the desired integration of the Arctic regime complex, proposed within this debate. For instance, the Arctic Council cannot perform the managerial tasks to be expected of such a forum in light of ongoing transformations within the Arctic system (see Chapter 3 for an overview of the Arctic Council).[185] It cannot meet the *law of requisite variety*. While it has the ability to avoid the mechanistic tendencies of formal law, thereby allowing for the inclusion of Arctic Indigenous Peoples and the coordination of nuanced scientific assessments, it lacks the ability to both prescribe and implement specific actions based on its own recommendations. What is more, the Council itself continues to build on a dichotomous (formal/informal) legal positivist distinction. As Anne-Marie Slaughter Burley (1993, 225) reminds us, "What nations 'want,' in either material or ideal terms, is irrelevant. The system, whether institutionalized or noninstitutionalized, dictates what they can get." This observation is particularly relevant to this project given my desire to observe how the dominant system of Arctic environmental governance interacts with changes in Arctic worldviews (and technologies) and the normative variation that arises therefrom (see Chapter 6).

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[183] Slaughter, Tulumello, and Wood (1998, 385) understand this as a broader flaw within IR theory, noting that "…although, IR theory predicts when institutionalized cooperation might occur and specifies the functions that institutions perform, its prescriptive implications tend to be abstract. Advice such as "improve monitoring' and 'facilitate information exchange' is pitched at too high a level of generality to be useful to international lawyers or other regime architects." In a previous article, titled "International Law and International Relations Theory: A Dual Agenda", Anne-Marie Slaughter Burley (1993, 222) more specifically highlighted that neoliberal institutionalism offers a "strong generic framework" for collaboration between scholars of international law and political science but does not necessarily stand for any answers.

[184] Already in the 1980s and 1990s, international lawyers questioned the value of "lumping 'norms, principles and decision-making procedures' together, thereby denying any difference between a legal obligation and an informal agreement." Slaughter (2000, 204). See also, Byers (1997).

[185] Proposals for Council's reform, however, are largely attributed to implicit assumptions made by states about international relations, and the nature of interactions between states, as opposed to the geophysical and social-ecological changes occurring in the Arctic today (Smieszek 2019a, 121).

Third, the functional differentiation of regimes, noted above, coincides with a much broader debate in IL theory on the fragmentation of international law— into human rights law, environmental law, trade law, etc. — and its consequent limitations as a tool for managing complex systems and challenges (see Teubner 1993). The consequences of this are particularly visible in the Inuit Petition – at the intersection of different regimes – where the legal process of the IACHR was unable to account for the complex causality of physical triggers (such as thawing permafrost) in the Arctic system in an institution which was primarily designed to respond to social triggers (see Chapter 4). In cases like this, the "fragmentation of law is the epiphenomenon of real-world constitutional conflicts," Fischer-Lescano and Teubner (2004) write, "as legal fragmentation is — mediated via autonomous legal regimes — a legal reproduction of collisions between the diverse rationalities within global society." Specifically, legal formality cannot overcome certain realities of complex systems because it is itself rooted within the static categories of each regime.

In response to this reality, proponents of an Arctic regime complex argue that it can serve as an antidote to fragmentation in Arctic environmental governance, simultaneously responding to increasing complexity and change while also accommodating a diverse set of actors.

Still, this debate gives little to no attention to the significant obstacles that can arise when seeking to merge specialized regimes into a more coherent whole (Ellis 2010, 5; see also Luhmann 1985; 2004; Teubner 1993). For instance, there is little discussion about what it would take to achieve technical coherence in a non-hierarchical Arctic regime complex. A legal system is technically the conjunction of primary and secondary rules, the nuts and bolts of law. The former tell us how to act; while the latter are essentially "rules about rules" (Goldstein 2000, 403; Teubner 1993, 41). These foundational rules — surrounding legal personality, international law-making, the law of treaties, state responsibility, and the settlement of international disputes — provide a self-regulating mechanism (Teubner 1993, 41); a common set of legal and institutional concepts and ordering rules on which international lawyers rely when advising governments, negotiating treaties, or litigating cases. As such, they are important because they influence our ability to adapt to change and inevitably influence the trajectory of Arctic environmental governance. Yet the horizontal structure of international law — where parallel international legal regimes have different internal logics embodying their respective normative biases — leaves ordering rules more unclear, thereby weakening positivist understandings of the law as a hierarchically-ordered imposition of social control emanating from a sovereign state (Brunnée and Toope 2008), as would be the case in the Arctic Treaty outlined earlier.

Achieving coherence in a non-hierarchical regime complex, in turn, means coordinating the preferences of horizontal international legal regimes based on context. In some cases, this process can distort our understanding of the international legal system (Young 2012, 10–11), obscuring legal pluralism by essentializing multiple conflicting worldviews (Roberts 2017) — including heuristics for how to respond to change — into a single set of ideas which may be far from optimal (Koskenniemi 2011, 27; March and Olsen 1989, 37–38; Young 2012, 113). This form of reductionism is especially concerning when it obscures the vast array of laws, practices, customs, and traditions of Arctic Indigenous peoples (see for example Borrows 2017); or when it fails to meet the *law of requisite variety* – to identify a sufficient variety of valid behaviours to match the scale of the external condition.

This brings me to my final point: the capacity of a more integrated regime complex to deal with the nature of change in the Arctic system is only briefly referenced in relation to the discourse surrounding the Anthropocene, including scholarship on the resilience of social-ecological systems and planetary stewardship. Instead, the discourse remains centred around establishing and maintaining internal coherence within the Arctic regime complex, more so than the coherence between the Arctic regime complex and the

complex systems it is seeking to manage. Once again, the debate is reductive as it seeks to fit material factors into social categories, thereby only accounting for particular system phenomena. In this way, the debate assumes that internal coherence within a regime complex is desirable, and fails to address that regime complexes can, in fact, maintain their internal coherence despite inconsistencies within the broader system (see Schiavello 2001, 237). In this regard, greater internal coherence does not necessarily mean greater adaptive capacity to transformational change in the Arctic system.

The idea of an integrated regime complex also raises various questions, such as which regime has the most authoritative voice on Arctic issues? Which regime's normative bias is favoured? To what extent can primary and secondary rules be adapted to address the specific context of a rapidly changing Arctic system? Based on my understanding, the consensus-based decision-making of the Arctic Council currently serves as the only comprehensive rule to specifically concern the day-to-day operations, substantive matters, and procedures specific to the Arctic system (Smieszek 2019c, 76).

3. What Remains Missing?

In many ways, it is unsurprising that scholars and policymakers alike turn to their conventional toolkits to manage accelerating, non-linear change in the Arctic system. In this particular context, it often includes a shift toward law, including the negotiation of Arctic-specific agreements like the 2011 *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic*. As Koivurova (2014) reasoned in an Arctic context, treaties are comforting to international lawyers – especially positivist lawyers – when "things get serious".

With this reasoning, however, Arctic scholarship generally fails to question the return to legal positivism for alternative solutions; that the efforts of both scholars and policy-makers "to prescribe – to solve legal problems – are deeply dependent upon the particular definition of the problem to be solved." (Dunoff 2000, 86). Yet this is important given that a legal positivist ontology – which underpins both current approaches to Arctic environmental governance and the two dominant debates surrounding potential governance alternatives – is particular in placing a strong emphasis on the more substantive, formal form of law. It foregoes a systems definition of the Arctic and goes straight for a jurisdictional definition instead. It understands the law as an instrument of governance with the general acclaim of maintaining stability by imposing order on complexity (Ruhl 1997). More precisely, it seeks to provide regular, continuous, and generally coherent international relationships, spanning large areas and long durations of time (Hathaway and Koh 2006, 22–23) by stabilizing expectations, constituting institutions, centralizing power, harmonizing norms, and reducing transactions costs (Ruhl 1997, 941; Abbott & Snidal 2009), often at the expense of the participation of non-state actors. There is also some recognition of law's capacity to change through legislative change, interpretive change, and administrative and contextual decision-making.

What remains missing from legal positivist theory, though, is an understanding of the capacity of law to contribute to the accelerated transformation of another system (Olsson et al. 2006b; Rosa and Scheuerman 2009; see also Ebbesson and Hey 2013), or a clear idea of how the law can lock another system into an unsustainable pathway (Carpenter and Brock 2008; Downey, Bonds, and Clark 2010). Instead, legal positivism is built on a Newtonian, mechanistic ontology of linear change and equilibrium, which is insufficient in explaining how the law interacts and co-evolves with other systems – geophysical, biological,

economic (see Chapter 4).[186] It treats the system of Arctic environmental governance as autonomous from the material world; it is state-centric, relies on consent, and has separate normative notions of justice, validity, and sources of law. As such, it is unhelpful, unsatisfying, and inherently colonial in many ways (see Anghie 2005).

In addition to this, legalization, as it is conceived by Abbott et al. (2000), ignores process to provide a much narrower and under-theorized notion of law that could hinder empirical research, or even generate wrong hypotheses. Finnemore and Toope (2001, 744) go so far as to argue that Abbott et al. misleadingly appropriated the concept of legalization, and arbitrarily focus on only three formal features of the law which leaves their conceptualization "very thin, formal and contractual." For one, precision, obligation, and delegation are neither the sole distinguishing factors of law, nor the sources of its power (Finnemore and Toope 2001, 747).[187] As examples, the delimitation of maritime boundaries, outlined in Chapter 3, is often imprecise (completed on the basis of "equity," instead); international human rights law does not necessarily depend on delegation; and obligation under many international environmental commitments continues to function based on voluntary compliance. Second, their conception of legalization takes the law as a given; where both soft law and hard law are treated as pre-existing instruments, actively chosen by states (Finnemore and Toope 2001, 744). However, this idea that states can simply choose to implement an Arctic Treaty is misleading. In fact, many legal analyses provide that the law is a much more dynamic and evolutionary process (see Chinkin 1989; Hillgenberg 1999; Finnemore 2000; see also Navarro, Rodriguez, and Bulygin 2014).[188]

So, in seeking some insight on the capacity of law to manage a rapidly changing system, like the Arctic, I turn to other dominant non-positivist theories of international law. Given the number of dissertations that this section could fill, I will keep the following survey concise.

Constructivism. A constructivist ontology and epistemology thinks more creatively about international law (Brunnée and Toope 2010, 13; 2008, 8; Mayrand 2014, 33; see also Kratochwil 1989; Wendt 1995; Onuf 2012).[189] Without denying rationalist and realist accounts, constructivists argue that law plays an important part in socializing actors; in shaping how actors see themselves, their world, their interests, as well as the choices they make (Brunnée and Toope 2010, 92). As such, constructivists seek to engage with some of the complex constitutive and behavioural characteristics of the legal system, relating to interactions between state and non-state actors, legal process, and the role of shared understandings in maintaining legality. However, it continues to understand the legal system as separate from the material world, and the material world as defined by jurisdiction as opposed to complex system characteristics. I focus on international legal process, transnational legal process, and especially interactional legal theory given their recognition of the dynamic nature of international law.

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[186] Anne-Marie Slaughter (2000) reminds us that "models can act as causal constructs, analogous to physical structures in which pressing a button or pulling a lever in one part of the model dictates a series of consequences in other parts." Inevitably, though, these causal constructs remain imperfect approximations of physical and social reality (Slaughter 2000, 191–92). This is particularly evident in the cases outlined in Chapter 4.

[187] In fact, these three features may not necessarily interact with one another in the most effective manner; increased precision could lead to less obligation when prospective members of legal regimes are driven away by fears of detailed rules that are inflexible. Delegation of decision-making can lead to less precision in rules rather than to greater clarity, as presumed by the proponents of legalization.

[188] The precautionary principle, for instance, is as much normative entrepreneurship as it is a subtle instantiation of strategic choice.

[189] Kratochwil (1989), for instance, conceives of law as "an exercise in practical reasoning", the result of "a continuing dialogue between norm and fact, and between means (process) and ends (substance)."

Legal Process. Through the lens of *international legal process* – an approach first developed by Abram Chayes, Thomas Ehrlich and Andreas Lowenfeld in the 1960s – international law is an instrument for maintaining compliance with treaties. It operates as a constraint on action, as the basis of legitimation and justification for action, and to provide organizational structures, procedures, and forums within which political decisions can be reached. However, compliance with international law is not self-activated. Within treaty regimes, Abram Chayes and Antonia Chayes (1998) argue that compliance is best fostered by a managerial model, characterized by a discursive and iterative, "horizontal legal process" where states (and their individual bureaucrats) engage in explanation, justification, and persuasion (Chayes and Chayes 1998, 2601). Moving beyond this lens, Harold Koh's model of *transnational legal process* understands the law as a socially embedded and purposive social system. Koh's model – unlike legal positivism's focus on formal consent – embraces the descriptive workings, as well as the *normativity*, of a process to focus on how state and non-state actors interact to make, interpret, enforce, and ultimately internalize law (see Koh 1996; 1997). The internalization of the UNCLOS by the U.S. even though it is not party to the Convention serves as a salient example of *transnational legal process* (Koh 1998). The process by which the POPs Convention was translated into national environmental law (see Chapter 4), or the ways in which Arctic states are tasked with representing northern interests at the UNFCCC (see Chapter 3), are other examples. More precisely, Koh (1997, 2646) argues that each instance of interaction and norm-interpretation "generates a legal rule which will guide future transnational interactions between the parties; future transactions will further internalize those norms; and eventually, repeated participation in the process will help to reconstitute the interests and even the identities of the participants in the process."

This lens is distinct from the current legal positivist underpinnings of Arctic environmental governance in four ways (Koh 1996):

1. it is non-traditional, breaking down two traditional dichotomies which have historically dominated the study of IL: the domestic/international dichotomy, and the public/private dichotomy;
2. it is non-statist, where actors include both state and non-state actors;
3. it is dynamic with transnational law transforming, mutating, and percolating up and down from the public to the private, and from the domestic to the international level and back again; and
4. it is normative, where new rules and law emerge through interaction.

While there is no direct link to a complex systems ontology *per se*, legal process theory goes beyond a purely mechanistic ontology to recognize the law as a broader phenomenon that transcends many of the formal categories of positive law.

Still, even though these two theories of legal process move beyond a legal positivist understanding of the law – where the law is an instrument of choice – toward a focus on legal process – which speaks to reconciling deep conflicts in worldviews and transformation – they nevertheless maintain some elements of its methodology. International legal process, like legal positivist theory, is state-centric (although transnational legal process focuses on actors beyond the state, as well). In addition to this, both theories understand legal process as autonomous from the material world, with little focus given to the co-evolution of various systems. Instead, as is the case in the debate on the Arctic regime complex, the focus remains on

the dynamic and changing nature of the legal system itself. As a consequence, these theories may provide limited insight into the capacity of international law to manage increasing complexity and change.[190]

Although I remain unaware of any scholarly engagement with legal process theory in an Arctic context, to date, it may provide insights which the two dominant debates fail to provide.

Interactional Legal Theory. Jutta Brunnée and Stephen Toope's *interactional legal theory* (2010) grapples with change in a similar vein. It understands the law as an emergent and dynamic process where shared legal understandings – embedded in the practices, beliefs and traditions of societies – must be developed, maintained and modified in a practice of legality (widely associated with the "rule of law") over time (see Brunnée and Toope 2008, 22; 2010, 7; Fuller 1969, 129; Bianchi 1997, 190; 2014, 211). It is different from both legal positivism and international legal process theory, in acknowledging the value and full participation of *all* relevant actors, rights- and stakeholders within this process (Audouin et al. 2013; Brunnée and Toope 2008; 2010, 124).[191]

Legal obligation, they argue, is felt not imposed. In making this argument, they draw on the work of legal theorist Lon Fuller to shine a light on why failure to enforce legal norms – as illustrated in Chapter 4 – can lead to frustrations with international law; because the formality of the rule is not necessarily linked with the practice that generates legal obligation (Brunnée and Toope 2008, 3, 31). "Meaningful norms," they argue, "cannot simply be posited." (Brunnée and Toope 2010, 351). The 2008 *Ilulissat Declaration* (see Chapter 6) might serve as a salient example of a normative commitment to a particular understanding of the Arctic, which raised significant questions relating to *who* governs the Arctic and *how*. When the five Arctic coastal states re-asserted their commitment to the UNCLOS, as the foundational framework for Arctic environmental governance, through the signing of this particular declaration, both Arctic non-littoral states (Finland, Sweden, and Iceland) and Arctic Indigenous peoples pushed back (ICC Declaration 2009).

Building on Fuller's work on the internal morality of law (Witteveen and Burg 1999, 78, 97),[192] Brunnée and Toope (2008, 31) move beyond the dichotomous distinction provided by legal positivism to contend that the law is only legitimate to the extent that it produces rules that are generally applicable, coherent with other rules, publicized, constant over time, possible to perform, congruent with official action, exhibit clarity, and avoid retroactivity (Fuller 1969).[193] These criteria are not a checklist *per se*. For instance, they do not identify whether a particular legal form, like an Arctic Treaty, is properly designed. Instead, the

[190] Other, process-oriented schools of thought, like the New Haven School for instance, conceive of the legal order as a process of authoritative decision-making dedicated to a set of normative values (see Koh 1997), rather than a condition. As a consequence, they focus on the interplay between rules and social process in affirming the law (Lasswell and Macdougal 1992).

[191] Brunnée and Toope (2008, 34) point to limited participation as a key weakness of formal law.

[192] The "internal morality" of law, Fuller argues, is based on a notion that certain conditions guide individual actions and interactions (Witteveen and Burg 1999, 78, 97). Contrary to Hart and Raz, who both consider the instrumentality of law (or lack thereof) as purely functional or symbolic, as opposed to moral, Fuller argues that law has an internal value aside from its instrumentality (Brunnée and Toope 2008, 18).

[193] Fuller outlines eight criteria of legality, applicable to both individual laws and legal systems. They must be general – prohibiting, requiring or permitting certain conduct. Laws and legal systems must be promulgated, enabling citizens to know what the law requires. They should be prospective, not retroactive, allowing citizens to account for rules in their decision-making. Laws and legal systems must also be clear, as citizens must be able to understand what is permitted, prohibited, or required. They should avoid contradiction, not requiring or permitting and prohibiting at the same time. Laws and legal systems should not demand the impossible but should be realistic. They require that citizens must remain relatively constant. Finally, there should be alignment between legal norms and the actions of officials operating under the law (Brunnée and Toope 2010, 351).

criteria "come alive" through the mutual engagement of actors even when actors disagree on substantive moral grounds (Brunnée and Toope 2010, 19).

To my knowledge, the doctoral work of Helene Mayrand (2014) is the only non-positivist study of international law in the Arctic. Combining Brunnée and Toope's interactional legal theory together with Martti Koskenniemi's critical approach to international law, Mayrand develops a framework for understanding "both the limits and possibilities of international law to bring about social change in favour of Arctic environmental protection." (Mayrand 2014, 12).[194] More specifically, Mayrand asks: how do the politics of international law play out in an Arctic context? How do they lead to outcomes which are not protective of the environment? And what is the specific role of international law in bringing about social change toward better environmental protection, without being used in a purely instrumental way?

The starting point of Mayrand's research project is the tension between the two dominant debates in Arctic governance, outlined above. Like me, the project concludes that "both debates fail to account of structural problems with international law…" including "how some rules, rights and standards are able [to] create a sense of legal obligation, when others, even if formalized in international conventions, cannot." From there, Mayrand applies their theoretical framework to four case studies – on offshore oil and gas activities; shipping practices; Indigenous peoples' environmental rights; and biodiversity – to illustrate that, when international environmental law is constrained by a neoliberal bias, it can "relegate environmental concerns to the margins, contrary to its promise."[195] In response to these findings, Mayrand (2014, 4) contends that "shared understandings and legality criteria are necessary to create and maintain practices of legality in favour of Arctic environmental protection." Ultimately, though, the research findings lead Mayrand (2014, 13–14) to question the relevance of international law in contributing to Arctic environmental protection, and to wonder whether international law is, in fact, the problem.

Mayrand's research moves beyond a legal positivist epistemology to provide significant insight into the limits and possibilities of international law in four particular sectors related to the Arctic. As through a legal positivist lens, though, the definition of the Arctic remains state-centric (which is unsurprising given that a jurisdictional definition would appear to serve as the necessary foundation for a critical legal analysis of international law in the Arctic). Similar to other positivist and non-positivist legal theories outlined above, Mayrand's theoretical framework – drawing on interactional legal theory and Koskenniemi's approach to critical legal theory – understands the legal process as autonomous from the material world, with little focus given to the co-evolution of various systems including the human-environment nexus. As noted earlier, material factors are fit into social categories instead. For instance, even though climate change is identified as a key variable, there is little engagement with the capacity of international law to systemically manage the constitutive and behavioural characteristics arising within the Arctic system therefrom. Instead, the focus remains on the emergent and dynamic process of developing, maintaining, and modifying shared legal understandings in a practice of legality; essentially, on the self-referentiality of an autonomous legal system exhibiting complex system characteristics (Teubner 1993; see also Luhmann 2004). Ultimately, the conclusion provides little guidance or recommendations on potential alternative governance responses.

While constructivists move away from precision and formality, and recognize the importance of ideas in facilitating change, they shy away from fully re-assessing their own positivist foundations (Cox and O'Neil 2008, 213–14). For instance, they are generally more interested in explaining stability than change. A significant part of constructivist theory also puts forward the claim that actors conform to a "logic of

[194] More precisely, Mayrand (2014, 3) combines these two approaches to explain "how international law is influenced by politics but is also irreducible to it."
[195] Mayrand structures these case studies around Fuller's eight criteria.

appropriateness" – a form of legal obligation – without necessarily focusing on how this logic might evolve over time (March and Olsen 1989, 59, 160–62; Finnemore and Sikkink 2008, 888; see also Habermas 1996; Brunnée and Toope 2008, 25).[196] Yet this logic is important, when one considers that the rules for selection within our repository of routines, procedures, conventions, or strategies shape our reality (March and Olsen 1989, 24; Barnett and Duvall 2005, 53; Hoffman 1999, 351; see also Giddens 1979).[197] They constrain the allocation of our attention, standards of evaluation, priorities, perceptions, and resources (March and Olsen 1989, 24, 55).[198] They can also create rules for justificatory behaviour, for procedures that assure the maintenance of the *status quo* or a preferred modification in the face of threats (March and Olsen 1989, 24). As such, they can be rigid.

4. Law & Governance for Transformational Change

Despite an ingenuity gap (Homer-Dixon 2002, 7) – a shortfall between the rapidly rising need for legal innovation and its inadequate supply in both current Arctic environmental governance and Arctic scholarship alike – scholars can turn to other areas of study for inspiration; in fact, some already are. Research in Earth systems science, on social-ecological systems, and Earth system governance increasingly draws on a complex systems ontology to think about the ways in which different components of a system fit together, interact with one another, and respond to change.[199]

Earth system science, for one, yields a greater awareness of the link between physical and biogeochemical processes (Weart 2008; Libarkin and Kurdziel 2006), thereby providing medium to long-term predictions of global environmental change in an open, integrated, dynamic and complex system, like the Arctic. Meanwhile, a social-ecological systems framework (Ostrom 2005) gives scholars the necessary concepts and tools – including theories of resilience and transformational change – to reflect on interdependent and co-evolving human-environment interactions within a system (Berkes, Folke, and

[196] In their work on institutions, sociologists James March and Johan Olsen (1989) determine that decisions result from two logics: the *logic of consequences* and the *logic of appropriateness*. The *logic of consequences* is anticipatory, willful and driven by preferences (March and Olsen 1989, 160). It is also analogous to rationalist-positivist reciprocity, where decisions are seen as instrumental in filling subjective desires, to "getting what one wants". Law, as such, provides a coherent signal that makes interactions predictable (Brunnée and Toope 2008, 23). Meanwhile, the *logic of appropriateness* is intentional. It generates self-reflection and moral consideration, asking "what should be done?" (March and Olsen 1989; Brunnée and Toope 2008, 25; 2010, 40; see also Finnemore and Sikkink 2008; Müller 2004, 400–401). It is through this logic that actors identify normatively acceptable behaviour; clarify the rules, make distinctions, determine the context, and define what 'fits' (March and Olsen 1989, 160).

[197] In their book, "Deontic Logic and Legal Systems", Navarro, Rodriguez, and Bulygin (2014) argue that the structure of legal systems, though normative, is much more dynamic and complex than most dominant legal theories might suggest. They argue, in short, that the legal norms required today cannot be adequately explained in terms of a static legal system, especially when communities of practice are dynamic. Legal systems, they continue, change at different times as a result of the introduction or elimination of legal norms by means of specific normative acts (i.e. promulgation or derogation).

[198] March and Olsen (1989, 160) also point to the cyclical nature of both logics in stating that, "having determined what action to take based on a logic of appropriateness, we justify the action by a logic of consequentiality…'Why did you do that?'...'I expected it to have consequences that I value.'"

[199] For a detailed overview of the emergence and evolution of Earth system science see (Steffen et al. 2020).

Colding 2002). Earning normative appeal in Arctic scholarship and policy-making alike,[200] the notion of *resilience* is generally defined as the capacity of a social-ecological system to absorb or withstand perturbations, or other stressors, so that a system can maintain its fundamental structure, function, feedback, and identity (Gunderson and Holling 2002; Walker et al. 2006). More precisely, it relates to a system's capacity to self-organize, learn, adapt, and transform when required (Holling 1973; Gunderson and Holling 2002; Walker et al. 2004). Meanwhile, system transformation is understood as a profound shift that alters human-environment interactions and feedback within a system (Walker et al. 2004). System transformations can be triggered by both endogenous drivers like the collapse of a resource stock (constituting a crisis) or a shift in human behaviour (constituting a choice), or exogenous drivers like biodiversity loss or globalization. Law is one element that has a pervasive influence on both endogenous and exogenous drivers of change (Fischer-Lescano and Teubner 2004; Ruhl 2011).

Together, these research frameworks provide a complementary and comprehensive understanding of stability and change (Blaikie et al. 2003; Cornell and Jackson 2013; Walker et al. 2004; Holling 1973; Anderies et al. 2013). Most importantly, though, they recognize that even relatively stable systems can become vulnerable when multiple stresses combine in a manner that magnifies and propagates their synergistic impact across different temporal and spatial scales (Costanza, Graumlich, and Steffen 2007, 269). As an example, Steffen et al. (2018) draw on this array of literature to argue that the current trajectory of our Earth system — driven by human emissions of greenhouse gases and biosphere degradation — is leading us toward a planetary threshold of a 2°C rise in temperature that could flip humanity into an alternative, irreversible stable state known as "Hothouse Earth". As I highlighted in Chapter 2, many indications suggest that the Arctic system is experiencing transformational change as well (Nilsson and Koivurova 2016, 179); the ongoing decline of multi-year Arctic sea ice and the opening of the Arctic Ocean to a relative increase in shipping, among other things, serve as salient examples of this change.

This research also finds that an alternative stable state, like "Hothouse Earth" or an ice-free Arctic Ocean year-round, is not the only option (Collins et al. 2013; Intergovernmental Panel on Climate Change and IPCC 2013; Steffen et al. 2018; Rosen 2017, 154). There are multiple alternative and competing stable states to which we, as a society, can choose to navigate to by re-orienting our behaviour, human values, equity, institutions, economies, and technologies by removing barriers to change (Steffen et al. 2018, 8258; see also Walker et al. 2004; Westley et al. 2011; Westley and Antadze 2010; Olsson and Galaz 2012; Rockström et al. 2017; Geels et al. 2017; O'Brien 2018). For instance, Steffen et al. (2018) point to an alternative pathway for our Earth system, guided by human-created feedbacks leading to a more desirable stable state, known as "Stabilized Earth". There are alternative pathways for the Arctic as well, with some research suggesting that rapidly melting Arctic sea ice remains reversible within a short (in geological terms) time frame of 50-100 years (Steffen et al. 2018, 3; Rosen 2017).

However, both scenarios require "a fundamental reorientation and restructuring of national and international institutions," including international law, "toward more effective Earth System governance" (Biermann et al. 2012, 1306–7; Steffen et al. 2018, 8257; Kotzé and Kim 2019; Kotzé 2020; Biermann and Kim 2020, 307). They require institutions that can cope with accelerating, non-linear change and increasing complexity. Still, "there is much uncertainty and debate about how this can be done — technically, ethically, equitably, and economically…" (Steffen et al. 2018, 8256; Westley et al. 2011; see also Ruhl 2011). This uncertainty might also explain some of the reluctance of Arctic scholarship, as well as scientific reports and

[200] See, for example, the "Arctic Resilience Interim Report" 2013 and Stockholm Environment Institute and Stockholm Resilience Center 2016.

assessments, to extend their application of a complex systems ontology to the role of law and governance in managing the ongoing transformation of the Arctic system (see Nilsson and Koivurova 2016, 180). For instance, the 2016 Arctic Resilience Report applies a systems ontology to understanding the nature of change in the Arctic system but falls short in extending that lens to Arctic environmental governance as well. Instead, the descriptive and normative discourse surrounding the role of international law in the Arctic invokes a legal positivist ontology, as outlined earlier.

Research on Earth system governance partly takes on the challenge of seeking to understand the role of organized human response in steering the co-evolution of human-environment systems (Biermann 2007, 328). Until recently, though, there was no "explicit, systematized and comprehensive research agenda focusing exclusively and comprehensively on the juridical dimensions of earth system governance." (Kotzé and Kim 2019). As a consequence, there is an increasing call for the inclusion of this dimension in the research agenda on Earth systems governance (see Kotzé and Kim 2019; Burch et al. 2019; Kotzé 2020) and for juridical science to embrace a complex systems ontology (Murray, Webb, and Wheatley 2019, 5; see also Ruhl 2008b) in describing both (1) the object of regulation, such as the Arctic, and (2) the regulatory system itself, in this case international law. [201]

Nascent legal scholarship at the intersection of law and complexity – largely drawing on theories of ecology – already embraces some elements of this call to action. For one, it seeks to avoid the particular pitfalls of other theoretical approaches to law, like the disregard of the foundational rules of law outlined earlier, by applying a complex systems ontology to the regulatory system itself. In doing so, legal scholars like J.B. Ruhl (1997) argue that the legal system is a complex adaptive system (see Chapter 2) which exhibits many of the same constitutive and behavioural properties of the complex systems it seeks to manage (see Appendix 4).[202] It is heterogeneous, consisting of an array of sovereign states and institutions (e.g. international tribunals, international courts, national parliaments, national legislatures, national courts, national agencies, etc.) and norms (e.g. due process, equality, fairness) through which actors (e.g. legislators, bureaucrats, judges, advocacy groups) employ various instruments (e.g. conventions, treaties, standards, customary international law, advisory opinions, recommendations, declarations, memoranda of understanding, guidelines) designed to influence the behaviour of various other actors (e.g. governments, companies, individuals). These components are interconnected through stochastic processes (e.g., negotiations) with feedback mechanisms (e.g. appeals to higher courts, commissions) that drive the legal system's behaviour over time. These legal systems are embedded in hierarchical and non-hierarchical network architectures (e.g., cross-references in international treaties) which often exhibit self-organizing properties. Shifting the lever in one part of the system (e.g. like the adoption of a rule) may prompt another component to enforce a different rule, leading another to issue an advisory opinion, and so on (Ruhl and Katz 2019a, 150). Actors within this system follow procedural rules (e.g., consultation). However, unlike the national legal system, the international legal system lacks governing rules for other rules (see section

[201] As an example, legal scholars Kotzé and Kim (2019) argue for the development of what they call Earth System Law, an overarching legal phenomenon that would comprehensively accommodate and encapsulate the juridical aspects of Earth systems governance. The research agenda surrounding Earth system law sets out to answer questions like: "How does earth system law help us go beyond conventional legal theories in order to address the many and varied dissonance between the law today and novel challenges in the Anthropocene?"

[202] Unlike Luhmann and Teubner's work on legal autopoiesis, which takes a qualitatively different approach by removing the person from the system of law, scholarship at the intersection of law and resilience understands the legal system as emergent, comprised of a multitude of interacting and co-evolving actors, ideas, rules, and institutions — rights, obligations, and responsibilities — which lay the foundation for a self-organized structure that gives rise to complex systems dynamics like non-linearity, feedback loops, and path dependency.

2.2.1. in this chapter). There is also no central controller, with some actors exhibiting more power to develop and implement rules than others. As noted earlier, this is the case in Arctic environmental governance, where the legal status of Arctic Indigenous peoples often limits their ability to participate in international treaty-making processes (Ingimundarson 2014, 190; Koivurova 2010, 151). The same would hold true in the case of an Arctic treaty. I provided examples of how this plays out in practice and how it can lead to both governance success and governance failure in Chapter 4.

In this regard, existing scholarship highlights that a focus on legal complexity has ethical implications, too. The application of a complex systems lens beyond geophysical systems calls for a shared responsibility for and participation in the legal system; it requires scholars and policy-makers alike to re-examine power, rights, and rules (Murray, Webb, and Wheatley 2019, 157). For instance – as is visible in the case of the Inuit Petition – changes in the Arctic system emphasize how the interconnected nature of various closed, self-referential systems in Arctic environmental governance – including the climate regime and the human rights regime – can fail to achieve normative consistency between systems (see Teubner 1993; Fischer-Lescano and Teubner 2006). The ability to identify and assess such points of interaction, where synergy or conflict may occur, is critical.

Research at the intersection of law and complexity, in turn, directs legal systems to think like complex adaptive systems (Ruhl and Katz 2019a, 162). For instance, unlike the proposal of a more coherent Arctic regime complex, which assumes that this form of governance would be more effective at managing the Arctic system, the literature on law and complexity recognizes that a resilient whole (in this case, the Arctic system) is not necessarily defined by resilient components (like its governance system) (see Ruhl 2008b, 908, 2011, 1382–83) seeking to isolate the "good" from the "bad" through concepts, rules, procedures, and institutions (see also Ruhl 1997; 2008a; 2012; Ruhl and Katz 2019b; Arthur 1994). In fact, even by isolating the "bad" from the system – as agreements like the SAR, EPPR and *Polar Code* seek to do – it does not resolve issues related to system non-linearities, for instance (Ruhl and Katz 2019a, 160). In other cases, no less, this normative approach to social resilience can provide human communities with "the ability to withstand external shocks or perturbations to their infrastructure, such as environmental variability or social, economic, or political upheaval, and to recover from such perturbations" (Timmerman 1981). As I write in Chapter 4, the feedback loops generated by limiting and prohibiting particular chemicals through a polycentric governance approach – including the development of the *Stockholm Convention on Persistent Organic Pollutants* – prevented their emission, as well as their negative impacts on the Arctic social-ecological system (Prior 2013; Downie and Fenge 2003).

At the same time though, the characteristics for which the law is often revered — including order, certainty, and predictability (Ruhl 1997; Ebbesson and Hey 2013) — can be of limited help when anticipating system transformation (Holling 2012, 37) and may, in fact, hinder the resilience of the system as a whole (Chapin 2010; Biggs, Westley, and Carpenter 2010; Scheffer et al. 2012). Another example is the deep stability surrounding the UNCLOS, as the primary framework for oceans governance, and the ways in which it can draw Arctic coastal states away from informal institutions, like the Arctic Council, toward a formal legal rationality, especially at the expense of the voices of Arctic Indigenous peoples (Ilulissat Declaration 2008).

The law often appears to be conservative to change (or what others refer to as stability), making it difficult for various actors to envision how law could contribute to, or manage, change (Kotzé and Kim 2019). However, research at the intersection of law and complexity increasingly seeks to also develop principles for a normatively acceptable design and operation of legal systems given their complex adaptive properties. This particular strand of research argues that the law can neither command-and-control, nor

deregulate its way to resilience (Adler 2012). In terms of the former, it builds on "a deep skepticism that top-down, centralized regulation can avoid unintended consequences or keep up with the co-evolving systems, and that more flexible, decentralized forms of governance fit better with the legal complexity model (Cherry 2008; Hornstein 2004)." At the same time, there is an understanding that deregulation, as a means of simplifying legal regimes, could lead to cascading effects with potentially negative impacts on the system.

While the call to action – to include a juridical dimension in the research agenda on Earth systems governance and for juridical science to embrace a complex systems ontology – put out by Kotzé and Kim (2019) is promising, most of the research to date remains descriptive and theoretical, as opposed to empirical and prescriptive (Ruhl and Katz 2015, 23; see also Katz and Bommarito 2014; Murray, Webb, and Wheatley 2019; Kotzé 2020; Ruhl and Katz 2019b). In moving this research agenda forward, the most pertinent questions relate to how legal complexity is measured, monitored and managed. This requires scholars to move beyond descriptive, prescriptive and ethical discussions toward empirical studies. At this time though, there is no standard toolbox of metrics and methods – a challenge which I faced as I first embarked on this research journey. Even though there are empirical studies at a national scale, the international and global scales remain understudied. Together, theoretical and empirical studies can help us understand what we do not know and cannot predict (Ruhl and Katz 2019a, 160) – a necessary but missing piece in the study of Arctic environmental governance (Smieszek 2019c).

5. Conclusion

At the beginning of this chapter, I cited Boggs (1933), Huebert (2009), Byers and Baker (2013) to highlight a long-standing recognition of both the Arctic's unique environment and the challenges that it presents for both governance and international law. Both the material environment, dominant worldviews of the Arctic and our technologies have significantly transformed since Boggs noted that the polar regions required the "special development of international law" in 1933 and Rob Huebert's more recent observation of the Arctic as a complex system in need of new forms of governance, in 2009. Curiously enough, the theoretical underpinning of Arctic environmental governance remains largely unchanged with actors continuing to draw on a legal positivist ontology for governance innovation.

In this chapter, I argued that the tendency to turn to the conventional legal positivist toolkit for alternative solutions to managing the Arctic system is not only insufficient but tells us very little about law's capacity to manage change. More specifically, the two dominant, alternative proposals for Arctic environmental governance – the idea of an Arctic Treaty and the push for a more integrated Arctic regime complex – provide neither a solution, nor a conceptual underpinning that can respond to the emerging material and social reality of the Arctic system. Neither engages directly with the constitutive and behavioural characteristics of the Arctic system, nor the triggers and characteristics of governance failure *per se*. As a consequence, these two debates remain rhetorical, to be found in academic articles, policy documents, or NGO reports.

Even other dominant constructivist theories of international law, which understand the law as a dynamic process with various participants (state and non-state), portray the legal process as autonomous from the material world. What is more, elements of these theories continue to be guided by a positivist methodology. In surveying these theories, I find that there is no general theory of change in international law; no theory that can explain normative variability (as a critical system feature) in the Arctic system – and the tensions

that arise therefrom – in a similar manner to ongoing discussions of the emerging material reality of the Arctic system, as referenced in regional and international scientific assessments, in scholarship, in policy-documents, even by the media (see Chapter 2).

In this way, the challenge of managing change in the Arctic system speaks to a much broader struggle in institutional design: the desire for stability amidst rapid change. It also raises several important questions, including: what counts as law? Who participates in making it? And what is the relationship of the legal system to other systems? Most importantly, though, it gives rise to the question: do our current ways of thinking about the law and/or the structures of law need to change? After all, continued governance failure, as it is outlined in Chapter 4, will likely continue to demand alternative governance responses. At the same time, different ontological, epistemological, and nomological assumptions about what this should look like will likely also lead to tension, aggravating frustrations, undermining confidence, threatening cooperation, and high levels of cognitive dissonance.

In the following chapter, I introduce a prospective research agenda for bringing together complexity science and Arctic environmental governance.

Chapter 6: Reimagining Arctic Environmental Governance

"If your theory is found to be against the second law of thermodynamics I can give you no hope; there is nothing for it but to collapse in deepest humiliation."

\- Sir Arthur Eddington

I am writing the conclusion to this research project in the autumn of 2020. While the realities presented by the ongoing global coronavirus pandemic dominate the news cycle, the Arctic environment has seen some of the starkest changes to date. In 2020, as in previous years, the Arctic experienced significant wildfires, including smaller ones in parts of Alaska and northwest Canada, and an astounding 18,591 separate fires in Russia's easternmost districts (Witze 2020; McCarty, Smith, and Turetsky 2020; University of Colorado at Boulder 2020). This year, unlike previous years, the wildfire season in Russia's Arctic started two months sooner and was unprecedented in scope. Wildfires in Siberia decimated 14 million hectares of land and led to a record spike in carbon emissions – rising from 208 megatons in 2019 to 395 megatons in 2020 – "with smoke plumes covering the equivalent of more than a third of Canada" (Lopez 2020; Witze 2020).

While wildfires on permafrost in the boreal regions of Siberia are not out of the ordinary, fifty percent of these wildfires occurred above 65° North latitude on permafrost with high ice content (McCarty, Smith, and Turetsky 2020, 659), many of them in Russia's Sakha Republic (Lopez 2020). These so-called "zombie fires" (Aparna 2020; Witze 2020) – characterized by their ability to smolder underground during the winter months, burn large areas, and drive substantial carbon emissions (McCarty, Smith, and Turetsky 2020, 659; Aparna 2020) – are increasingly prevalent due to warming temperatures and drier surface conditions, which provide an ideal setting for fires to both burn and persist over long periods of time (Sengupta 2020). Yet these fires remain poorly understood; these areas of frozen carbon-rich peatland were largely assumed to be fire-resistant (Witze 2020) and because of this, their rapid thawing and the consequent release of large amounts of greenhouse gases, including methane, remain unaccounted for in climate models (University of Colorado at Boulder 2020). This is important to note, given that almost half of the world's peatland-stored carbon is located along the Arctic Circle. In fact, a recent study by Hugelius et al. (2020) provides evidence that these northern peatlands could eventually shift from being a net sink to a net source of carbon, thereby further accelerating climate change.[203]

Then, in May, an aged fuel tank at a power station – a subsidiary of Norilsk Nickel, the world's leading nickel and palladium producer – released 21,000 tons of diesel (a quarter of the oil that Alaska produces each day) into the subsoil and waters of the Ambarnaya river near the remote northern city of Norilsk, Russia (Bennett 2020). In Chapter 2, I outlined some of the challenges that cities like Norilsk face when the ground beneath them begins to shift. The erosion of the tank's foundation due to melting permafrost is precisely what the company has attributed the accident to. The Norilsk spill is significant because it is one of the largest oil spills in Arctic history, comparable to the 1989 *Exxon Valdez* oil spill, where an oil tanker ran aground and spilled 37,000 tons of crude oil off of Prince William Sound, Alaska. Alexander Uss, the

[203] McCarty, Smith, and Turetsky (2020, 660) point to the Arctic Council as a well-placed forum for developing a pan-Arctic fire-monitoring system "driven by knowledge co-production with Indigenous, traditional and modern Arctic communities and economies."

governor of Krasnoyarsk, the region in which Norilsk lies, describes seeing "rivers of fuel." (Bennett 2020).[204]

In a statement, Russia's Ecology Minister Dmitry Kobylkin noted that "[t]he scale of the damage to Arctic waterways is unprecedented," (Last 2020) with the cost to nearby bodies of water estimated at $2.8 billion Cdn and the harm to subsoil estimated at $14 million Cdn (Thomson Reuters 2020). What is more, the potential for cascades of failure is crystallizing. In previous years, the Ambarnaya river would have been frozen, but because the region experienced the warmest Spring since 1936, the ice on the river broke-up much sooner than normal (Bennett 2020; Staalesen 2020).[205] Furthermore, unlike the *Exxon Valdez* spill, which involved thick crude oil for which best clean-up practices were known, the Norilsk spill involves thinner oil in freshwater which is more difficult to clean-up (Cage, Law, and Glanville 2020). Thus, despite ongoing clean-up efforts, eyewitness accounts from activists, indigenous peoples, and the governor of the region all suggest that the oil has made its way north through the Ambarnaya river into nearby Lake Pyasino, which feeds into the Pyasina River and flows into the Kara Sea in the Arctic Ocean at which point "it is unclear where it will go, whether it will head toward Finland and Norway, or the U.S. and Canada" (Northam 2020; see also Bennett 2020; Stammler 2020; Last 2020).

If the oil makes its way to the Kara Sea, it will contaminate water along the migration route of fish and have potentially devastating consequences for the subsistence livelihood of indigenous populations (Stammler 2020). Furthermore, scholars like Rob Huebert suggest that if the spill makes its way into the Arctic Ocean, it will be an interesting test of the 2013 EPPR Agreement and "whether or not good sense and cooperation can perservere…" (Northam 2020).

The news did not stop there. Two months later, in July 2020, 45 tons of aviation fuel leaked from a Norilsk Nickel pipeline in the Arctic. Meanwhile, in August, the Milne Ice Shelf at the fringe of Ellesmere Island, the last fully intact ice shelf in the Canadian Arctic and the world's last known epishelf lake, collapsed after losing more than forty percent of its area in two days at the end of July (Warburton 2020).[206] Warming temperatures together with offshore winds and increasingly open waters contributed to its break-up. September 2020 saw minimum Arctic sea ice at its second-lowest extent since 2012, in part due to an early sea ice melt season kicked off by the same Siberian heat wave that contributed to Arctic wildfires and the melting of the Ambarnaya river (Ramsayer 2020).

September also saw the return of the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) expedition, an international team of 442 researchers from 80 institutions and 20 different countries. According to Anja Karliczek, Germany's Federal Minister of Research, the MOSAiC expedition (which received significant funding from the German government) set out to overcome "the greatest challenge facing humanity" by "transcending the borders of disciplines and nations alike." (Quinn 2020). Its main research vessel – the *Polarstern* – spent the past year drifting across the Arctic Ocean, frozen into the sea ice. During this time, scientists aboard the vessel collected an unprecedented amount of data on the Arctic climate system including its atmosphere, ocean physics, and biology (Harvey et al. 2020). While scientists will draw on this data for decades to come, the preliminary observation from Markus Rex, the mission's lead, is telling: "You just need your eyes to see that the Arctic ice is dying."

Perhaps the sharpest assessment comes from James Overland (2020), an Oceanographer with the U.S. National Oceanic and Atmospheric Administration, whose most recent article argues that, "No one should

[204] Norilsk Nickel denies that there is any risk of the oil flowing into the Arctic Ocean.
[205] In June, northern Siberia experienced the highest northernmost temperature at 38°C (Overland 2020).
[206] An epishelf lake is a freshwater lake dammed by an ice shelf and floating atop ocean water.

be surprised any longer when extreme events occur in the Arctic. They will continue with greater frequency than any time on record (Schweiger, Wood, and Zhang 2019)." If so, then there is an imperative for scholarship at the intersection of law, complexity science, and Arctic environmental governance to actively work together to manage this change.

***

1. Introduction

In this concluding chapter, I return to my central research question: Is the emerging material reality of the Arctic system fundamentally incommensurable with the functional requirements of the law that seeks to govern it? In reviewing the previous five chapters, I conclude that that is the case. I then go on to argue that a complex systems ontology might be able to help us identify how to build a better governance structure for the Arctic and outline a prospective research agenda for bringing together complexity science and Arctic environmental governance using three specific complexity tools.

2. Reflections on the Research Process

One of the greatest challenges presented by this project is its interdisciplinarity, sitting at the intersection of three fields of research – complex systems theory, legal theory, and the study of Arctic (environmental) governance and Polar Law. As such, it seeks to contribute a set of findings to inform all three areas of research.

One of the greatest challenges of this research project was the process of bringing together two disparate fields of research – law and complexity – to study Arctic environmental governance. This nexus proved to be particularly challenging for two reasons: first, because the intersection of law and complexity remains understudied at an international and global scale (Kotzé and Kim 2019); and second, because there are fewer empirical and prescriptive studies than descriptive and theoretical ones (Ruhl and Katz 2015, 23; see also Katz and Bommarito 2014; Murray, Webb, and Wheatley 2019; Kotzé 2020; Ruhl and Katz 2019). In other words, there is no clear roadmap for a project like this. A key contribution of this project is thus a reflection on the interdisciplinary research process itself.

When I first set out on this project, my intention was to explore how normative variation among various formal and informal institutions of Arctic environmental governance play out on the ground, and the ways in which these institutions can guide the transformation of the Arctic system in different directions. Originally, I was interested in exploring whether reflexive law could provide an effective alternative to current governance approaches, including instruments like the UNCLOS, and the challenges that these rigid, mechanistic structures pose to our ability to effectively respond to some of the characteristics that increasingly define the Arctic system – characteristics like non-linearity, thermodynamic openness, connectivity, and feedbacks.

The idea of a reflexive law was interesting to me because it recognized that a rules-based approach to law is insufficient to manage increasing complexity; instead, it focused on structure and process, like

coordinating goals and activities in various elements of society (Teubner 1983, 239; Stewart 2001, 130–31). Following from this, my plan was to identify characteristics of a proto-reflexive law, to search for empirical evidence of this law in the Arctic and isolate the conditions that foster it. Finally, I would determine whether instances of proto-reflexive law could be scaled-up to produce an alternative, reflexive legal approach to Arctic environmental governance.

With this research trajectory in mind, I mapped the normative instruments relevant to Arctic environmental governance (now Chapter 3) and sought to identify why they are insufficient in governing increasing change and complexity (now Chapter 4). Following from this, I examined the proposed governance alternatives and why those are insufficient, too (now Chapter 5). Then, I turned my attention to the literature on reflexive law to identify characteristics that I could use to identify instances of proto-reflexive law in the field. This is where I hit my first roadblock. A lot – if not all – of the literature was dedicated to theory-building and largely focused on the national scale (see Teubner 1983; Orts 1995; Gaines 2002), providing little reflection on how reflexive law is identified, or applied, to a transnational context, like the Arctic. Stumped, I turned to the literature on legal autopoiesis (Teubner 1993; 1993; 1994; Luhmann 1985; 2004; Ellis 2010), and to research at the intersections of law and complexity (Katz and Bommarito 2014; Ruhl and Katz 2015; Ruhl and Katz 2019; Webb 2005; Webb 2014; Murray, Webb, and Wheatley 2019), as well as law and resilience (see for example Cosens et al. 2017; Ruhl 2011; 2012; 2008b; 1997; Garmestani, Craig, and Cabezas 2009; Allen and Garmestani 2014; DeCaro et al. 2017), in search of criteria. Although theoretically interesting, much of this scholarship fell short of my ambitions; its case studies also focused on the national scale. Moreover, a significant part of the research at the intersection of law and complexity and law and resilience was focused on describing legal systems using a set of concepts from complexity science, rather than exploring how the law is used to manage complexity within the systems it seeks to govern, how law's complexity interacts with the complexity of those systems, or how the successes and/or failures of law can be measured in those cases. All of this research, especially the study of legal autopoiesis – or how a system produces and reproduces its own elements by the interaction of its elements – made evident that "the most important feature of evolution is the maintenance of the [legal] system's internal cyclical structure, not its ability to adapt to the environment." (Teubner 1993, 56). Yet I was most interested in understanding the capacity of international law to manage a rapidly changing Arctic system.

Without a set of tested criteria, and with Teubner's work in mind, I went back to the drawing board. Having been one of the contributing authors of the *Arctic Resilience Report*, I made note of the application of a complex systems ontology to the study of change in Arctic social-ecological systems (Arctic Council and Stockholm Environment Institute 2016, 19). As you read through the report, though, it becomes evident that the same ontological lens was not applied to the study of Arctic environmental governance, including the study of international law, and its role in shaping change.[207] I returned to the literature on Arctic

[207] The *Arctic Resilience Interim Report* (Arctic Council, Stockholm Environment Institute, and Stockholm Resilience Centre 2013, 61) acknowledged the role of law in resilience, noting that because of the complexity of Arctic change, "legal issues will be an important lens through which changes, including thresholds, should be viewed…" With this, the authors of the Arctic Resilience Report committed the case studies and final analysis of this report to a legal lens. Ultimately, though, neither the *Arctic Resilience Interim Report* (2013), nor the subsequent *Arctic Resilience Report* (2016) [to which the author contributed], used this lens (Arctic Council and Stockholm Environment Institute 2016). This component — with a focus on circumpolar governance, including existing legal structure — was published in near-conjunction with the Report by two of its contributing authors, Annika Nilsson and Timo Koivurova (2016) in an article titled "Transformational Changes and Regime Shifts in the Circumpolar".

environmental governance and Polar Law in search of an explanation for why this booming, yet fragmented (Bankes 2018), area of research shies away from applying a complexity lens.

In doing so, I observed several elements of incommensurability between the ontological, epistemological, and normative commitments of complexity science and the law. The first is an ontological incommensurability related to the level of order within a system – complexity ontology reveals the unstable, disordered, and messy parts of a system while the law reflects stability, rigidity, and control. The second is an epistemological incommensurability related to worldviews; while complexity science focuses on the big picture and the connections between systems, legal theory tends to focus on details, and on the evolution of the legal system itself rather than its co-evolution with other systems. The third is a temporal mismatch between a rapidly changing environments and the often slow-changing nature of law. Finally, the fourth incommensurability is a spatial mismatch between transboundary challenges, like climate change, and the sovereign, fragmented, sectoral approaches of law.

I found that in an Arctic context, this incommensurability begins with the definition of the Arctic: current scholarship on Arctic environmental governance is often imprecise in its description of change and complexity in the Arctic system because it defines the Arctic based on geography and issue area (Chapter 2). This mechanistic ontology assumes that a system has easily discernible or closed boundaries, that its behaviour is an additive consequence of the behaviour of its parts, that cause and effect are directly proportional, and that it is possible to discriminate between multiple causes to identify a single, necessary and sufficient cause for a particular phenomenon (Homer-Dixon 2007; 2008). However, the emerging material and social realities of the Arctic – including its transition from a relatively geophysically-closed to an increasingly open area – challenge this mechanistic ontology. When the definition of the Arctic is based on a complex systems ontology (Chapter 2) – and is defined as a thermodynamically open, integrated, dynamic, and complex system with multiple equilibria – instead, it brings several fundamental things into question including notions of sovereignty and the law (Thomas 2013, 57).

Specifically, the legal positivist theoretical underpinning of the current approach to Arctic environmental governance – with a preference for precision and formality – runs counter to a complex systems ontology and the reflexive law which I had originally envisioned (Chapter 3 and 5). It seeks to provide stability by mapping terrain, establishing property rights, regulating access and ownership of resources, delegating responsibilities, and providing guidelines for participation instead. In doing so, the sovereign becomes and remains the facilitator and moral and political authority from which legitimacy derives. This legal positivist approach – which reflects an evolutionary process whereby the law seeks to reinforce its own system dynamics – mirrors the conclusion drawn by Gunther Teubner, above. It also helps explain why the past two decades of Arctic environmental governance has seen a relatively significant rise in formal agreements and informal rules (like declarations and guidelines) – as the Arctic geophysically opens, the dominant actors of the region seek to maintain control and, in some areas, close-off the Arctic through positivistic means – by reinforcing the role of the sovereign (Ilulissat Declaration 2008; Dodds 2019; see also Simon Dalby 2017; Agnew 2020), regulating access (Schatz 2018), mapping terrain (Brekke 2014), and developing guidelines for participation (Council 2013a; Graczyk and Koivurova 2013). The Arctic Fisheries agreement, outlined in Chapter 3, serves as a salient example of how positivistic approaches to law seek to bound elements of the Arctic for certain actors.

At the same time though, there is a literature which suggests that current approaches to Arctic environmental governance are insufficient, that the Arctic is in need of governance innovation (Corell et al. 2010; Young 2011, 332). To better understand *why* a normative evolution toward the legalization of Arctic environmental governance (Chapter 3) may be insufficient (Chapter 4), I turned to three cases – the

governance of POPs, the intersection of climate change and human rights, and the governance of Arctic shipping and navigation – and found that legal formality has led to governance success (in the case of POPs), as well as failed to deliver the desired outcome (in the case of the Inuit Petition), or has the potential to do so (in the case of Arctic shipping and navigation). Once again, in looking at some of the characteristics that contributed to the difference in outcome, an underlying ontological incommensurability became evident: a dissonance between the nature of change in the Arctic system, which is increasingly non-linear and complex, and the reductionism of law, built on a Newtonian ontology of linear change and equilibrium which rejects integration, ambiguity, and paradox (see Beinhocker 2006; Unger and Smolin 2015, 49). I deduced that proposals for an alternative approach to Arctic environmental governance would need to respond to this mismatch between two realities: the complexity of the Arctic system and the response provided by the current governance approach.

Indeed, as I outline in Chapter 5, there are two dominant alternative proposals to current approaches to Arctic environmental governance – variations of an Arctic Treaty (see for example Pharand 1992; Nowlan 2001; Koivurova and Molenaar 2009; Verhaag 2002) or a more coherent and integrated Arctic regime complex (see for example Stokke 2007a; Young 2012) – that continue to resurface, time and again. To this date, though, neither has been implemented or necessarily reflects on how to manage some of the defining characteristics of the Arctic system, including its heightened connectivity. Similar to the current governance approach, both are positivistic in nature.

Thus, in an effort to find an alternative approach that could account for the complexity of the Arctic, I turned to non-positivist theories of international law, particularly dominant constructivist theories including transnational and international legal process theory (Koh 1996; 1997; 1998), as well as interactional legal theory (Brunnée and Toope 2010). While these theories reflect on stability and change (Finnemore and Sikkink 2008; Brunnée and Toope 2010), as well as normative complexity (Koh 1998), they continue to understand the law as autonomous from the outside material world (Chapter 5). There has been some recognition of this research gap among scholars in these fields beginning to engage with complexity theory in a limited scope (Brunnée 2017).

I also turned to scholarship in Earth systems governance where scholars are increasingly interested in bringing together the juridical and Earth System sciences (Kotzé and Kim 2019). As noted in Chapters 1 and 5, a call for greater interaction between these two fields of study over the past year, or so, reinforces that there is a critical gap in research. I concur. Reconciling research on complexity science and the law – especially their deep ontological commitments – and bringing this nexus to bear on Arctic environmental governance has often felt like an insurmountable challenge for three reasons: first, it necessitated prerequisite research that engaged a complex systems ontology to explore the degree to which current approaches to Arctic environmental governance have responded to increasing complexity and change in the Arctic system; second, it required an exercise in mapping the complexity of the system of Arctic environmental governance onto the complexity of the object of regulation; and third, it required a study of how current scholarship on Arctic environmental governance engages with a complex systems ontology.

I have outlined my findings and, essentially, my diagnosis of the problem in the previous five chapters. Thus, the answer to my central research question is that the emerging material reality of the Arctic system, defined by characteristics like heightened connectivity and non-linearity, *is* fundamentally incommensurable with the functional requirements of the dominant legal positivist approach that seeks to govern it. It is increasingly clear that the conventional legal positivist toolkit does not lend itself to conversations on how the law interacts with other systems, and that systems like the Arctic necessitate a legal form that is more consistent with their complexity.

3. A Prospective Research Agenda for Complexity Science & Arctic Environmental Governance

Research frameworks increasingly embrace elements of complexity science to explore variation in the Arctic material environment, as well as parts of its social-ecological system. However, as I highlighted in previous chapters, a complex systems ontology is rarely, if ever, extended to the study of normative variation. Yet, factors relating to a changing Arctic – including a rapidly altering environment, tightly linked social-ecological systems, and the opening up of the region to the rest of the world – are *also* leading to a cognitive shift with deep effects on the evolution of Arctic norms and worldviews, the moral grounding and anchor of legitimacy and authority in the Arctic system. The ability to understand how these different system elements interact and feedback on one another is crucial to our ability to manage change therein.

Thus, in the second half of this chapter, I seek to respond to Kotzé and Kim's (2019) call to action – for juridical science to embrace a complex systems ontology and *vice versa* – with a prospective research agenda for bringing together complexity science and Arctic environmental governance. I argue that a complex systems ontology can help us identify how to build a better governance structure for the Arctic. A complex systems ontology can shift the focus from the substance of law to how the law interacts with other systems by providing a unique set of analytical concepts and tools that capture and exhibit a noteworthy comfort with many of the constitutive and behavioural characteristics of the Arctic system. These characteristics include emergent phenomena, multiple agents, non-linearity, material social systems (composed of individuals) and natural systems. In this way, a complex systems ontology is fundamentally different from the positivist legal theory, which currently underpins Arctic environmental governance. It also contributes to theories of change and transformation.

More specifically, I propose a set of three complexity tools, two descriptive and one prescriptive – (1) the WIT framework, (2) the law of requisite variety, and (3) the energy landscape metaphor – which can help us re-imagine the Arctic system and explore the role of international law in anticipating and responding to critical transitions therein (see Scheffer et al. 2012, 344). Drawing on the information in the previous five chapters, I tease out how, together, these three tools might allow us to reimagine Arctic environmental governance in the following section. The introduction of these three tools is significant because the scholarly literature on law and complexity has yet to include an in-depth engagement with specific tools and heuristics from complex systems theory.

3.1. The WIT Framework

The WIT framework is an analytical framework developed by Rachael Beddoe et al. (2009) to identify coherent sets of interconnected and interdependent worldviews, institutions, and technologies – or WIT sets – which can act as barriers or openings to a "realignment of the way we view and interact with our surroundings" (2483), including our environment. In the sections below, I briefly present this descriptive tool. Then, I use it to outline two dominant Arctic WIT sets composed of different combinations of worldviews, institutions, and technologies – which I argue guide the interaction of agents in the Arctic system. This exercise is by no means conclusive, but instead seeks to illustrate how the WIT framework can contribute an analysis of the co-evolution of Arctic norms and worldviews – in relation to a changing Arctic environment (over time and space) – to a vibrant, ongoing discourse in Arctic governance.

3.1.1. What is a WIT?

Societies are generally organized around cohesive sets of worldviews, institutions, and technologies (Beddoe et al. 2009). Why these three variants in particular? In *Leverage Points: Places to Intervene in a System* (1999), environmental scientist Donella Meadows, outlined twelve leverage points within a complex system where a small shift in one point could produce a large shift in another. Worldviews, institutions, and technologies all correspond with leverage points highlighted by Meadows: worldviews correspond with Meadows' point two, a mindset or paradigm out of which the system – goals, structure, rules, etc. – arises; institutions speak to Meadows' point four, whereby a system's rules define scope, boundaries, and rules of freedom, while technologies complement Meadow's list of leverage points throughout. I outline each variant in greater detail below.

A) Worldviews

Worldviews are mental networks of concepts, beliefs, and values which allow individuals and groups to interpret the world around them; this includes the relationship between society and the environment (see Wendt 1994, 389).[208] Often, worldviews are "unstated, deeply felt, and unquestioned" (Beddoe et al. 2009, 2484), and while they are neither normatively good, nor bad, they provide boundary conditions within which institutions and technologies are designed to function (Ostrom 2005). Worldviews underpin our social norms and legal norms, from the basic acceptance of the need for law in society to more substantive and value-laden understandings (Brunnée and Toope 2010; Kuhn 1970; Winch 1958; Castells 2009). These worldviews also set goals, thereby guiding actions in response to selection pressures. In other words, they choose which institutions or technologies are used, which in turn feed back onto the system as a whole (Davidson 2010, 1142; Keohane 1997, 500). As an example, Beddoe et al. highlight how particular worldviews privilege economic growth while postponing actions to mitigate and adapt to climate change, and because a worldview like that gives some (largely western) societies a sense of meaning (Wendt 1994, 389; Cleaver and Whaley 2018) and security, it is particularly resistant to change.[209] Worldviews, as such, have both ideational and material power.[210] In an Arctic context, for instance, "geopolitical narratives are negotiable and man-made in order to serve the policy-makers [sic] distinct ideology determined by material and/or normative interests at a certain point in time." (Knecht & Keil 2013: 187).

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[208] Worldviews also encompass our relationship to nature, defining who forms knowledge about social-ecological change and how it is communicated. See for example Scholte 2000; Arctic Council and Stockholm Environment Institute 2016; Burns, Calvo, and Carson 2009; Hulme 2009; Flam and Carson 2008; Hollingsworth, Müller, and Hollingsworth 2002; Beddoe et al. 2009.

[209] Cleaver and Whaley (2018), for instance, write that "These meanings encompass worldviews about cause and effect in the human and natural worlds and different logics of action (for example the comparative values attributed to collective or individual action). Attribution of meaning is crucial for legitimizing and sanctioning relationships by relating them to accepted knowledge and familiar socio-political and environmental orders. Meaning (and power) therefore helps to ensure the acceptability and durability of institutional arrangements. Lessons for adaptive governance include the need to be aware that multiple processes of meaning making (beyond those of the adaptive governance focus) will likely shape adaptive governance arrangements in unplanned directions."

[210] There is a well-developed canon of literature that explores how norms reflect underlying power and interests. See for example Brunnée and Toope 2008, 7; Barnett and Duvall 2005; Lukes 2009; Dahl 1957; Kahler 2009; Castells 2009; Weber 2009; Carstensen and Schmidt 2016; Mann 1986.

B) Institutions

Institutions function as a normative expansion of our worldviews and are thereby also central in maintaining stability within a system (see Pierson 2000, 256; North 1990, 3; Cornell and Jackson 2013). In fact, they may be the central variant in maintaining WIT coherence (Beddoe et al. 2009, 2484; Myers, Kent, and International Institute for Sustainable Development 2008). Broadly speaking, institutions are both the formal and informal rules that guide our interactions – shaping goals, facilitating cooperation, mediating and resolving conflicts, alleviating collective action problems (Steinmo, Thelen, and Longstreth 1992, 3; Ostrom 2005) – within society and with our environment (see Beddoe et al. 2009, 2484; Meadows 1999; Giddens 1979). They range from complex international laws like the *United Nations Convention on the Law of the Sea* to unwritten cultural norms (i.e., what is ethical or moral). Institutions determine the level of "slack" (or level of flexibility) within a system, facilitate the emergence of new or reinforce existing worldviews, and determine how and when technologies are adopted by setting standards (Beddoe et al. 2009, 2484).

Institutions also seek to provide a level of predictability and social resilience to change (Cornell and Jackson 2013). When there is little slack in the system, though, institutions become difficult to change, persisting beyond the critical juncture at which they were conceived, at times producing feedbacks with unexpected and unintended consequences (March and Olsen 1989, 168; see also Beddoe et al. 2009, 2484; Dryzek 2005; Arctic Council and Stockholm Environment Institute 2016). This is significant in areas like the Arctic, where our ability to respond to shifts in worldviews and technologies increasingly demands reflexivity in the face of non-linear, abrupt, and typically irreversible shifts or flips in the Arctic system.

It must also be noted that the deeply interpretive nature of particular institutions, like the law, allows actors with different worldviews to draw on them to reinforce their respective normative goals. In this way, institutions can become sites of contestation.

C) Technologies

Technologies – device, method, process (Arthur 2009, 29) – are indispensable to how we live. They are the knowledge, tools, and techniques which humans use to mediate their environment (Arthur 2009, 27; see also Lin 2013, 1–4; Galaz 2014, 133; Beddoe et al. 2009; Homer-Dixon 2002). Technologies use energy and information to exploit the properties of their physical environment to meet various goals. In *The Nature of Technology*, Brian Arthur (2009, 28–29) identifies three particular forms of technology: 1) as a means to fulfill a human purpose (singular); 2) as an assemblage of practices and components (plural); and 3) as a collection of devices and engineering practices (general) available to a culture. If we look at the process of Arctic shipping, for example, we can understand ice breakers as a singular technology; plural technologies include broader shipping technologies built around particular phenomena, altering parts and practices to adapt to changing conditions like sea ice. The adoption of both singular and plural technologies can be driven by institutions, such as regulatory standards set by international bodies like the IMO. The entirety of these technologies – a collection of available past and present devices and engineering practices originate from and build on natural phenomena like our ocean currents or the heat of fire (Arthur 2009, 22), often combining old elements to form new ones.

Technologies function as a material expansion of different worldviews, feeding back onto them and their respective institutions (in an Arctic context, see for example Nilsson and Koivurova 2016). And because technologies can have both intended and unintended consequences – risks, uncertainties, and ethical concerns – for the environment, economy, and polity, it is crucial to understand the context within which they emerge and evolve (Lin 2013, 3, 7, 16 and 181).

These three variants create a mutually interdependent, reinforcing, and – ideally – coherent WIT set (see Figure 15). As the primary 'unit of selection' in the evolution of societies and their culture, WIT sets carry forward some information and structure through time. The desired outcome of a WIT set is a society that is adapted to its surrounding environment (Beddoe et al. 2009, 2484). This is measured by the ability of a WIT set, and its individual variants, to thrive and reproduce (Kauffman 1993; Kauffman 1995).

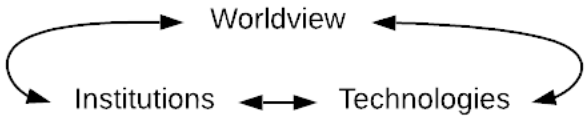

Figure 15: Interdependent, reinforcing WITs.

Still, it is possible for formerly adaptive WIT sets, or individual WIT variants, to become maladaptive due to a changing material environment, where there is a mismatch between the currently dominant WIT set and the fundamental properties of the system as a whole. "The result of a society locked-in to a maladaptive WIT," Beddoe et al. (2009, 2484) argue, "is, potentially, a societal decline like those observed in many historical settings."

A substantial realignment of how we understand and interact with our surroundings in response to this lock-in cannot occur without changing worldviews, institutions, *and* technologies together (Beddoe et al. 2009, 2484). This shift takes place through a co-evolutionary process that follows rules analogous to those governing organisms, (although WIT sets vary in their units of selection and method of transmission).

For each worldview, institution, or technology there are many variants. Still, WITs are not infinitely combinatorial. Each variant has its costs and benefits relative to local conditions and selection pressures – including changing resource availability, environmental conditions, shifts in the behavior of other key species or members of a population, etc. –which push a variant in the direction of a finite number of other variants. In other words, certain worldviews will lead to a finite number of institutions and technologies. Generally, more favourable variants increase in frequency while less favourable ones decrease. Within each WIT set, the individual components will be very different from the components in other WIT sets.

It is important to note, though, that the shift from a dominant to an alternative WIT set is not necessarily marked by a clear bifurcation point. Instead, the transition from one WIT to another is often messy. A period of crisis, in turn, is one where selection pressures act on individual variants enough that an alternative WIT set is necessary to alleviate the pressure. By this reading, crises are an essential part of the evolutionary process. "Indeed, when selection pressures become powerful enough to reshape society, it will appear to the adherents to the dominant WIT that their world is in a state of crisis. Such crises are best viewed as an opportunity to redesign a socio-ecological regime better adapted to the changing conditions" (Beddoe et al.

2009, 2485). At times, though, there are also barriers to the implementation of alternative WIT sets or specific WIT variants.

3.1.2. Why is it helpful?

In Chapter 2, I noted that complex adaptive systems like our legal systems share many common features with the complex non-adaptive systems they seek to manage. These features include constitutive properties such as synergistic causation and behavioural properties like non-linearity. In addition to this, complex adaptive systems have a living component: individual agents or groups with internal representations of the external environment and heuristics for how a system should respond to change. While these internal representations are often robust and persistent, they can be far from optimal and subject to selection pressures.

A WIT framework can provide an improved awareness of various WIT sets and help identify intervention points – to explore a) conceptual roadblocks, b) institutional roadblocks and c) technological roadblocks to societal sustainability – to adapt to changing circumstances. As such, the WIT framework moves beyond a legal positivist ontology, which focuses primarily on the institutional variant, to provide a more nuanced focus on the co-evolution of various system components – a missing component of both the legal positivist and non-positivist approaches outlined in Chapter 5.

3.2. The Law of Requisite Variety

The ultimate test of the robustness of a WIT set is whether it can thrive and reproduce itself in relation to its material environment – does it fit or is there a mismatch? I argue that the adaptive capacity of a WIT set can be defined by a third, prescriptive complexity tool called the *law of requisite variety*. The *law of requisite variety* (LoRV) is a principle that proposes a positive correlation between the complexity of a problem (in this case, accelerating, non-linear change in the Arctic system), the complexity of the actors who are generating solutions to the problem (in this case, both state and non-state actors in and outside the Arctic), and the complexity of the solutions themselves (in this case, current approaches to Arctic environmental governance) (Homer-Dixon 2006, 358; see also Klir 1992, 7:405; Ostrom 1995, 34; Bar-Yam 2004, 37).

It is generally understood that the LoRV first originated in the science of telecommunication. In the 1920s, faced with the problem of determining the necessary capacity of a communication channel to transfer a specific message in a determined period of time, scientists identified a law which specified the capacity, or bandwidth, of the channel. This quantitative relation was elaborated on by Hartley in 1928 (see Cherry 1968) and later by Shannon and Weaver (1949), who explored the importance of this law – Theorem 10 – in information theory. In 1956, British psychiatrist and cyberneticist Ross Ashby provided a more general interpretation of the LoRV, applicable beyond information and communication theory (Umpleby 2009, 233; Ashby 1960).[211] In addition to entropy – the statistical measure of uncertainty used by information theorists, like Shannon and Weaver (1949) – Ashby introduced *variety* as a fundamental measure by which the law of channel capacity could be expressed. Ashby named this cybernetic analog of Theorem 10 the "law of requisite variety" (Raadt 1987, 518; Klir 1992, 7:405, 598).

The introduction of *variety* as a measure built on work in cybernetics – "the scientific study of control and communication in the animal and the machine" (Wiener 2013) – which seeks to study systems

[211] Although, there has been criticism of Ashby's LRV as well. For one, it has been criticized for being tautological (Berlinski 1976). See fn 11 for additional criticism.

independently of their substrate – an approach which has propagated into complexity theory, as well. Cybernetics, as such, is concerned with three basic forms of construction. The first is *circularity*, which is evident in early research on circular causality, as well as in the study of self-organization (Kauffman 1993; Hull and Katz 2006; Gershenson 2015) and autopoiesis (Krippendorff 2009, 37; Varela 1974; see also Teubner 1984 for a discussion on law and autopoeisis).[212] The second is *process*, apparent in efforts to explain system transformation which often emphasizes system dynamics, development, epigenesis, and evolution in order to understand the behavior and interactions of various elements in a system (Krippendorff 2009, 38). The third and final form is *variety* which measures the number of possible states of a system (Raadt 1987, 518). It does so by recognizing that a system is composed of a multitude of interacting variables distinguished in a set, like those in a WIT set. *Variety* within a set is often also associated with concepts of constraint, uncertainty, and chance (Krippendorff 2009, 38).

3.2.1. What is the Law of Requisite Variety (LoRV)?

So, what is the LoRV and how does it work in practice? The LoRV applies to any system that performs a regulatory process like our institutions, including international law (Raadt 1987, 517; see also Duit et al. 2010; Ruhl 1997; 2008b; Kim 2013). As a principle, it proposes that variety in a system must be controlled in order for regulation to be achieved successfully (see also Beer 1966; Jordana and Levi-Faur 2004, 164).[213] However, rather than build a more complex structure, Ross Ashby argued for the reduction of the maximum possible variety to match the variety observed within the environment (Umpleby 2009, 232). Each WIT set must coordinate a variety of valid behaviours matched to the scale of each external condition (Bar-Yam 2004, 38–41).

More precisely, Ashby observed a system in three stages: a disturbance, a process of regulation or response, and an outcome. In addition to this, Ashby identified a set of values – good or bad – for each outcome. These values provide additional mapping which represents a set of normative preferences with a subset serving as the "goal". A set of values is relative to each system; in biological organisms, their ability to survive (or their adaptive capacity) requires them to remain within particular physiological limits. Meanwhile, in economic systems survival relates to a firm's positive profits. If, as Ashby (1984, 199) argued, the LoRV seeks to achieve a "goal," or acceptable outcome, by reducing the maximum possible

[212] A self-organized system is dynamic, persistently operating at or near a complex critical state to which it evolves without the interference of external or internal agents (Bak 1996; Pruessner 2012; Kauffman 1993, 7; see also Mitchell 2009; Dietz, Ostrom, and Stern 2003; Folke et al. 2005; Olsson et al. 2006). Autopoiesis "refers to the extent to which various social systems-again, law, economy, politics- are self-reproducing, self-maintaining, self-organizing, self-regulating, and self-observing" (Orts 1995, 1266). The system can undergo any change, provided the circular organization is not interrupted" (Teubner 1993, 56). This goes back to the Kantian view that organisms are self-organizing entities whose parts exist for one another and by means of one another (Kauffman 1993, 7). For differing definition of autopoiesis see Varela, Maturana, and Uribe (1974); Luhmann (1985); Teubner (1984; 1993); Arthur (2009). The work of Gershenson (2015) relates the theory of autopoiesis with Ross Ashby's LRV and self-organization as means of designing systems to match the variety of their environment. Through this research, Gershenson (2015) finds that "guided self-organization has been shown to produce systems which can adapt to the requisite variety of their environment, offering more efficient solutions for problems that change in time than those obtained with traditional techniques."

[213] Some scholars, like American physicist Yaneer Bar-Yam (2004), use *variety* and *complexity* interchangeably, essentially establishing the *law of requisite complexity* where a complex adaptive system must maintain and coordinate an internal repertoire of valid, possible (if-then) behaviors that correspond with the complexity of their surrounding environment across scales. In practice "this requires a balance between predictability and adaptability of the controller to face both the emergence and self-organization of the controlled" (Gershenson 2013).

variety to match the variety observed within the environment, then it is necessary that processes of regulation act to lessen the variety in outcomes within the outlined scenarios.

Specifically, Ashby (1984, 207) argued that "[o]nly variety can destroy variety."[214] which establishes a quantitative relationship between the variety in disturbances, responses, and the smallest variety which could be achieved in the set of actual outcomes (Ashby 1984; see also Raadt 1987, 523). For instance, if a disturbance in the system introduced a variety of ten bits into the outcome, but the survival of the system demanded that the outcome be restricted to two bits, then the response must provide a variety of at least eight bits. In the context of this research project, one might argue that an ongoing boost of material energy into the geophysical system of the Arctic (the disturbance) is leading to higher variance throughout the Arctic system as a whole. The survival of the system, in turn, demands that the outcome be restricted (for example, to a maximum warming temperature), which necessitates that a WIT set respond in a manner that reduces the maximum possible variety to that level. I am specifically interested in whether legal institutions have the capacity to generate the necessary variety of responses to respond to emerging conditions in the Arctic.

Moving from conceptual to more concrete, Stuart Umpleby (1990) builds on Ashby's work to identify four strategies of regulation to reduce the variety of disturbance (see also Umpleby 2009, 232):

1. one-to-one regulation of variety (as in football or at war);
2. one-to-one regulation of disturbances (like crime control in a city);
3. ecological regulation (through international law, as an example); and
4. epistemological regulation (through global models like the 1972 Club of Rome).

Through these rules, Umpleby (2009, 235) highlights how variety does not necessarily need to be controlled directly; for instance, changing the rules of the game or changing the game altogether makes it possible to regulate larger systems, like the global economy.

3.2.2. Why is it helpful?

In the context of this research project, the LoRV is helpful in three regards: as a concept, as a measure, and as a guide. First, as a concept, the LoRV "links variety to regulation, adaptation, intelligence, and evolution" (Krippendorff 2009, 38), key concepts highlighted in my earlier discussions of the WIT framework and the energy landscape metaphor. I am not the first scholar to observe its utility in relation to governance. Although Ashby himself had little to say about the role of institutions, networks, markets, and organizations in regulating changing systems (Duit et al. 2010, 365–66), the idea that institutional and organizational diversity and decentralization could improve society's adaptive capacity to complexity is now well-established.

[214] It is important to note that some scholars, like Heylighen (1992), argue against Ashby's assumption that "only variety can destroy variety", noting that a spontaneous decrease of variety *is* possible as well. For Heylighen (1992), the LoRV is an application of the 'principle of selective variety' where "[t]he larger the variety of configurations a system undergoes, the larger the probability that at least one of these configurations will be selectively retained." The danger of monoculture serves as the paradigmatic example where a single disease or parasite invasion can be sufficient to destroy *all* crops; but where there is variety, *some* crop is very likely to survive. And so the argument goes: the larger the variety of actions available to a control system, the larger the variety of perturbations it is able to compensate. And the further apart that stable configurations may be, the more variation the system will have to undergo – passing through various configurations – in order to maintain a chance at finding a stable configuration (Heylighen 1992).

In the 1960s and 70s, Ashby's LoRV influenced the development of organizational theory, especially the advent of contingency theory, and empirical research stemming therefrom (see Raadt 1987).[215] Similar to Ashby, contingency theorists like Stafford Beer assumed that organizations must achieve a stable output equilibrium; as in environmental variety must be matched by organizational variety. A part of this research was also directed toward an examination of the impact of the environment – including uncertainty, change, and complexity (Duncan 1972; Downey and Slocum 1975) – on the structure and performance of organizations (Miles, Snow, and Pfeffer 1974; Leifer and Huber 1977; Tushman 1979; Osborn 1977; see also Aulin 1982; Klir 1992). This research, in particular, found that it is expected that organizations achieve a particular output when variety and uncertainty are below a specified maximum level. Any variety and uncertainty within the environment beyond this level must be absorbed within the organization, and must thus also be reflected in its structure (see Raadt 1987). Interestingly, the work of Leifer and Huber (1977) has found that environmental uncertainty is positively correlated with a more flexible organizational structure.

More recently, the LoRV serves as the conceptual root for literature in contemporary policy discourse; on institutional diversity and redundancy, where an overlapping and overcrowded institutional landscape may be better adept in governing common pool resources (Low et al. 2003; Ostrom 2005); on *polycentrism*, where multiple, overlapping control hierarchies might be more effective in implementing challenging policies (McGinnis 1999; Ostrom 2010; Aligica and Tarko 2012); on adaptive co-management and governance (Dietz, Ostrom, and Stern 2003; Folke et al. 2005; Olsson et al. 2006a), as well as reflexive governance (Orts 1995; Gaines 2002; Voss, Bauknecht, and Kemp 2006) which emphasizes a combination of approaches including stakeholder involvement, trial-and-error based policy experiments, and context-specific network-based incremental policy-making. As an example, Elinor Ostrom's "Designing complexity to govern complexity" (1995, 34) references the LoRV as a tall yet necessary order in the regulation of complex biological systems, arguing that simple, large-scale centralized governance does not have the necessary level of variety (or adaptive capacity) to govern complex, multi-scale biological processes as complex, polycentric, multi-layered governance systems do (Gadgil and Rao 1994; Ostrom 1995, 34–35). Ostrom writes: "[W]ithout a deep concern for creating complex, nested systems of governance, the very processes of trying to regulate behavior so as to preserve biodiversity will produce the tragic and unintended consequence of destroying the complexity we are trying to enhance (Ostrom 1994; Ostrom, Feeny, and Picht 1993)."[216]

In this regard, the question becomes which legal form provides sufficient flexibility to develop the necessary variety of responses to disturbances, as well as the ways in which the law can move beyond its dichotomous tendencies and exhibit more reflexive characteristics while still commanding a level stability and control of its surroundings.

Second, as a measure, the LoRV can define the *adaptive capacity* of a WIT set; its ability to maintain an internal repertoire of valid possible (If-THEN) behaviour that corresponds with its surrounding environment. As such, this tool could help answer questions like: Does the current legal approach to Arctic

[215] Contingency theory argues that there is no ideal way of organizing; the optimal way is contingent on the internal and external factors. For a more comprehensive analysis of theories, evidence, and methodological issues relating to contingency theory see Donaldson (2001).

[216] Bar-Yam (2004, 39–40) similarly reminds us that the scale of behavior to scale of response is relevant and should be accounted for. First, an increase in variety at one scale comes at the expense of variety at another scale. Second, scales are an important consideration when the behavior of a complex system, such as non-linear dynamics or amplification, can lead to delayed or contingent effects.

environmental governance satisfy the LoRV? Or, what happens when there is no LoRV? Third, it might point toward a more effective regulatory response moving forward.

Although conceptually helpful, a central question relates to the empirical utility of the LoRV in prescribing the type of governance system that is best equipped to address and manage processes characterized by a variety of complex changes.

3.3. The Energy Landscape Metaphor

For normative insight, I propose another complexity tool: the energy landscape metaphor. Widely used in the natural sciences, I believe that this metaphor can help define, understand, and visualize the co-evolution of dominant and alternative Arctic WIT sets over time. It provides a tool to: (1) analyze the relative authority of competing WIT sets; (2) consider whether particular components of a WIT affect its stability; and (3) consider which practices and mechanisms may introduce instability, thereby contributing to transformational change within the system. More specifically, in the context of Arctic environmental governance, I argue that without this level of understanding, we will fail to grasp and answer central questions related to how actors can productively exploit non-linearities within institutions – in this case international law – to cope with some of the more destructive and accelerating, non-linearities within the Arctic system.

3.3.1. What is an Energy Landscape?

What is the energy landscape metaphor? In simple terms, an energy landscape is a three-dimensional topological map of the spatial positions of all interacting entities within a system. Frequently invoked by physicists, chemists, and biologists alike, the energy landscape has become a fundamental means of understanding and predicting system dynamics (Mitchell et al. 2016). In physics, energy landscapes are used to study potential energy in physical systems; physicists draw on this tool to find good, global optima in the presence of large numbers of local optima.[217]

Energy landscapes exhibit multi-dimensional features including mountain ranges, hills, valleys, ridges, channels, plains, valleys, slopes, cliffs, and so on (Homer-Dixon 2020a, 308). The valleys are known as *basins of attraction* – or areas of stability and equilibrium – which require less energy. Specifically, a basin of attraction is the region surrounding an *attractor*, a set of coherent values of key variables, toward which a system evolves. Deep basins of attraction – where a high density of relevant interactions between different actors occurs – generally surround stable, coherent, dominant WIT sets. Alternative WITs can exist simultaneously; some may be evolving out of the dominant WIT within the same basin, others are located within shallower basins on the same landscape, adjacent to the dominant WIT, or in more distant basins.

Although it is the environmental context that defines the initial conditions under which the size of the dominant basin and the adjacent possible – the alternative basins directly accessible from the dominant one – are determined, it is the variables that define the dimension of the landscape of the state space. Specific values of these variables identify particular points in that state space.

A system usually has multiple basins of attraction, some deeper than others. Meanwhile, the mountains or hills correspond to areas of instability that require high levels of energy to be maintained, and from which

[217] The concept of an energy landscape, or the free energy map (landscape) as it is known in physics, arose in 1931 in work surrounding the hydrogen atom (Polanyi and Eyring 1931). For a more in-depth theoretical understanding of energy landscapes see (Wales 2003). In this book, Wales seeks to define and unify the field of energy landscapes.

a system is likely to move away from toward a nearby basin (Homer-Dixon 2020a, 308; Dill and Chan 1997, 11). The areas in between are defined by a set of incoherent values of key variables. In search of a global optimum, even sub-optimal moves can improve the solution, jumping into another basin and settling into a new global optimum.

The level of stability within the Arctic system, over time, is determined by the interactions between its environment and the internal adaptive capacity of its dominant WITs. A robust WIT should behave like a homeostatic mechanism, reacting to exogenous (environmental) and endogenous (within the WIT set) change to maintain the equilibrium of a system (Kauffman 1993; Bar-Yam 1997, 37–38). If its adaptive capacity is defined by the *law of requisite variety*, then this essentially means that the "I" component of a WIT must have the ability to regulate a set of disturbances to produce an acceptable output.

3.3.2. Why is it helpful?

As a tool, the energy landscape metaphor is intended to help the reader see things about dominant WIT sets, and potential alternatives sets, which they may not otherwise observe. It allows for the positioning of various WIT sets – dominant and alternative – relative to one another so that the reader can discern how close they are from one another, how they differ, how deep the basins of attraction are, what it might take to get to an alternative basin, or what the current barriers are to reaching a basin. The metaphor is especially effective in representing changes in the depth – including both the shallowing and deepening – of the basin of attraction of the dominant WIT set.

As a tool, the energy landscape metaphor is easily transposed onto Beddoe et al.'s WIT framework. It identifies WITs as the set of coherent or incoherent values of key variables that define the dimension of the landscape state space. Coherent WIT sets – where dominant worldviews are reinforced by dominant institutions and technologies – will sit deep in a valley, or basin, while incoherent WIT sets will not. In *Commanding Hope*, Homer-Dixon (2020, 310) argues that societies tend to move back-and-forth between two and three basins of attraction. Alternative WIT sets are often not visible from the current WIT set or are difficult to get to, due to a host of barriers including vested interests in the dominant WIT; self-reinforcing mechanisms that require low levels of energy and make migration to an alternative WIT set that requires significantly more energy difficult; the interdependence of key variants including worldviews, institutions and technologies (Beddoe et al. 2009); and the challenge of coordinating a shift among diverse actors (Ostrom 2005). In short, shifting toward a new WIT – accepting new worldviews, changing institutions, or developing new technology – seems difficult, if not impossible, to achieve quickly.

The primary purpose of the energy landscape metaphor, as such, is to permit the reader to imagine alternative WITs and potentially significantly re-define interactions within the Arctic environment. A note of caution, however: the energy landscape metaphor cannot necessarily tell us which WIT set – or individual WIT variants – to choose, moving forward. It must also be noted that the following sections are by no means exhaustive, providing merely an introduction to how these tools may be applied to understand how the role of law, and its positivist legal underpinnings, are used to maintain stability or contribute to change in the Arctic system.

4. Engaging Complexity: An Exercise in Re-Imagining Arctic Environmental Governance

Seeking to understand how Arctic worldviews, institutions, and technologies interact with a rapidly changing Arctic environment, I drew on Beddoe et al.'s framework to identify two Arctic worldviews which, I believe, frame some of the key elements of Arctic narratives today. I labelled them the Closed Arctic and the Open Arctic. As I have highlighted in the previous five chapters, the dichotomy between closed and open is often used to reference geophysical change in the Arctic over the past three decades (see for example Howard 2009; Koivurova 2012a, 139; Knecht and Keil 2013, 179; Le Mière and Mazo 2013; Young 2016c, 271; Smieszek 2019c, 10; Keskitalo 2007, 192; Koivurova, Kirchner, and Kleemola-Juntunen 2020, 59, 61–62).[218] At times, it is also drawn on as a metaphor for the accessibility of the Arctic to various actors including non-Arctic states and corporations, among others.

From this point, I identified a dominant WIT – the Closed Arctic WIT set, which I define as the current regime – and an alternative, Open Arctic WIT set evolving out of the current regime, which is under stress. In order to define these two WITs, I drew on a comprehensive literature review of scholarship on the Arctic in the fields of political science, international law, geography, sociology, and earth system science; policy documents; scientific assessments and reports; and publications produced by intergovernmental and non-governmental organizations. More specifically, I defined these WITs by tracing terms, delineations, and debates through published literature and documents following salient references to other references, especially those of key civil servants and prominent academics to encompass the relevant discourse area.

I recognize that there are a significant amount of possible WIT combinations given the variety of worldviews, institutions, and technologies. After all, every Indigenous person, northern and southern policymaker, scholar and industry executive does not share the same worldview. Nevertheless, if we examine existing scholarship, the exercise of distilling Arctic worldviews is not uncommon, although it does raise some tensions. In an inquiry on Canada's Mackenzie Valley Pipeline of the Northwest Territories, Thomas Berger (1977, 1) distinguished between the "Northern Homeland" narrative of Arctic residents and the "Northern Frontier" narrative of non-Arctic residents. Berger further highlighted that "the choice we make will decide whether the North is to be primarily a frontier for industry or a homeland for its peoples." In a similar vein, Oran Young (2004) identified various Arctic narratives: The first was the theatre for military operations narrative. The second was the scientific narrative which focused on global processes. The third was the environmental narrative which situated the Arctic in global environmental dynamics, often leaving out social, cultural, and economic issues. Finally, the fourth was the *terra nullius* narrative where travelers and explorers seek a wild space away from modernity. Nearly a decade later, Steinberg et al. (2015) outlined six similar, ever-changing Arctic imaginaries in *Contesting the Arctic: Politics and Imaginaries in the Circumpolar North*: terra nullius, frozen ocean, Indigenous statehood, resource frontier, transcendent nation, and nature reserve.

While a reductionist exercise, distilling a dominant, Closed worldview and alternative, Open one can provide valuable insight into how these WIT sets compete and co-evolve with one another, and with the Arctic's rapidly changing material environment. To this day, dominant worldviews – like the Closed and Open Arctic – speak directly to how the circumpolar North was "colonized, exploited and settled" (Dodds 2016), pointing to the nationalization of both land and ice, and to ongoing contestation by Indigenous peoples with regard to land claims, greater autonomy, free prior and informed consent, and social justice. Berger's distinction between "Northern Homeland" and "Northern Frontier" speaks directly to how

[218] While I recognize the dynamic nature of the Arctic, I choose these two labels to demarcate a clear transformation in the Arctic system, from closed to open.

diverging worldviews will select different institutions and technologies; for instance, with the latter driven by modernity, the Westphalian system, the growth of enclosures, and extraction.

Thus, in an effort to understand the dominant and alternative worldviews that underpin international law in the Arctic, I make a distinction between western rationalist worldviews – primarily, although not exclusively, held by non-Indigenous scholars, policymakers, etc. – and various Indigenous worldviews (see Appendix 5). As a white settler Canadian, I do not purport to be able to learn the multiplicity of Indigenous worldviews and cosmologies held by Arctic Indigenous peoples, each one of which would take a lifetime to know. Thus, in an effort to not impose my own understandings onto a community, I focus on distilling the main elements of these western rationalist worldviews, which I believe underpin the legal positivist approach to Arctic environmental governance at an international and pan-Arctic scale. Elements of these worldviews may, or may not, coincide with a multiplicity of Indigenous worldviews and cosmologies, though I will not focus on these specific connections as such.

I outline the Closed and Open Arctic WITs below. A significant part of my discussion builds on the five previous chapters. With this in mind, I will refrain from reiterating prior details and will, instead, provide a general overview of each WIT set with references to previous sections where necessary.

4.1. The Closed Arctic WIT: Our Current Regime

In the late 1980s and early 1990s, a deep basin of attraction started to evolve around the current dominant WIT set in an environmental context where the Arctic was perceived by many – especially by non-Indigenous peoples outside the Arctic – as an inaccessible, inhospitable, and uninhabitable environment (although there were plenty of Arctic Indigenous peoples living in the circumpolar North) (Koivurova 2012a, 134; Keskitalo 2007, 192; see also Berger 1977; Kikkert 2015; Dodds and Nuttall 2019).[219] Apart from the Antarctic, the pristine quality of the Arctic environment was unmatched and largely perceived to be unchangeable (Evengård, Nymand Larsen, and Paasche 2015, 2). I call this material reality the Closed Arctic.[220] This static worldview of the Arctic environment persisted outside the Arctic context for a long time. As Evengård, Nymand Larsen, and Paasche (2015, 2) note: "the whole concept of an Arctic without sea ice and glaciers would have been considered obscure." Within this closed environment, where there was low biological productivity and high vulnerability to pollution and human disturbance (Pharand 1992, 166), the focus was often on cost-effective development.

The current worldview of what is desirable and possible was forged in the context of this Closed Arctic. In short, the Arctic was a harsh and vulnerable environment that required protection. Many of the current institutional and technical approaches are thus an extension of an adaptation to this Closed Arctic.[221]

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[219] Beddoe et al. (2009, 2483) understand an interconnected set of worldviews, institutions, and technologies as a social-ecological regime.

[220] Although, it is important to note that, despite being materially closed, the Arctic had already experienced significant transformations in its social relations through trade and the colonization of the North as early as the 1600s in Fennoscandia and into the mid-1900s in northern Canada. In both cases these transformations were linked to nation-building efforts through which northern land areas and societies were linked to national political structures. Often this occurred at the expense of northern Indigenous communities including their sophisticated Indigenous governance structures and legal orders (Nilsson and Koivurova 2016, 184). In addition to this, Osherenko and Young (1989) noted that the Arctic was opened to various opportunities in the late 1980s and early 1990s.

[221] Many scholars also point to the political impetus for cooperation between Arctic states during the Cold War and then following the end of the Cold War (see for example Heininen 2004; Keskitalo 2007). While I focus specifically on the relationship between material changes and the institutions and technologies implemented, I do not discount this critical element of Arctic governance.

Institutionally, this is perhaps best exemplified by UNCLOS (as well as other treaties related to the Law of the Sea), one of the fundamental frameworks of Arctic environmental governance, which was negotiated at a time when the Arctic was perceived as a "frozen desert" (Koivurova, Kirchner, and Kleemola-Juntunen 2020, 61). The application of Article 234 of the Convention (see Section 3.2.1) particularly reflects the link between the UNCLOS and this particular material reality of the Arctic, where its waters must be ice-covered for at least six months and a day (Rothwell and Baker 2013; Durfee and Johnstone 2019, 207; Dodds 2019, 545). Other international agreements regularized cooperation between northern Indigenous peoples through transnational networks and organizations like the Inuit Circumpolar Conference (now the Inuit Circumpolar Council) existed, as well.

However, the Arctic was largely unidentifiable as a politico-legal area in itself until the adoption of the AEPS in 1991 (Koivurova 2012a, 131; 2010, 146). It was through the adoption of the informal AEPS (see Chapter 3) that the eight Arctic states sought to build mutual trust while protecting the northern environment from within and outside the Arctic (Koivurova 2012a, 133; Pharand 1992, 172; see also Knecht and Keil 2013, 184). The institutionalization of this Closed Arctic worldview is reflected in the introduction of the AEPS (Arctic Environmental Protection Strategy 1991):

> The Arctic is highly sensitive to pollution and much of its human population and culture is directly dependent on the health of the region's ecosystems. Limited sunlight, ice cover that inhibits energy penetration, low mean and extreme temperature, low species diversity and biological productivity and long-lived organisms with high lipid levels all contribute to the sensitivity of the Arctic ecosystem and cause it to be easily damaged. This vulnerability of the Arctic to pollution requires that action be taken now, or degradation may become irreversible.

It was already at this time, though, that ideas for alternative institutions – Arctic Region Council and Treaty, proposed by Donat Pharand (1992) (see Chapter 5) or an Arctic Treaty (see for example Nowlan 2001) – started to form.

The AEPS – with its mandate of environmental protection, informal structure, and the innovative inclusion of Arctic Indigenous peoples as Permanent Participants – was subsumed by the Arctic Council (Arctic Council 1996) and its broadened mandate of sustainable development in 1996 (see Chapter 3). The Council became a part of a fragmented patchwork of informal governance institutions – primarily focused on the Arctic environment – and formal governance institutions, most of which are not specific to the Arctic environment *per se* (see Chapter 3).

This governance arrangement was sufficient to manage a relatively static Arctic material environment where the cause and effect of various issues, like the impacts of POPs on Arctic Indigenous communities (see Chapter 4), were linear. A significant motivation behind the development of Arctic-specific institutions, like the Arctic Council, was the development of technologies, such as informal working groups and networks of collaboration to maximize the collection, exchange, and synthesis of scientific, as well as traditional and local, knowledge (see for example Nilsson 2009; Heininen and Southcott 2010) to gain a more precise understanding of the material and social realities of the area (see Chapter 3). It would not have been possible for any one actor – state, Indigenous group, IGO, NGO, scientific network, or other – to gather this information on their own (Prior 2013). The case of POPs serves as a salient example where the Closed Arctic WIT met the LoRV – it acted as a coherent WIT set to produce a successful outcome to meet the complexity of the challenge at hand. In short and very simple terms: underpinned by the worldview of a vulnerable Arctic environment and the notion that its inhabitants needed to be protected from pollution (among other things) – as well as a recognition that this necessitated cooperation – the eight Arctic states

worked together to develop the informal AEPS and the subsequent Arctic Council under whose auspices the Arctic Monitoring and Assessment Programme (AMAP) Working Group drew on various technologies to identify the linear cause-and-effect of POPs, which subsequently contributed to the successful negotiation and implementation of the *Stockholm Convention* (see Chapter 4 for a more detailed analysis).

In large part due to the successful gathering of scientific, Indigenous, and local knowledge over the past thirty years, there is now a considerably more accurate and deep understanding of significant large-scale changes occurring in the Arctic's material environment. "The [Arctic Climate Impact Assessment] dramatically changed the way we perceive the Arctic as a region. Instead of the frozen desert image that had influenced the work of the AEPS, it became almost the opposite, a region undergoing a vast and long transformation process." (Koivurova 2010, 149; see also 2012a, 134; Graczyk and Koivurova 2015, 312; Dodds 2019). However, the increasingly complex institutions and technologies, developed in response, are making the Arctic system more brittle.

4.2. The Open Arctic Scenario: A Regime Under Stress

It is increasingly clear that many complex systems, like the Arctic, have critical thresholds at which point the system can fundamentally shift from one state to another. More specifically, research by Scheffer et al. (2012, 344) suggests that there are generic markers that can help us anticipate such critical transitions. They point to two early warning signs in particular: the first being the "critical slowing down" of a system's ability to recover from small perturbations (Scheffer et al. 2009, 53; 2012, 346), suggesting an increased probability of a sudden transition to a new unknown state; the second being the phenomenon of "flickering" in highly stochastic systems (Scheffer et al. 2012, 346), which occurs when an alternative basin of attraction begins to form and the system moves back-and-forth between the basins of attraction of two alternative attractors prior to a bifurcation and an eventual shift to one stable state (Scheffer et al. 2009, 55).

I argue that a significant transformation in the Arctic's material environment (Chapter 2) is leading the current dominant basin to shallow as another alternative basin begins to take form. While there has not yet been a shift to a new basin or new dominant Arctic WIT (although there has been some evolution within the current WIT), there is evidence that the current one is becoming less stable and resilient – "Twenty years ago the Arctic system was more resilient than now as sea ice was three times thicker than today." (Overland 2020). In an effort to manage this system behaviour, we are seeing a flickering between the dominant Closed Arctic WIT and a potential Open Arctic WIT. More specifically, while the "W" and the "T" are shallowing the basin of the dominant Arctic WIT (in addition to the shallowing stemming from changes in the Arctic environment), the "I" appears to be deepening the basin through a process of structural deepening. This leaves the elements of the current WIT – which does not fit the current environment – and the potential WIT – whose elements are antithetical to one another – incoherent and thus, in a state of "flickering" (Scheffer et al. 2009, 55). Ultimately, I expect that this increasing instability will lead to a Kuhnian shift – from Closed to Open Arctic WIT – either due to a tipping point which knocks the current WIT to an alternative basin, or through a controlled shift where a WIT set adapts to increasingly erratic behaviour.[222]

[222] This shift resembles a Kuhnian cycle. In the "Structure of Scientific Revolutions", Thomas S. Kuhn (1970) proposes a cycle for the development of scientific theories: "Kuhn's cycle starts when a new theoretical model working on a new principle (he calls this a paradigm) replaces an old one. The new paradigm then is worked out, applied to many exemplars, becomes accepted, and is further elaborated in a process Kuhn calls normal science. Over time, examples

that do not fit the base paradigm—anomalies—build up. The paradigm is stretched to accommodate these but becomes increasingly strained as further anomalies build up. It collapses when and only when a newer, more satisfactory set of explanations—a newer paradigm—arrives." See also Arthur (2009).

	Closed Arctic WIT		Open Arctic WIT
W	**Closed**	→	**Open**
I	**Patchwork of Formal & Informal**	→	**Increasingly Legalized Patchwork**
T	**Closed (knowledge)**	→	**Open (knowledge & harder tech)**

Table 3: Evolution from Closed to Open Arctic Worldviews

In the sections below, I unpack how the Closed Arctic WIT is failing to meet the needs of an increasingly Open Arctic with no coherent vision for how to ensure the well-being of both the Arctic environment and its inhabitants over time. Aspects of this WIT which no longer serve us in an Open Arctic can be grouped under the following interrelated themes: First, a belief that components of the Arctic system are linear and predictable. And second, that an increase in the complexity of institutions and technologies is sufficient to manage this rapidly changing Arctic system.

A) The Arctic is increasingly unpredictable and is expected to remain so.

As highlighted in Chapter 2, the Arctic system is undergoing a significant, large-scale transformational change – a shift which is profoundly altering human-environment interactions and feedbacks within the system. While there is "no proof for the timing of abrupt Arctic changes" like this, Overland (2020) argues that, "there is a consilience of evidence for reduced resilience to change: multiple new Arctic extremes-heat waves, sea ice loss, unique Arctic processes such as sea ice/storm interactions, permafrost melt, albedo shifts, and ecosystem reorganizations."

What was once described as a relatively closed area, both in terms of its material and social reality, is now increasingly open and complex. One of the most significant geophysical changes to date is an increase in the rate of solar radiation absorbed by the Arctic Ocean which heightens the variance of behaviour within the Arctic system. This increase in material energy contributes to the rapid transition of multi-year Arctic sea ice into younger, thinner and more mobile ice, pointing to "impending climatic and ecosystem thresholds" (Overland 2020). According to Lind, Ingvaldsen, and Furevik (2018), the Barents Sea, has already reached a "tipping point" (Lind et al., 2018) – sea ice loss has shifted "from acting as a buffer between the Atlantic and Arctic oceans to something closer to an arm of the Atlantic." This shift has wider implications on traditional lifeways and infrastructure development alike.

Furthermore, there is little isolation of these changes. Tightening links between the Arctic system and our global system mean that protracted periods of open Arctic waters contribute to ocean heat fluxes which can impact global precipitation patterns and ocean currents, thereby impacting the lives of individuals who live far from the Arctic (Carmack et al. 2012). What is more, "[w]here environmental prediction is not precise, potential economic costs are high, and impacts range across global economic and security interests." (Overland 2020).

Moving forward, the material environment of the Arctic is expected to open further – the Arctic Ocean is on course to being ice free during the summer months (Wang and Overland 2009) – with

notable uncertainty as to how ocean currents will change under these conditions (Durfee and Johnstone 2019, 31).

More recent research has found that, although climate models project a smooth trajectory for climate change in the Arctic over the coming 30 years (Barnes and Polvani 2015; Bathiany et al. 2016; Cai et al. 2018), current conditions do not necessarily "rule out a more rapid transition within the next two decades" (Screen and Deser 2019; Pistone, Eisenman, and Ramanathan 2019).

In short, the characteristics exhibited by the Arctic system are becoming increasingly complex thanks to the increased flow of energy through the system and its dense web of causal connections and recursive interactions between its system components.

B) The increasing complexity of the Arctic's material environment is reflected in Arctic worldviews.

Since the mid-2000s, Arctic worldviews have shifted to adapt to accommodate the idea of an Open Arctic. The material opening of the Arctic is now widely recognized by state and non-state actors – in part, due to its significant visual dimension – although it is imagined in different ways by different actors (Knecht and Keil 2013, 180, 188; Smieszek 2019, 43; Evengård, Nymand Larsen, and Paasche 2015, 2; Young 2012, 391).[223]

To some, an increasingly Open Arctic leaves the area vulnerable to a resource race, even conflict (see for example Borgerson 2009b; Blunden 2013; Huebert 2014). Many of these narratives are geopolitical, focusing on how the emerging material and social reality impacts the sovereignty and role of Arctic states in particular (see for example Knecht and Keil 2013). These worldviews set the boundary conditions for the evolution of Arctic institutions and technologies. For instance, a worldview that expects there to be a race for resources in the Arctic is more likely to favour a state-based approach and the use of harder technologies.

At the same time, an increasingly Open Arctic – characterized by thermodynamic openness-– raises questions about where the Arctic begins and where it ends (Dodds and Nuttall 2016). This is reflected in concepts like the global Arctic (Dodds 2016; Shadian 2018; Heininen 2016), the Arctic common (Knecht and Keil 2013), and One Arctic.[224] The concept of a Global Arctic was, for instance, adopted in the 2016 US-Canada Joint Statement on Climate, Energy, and Arctic Leadership, in noting the "outsized impact [of greenhouse gas emissions] on the long-term health of the global Arctic." (Office of the Press Secretary 2016). Meanwhile, Lackenbauer, Nicol, and Greaves (2017 iii) explore the ambiguity of the last concept in their aptly titled "One Arctic," an edited volume of essays that explores the concept's Inuit origins – a context in which it fostered bonds among the Inuit who had experienced processes of colonization that divided them across the borders of four Arctic states (see also Fabbi 2012) – to its appropriation as the theme of the 2015-2017 US Chairmanship of the Arctic Council, all the way to its most elastic use as a "thematic umbrella with the potential to unify a region…characterized by substantial social, political demographic, and ecological diversity…" (Lackenbauer, Nicol, and Greaves 2017, iv). These competing narratives are more likely to seek out

[223] As Knecht and Keil (2013, 188) remind us, non-state and transnational actors including Arctic Indigenous peoples, NGOs, and corporations have significant narrative power which that can influence states worldviews, and vice versa.
[224] The theme was precisely titled "One Arctic: shared opportunities, challenges, and responsibilities". See (Circumpolar Council (2015); see also Lackenbauer, Nicol, and Greaves (2017).

cooperation and collaboration between state and non-state actors with a focus on technologies that enable the exchange, gathering, and synthesis of various forms of knowledge.

Despite this wide spectrum of Arctic imaginaries, though, the general recognition of an increasingly open material Arctic environment provides sufficient leeway for actors with different worldviews to coalesce in the same basin of attraction, thereby deepening it through regularized interactions over time. While this leaves the WIT sufficiently adapted to remain the dominant W, the competition between multiple worldviews leaves the "W" insufficient in its ability to produce a coherent vision for the future of the Arctic.

C) Increasingly legalized and complex Arctic institutions are poorly adapted to an Open Arctic.

Scholars and policymakers alike recognize an ongoing shift in the Arctic, from an area which was once inhospitable to one that is increasingly complex and dynamic, and in need of new governance responses (Koivurova 2012a, 134). While two ideas for alternatives to the current governance approach for the Arctic (or variations thereof) have existed for almost three decades now, the mid- to late-2000s saw a particular resurgence in interest in the idea of developing an Arctic Treaty (see Chapter 5). The renaissance of this particular debate was in step with the shift in Arctic worldviews noted above; with it came a range of questions, such as: Who are the key actors? What is the role of Arctic Indigenous peoples? How do we define sovereignty? Is the law sufficiently reflexive to change with the environment? It also raised questions about the link between worldviews and normative biases in Arctic institutions which may contribute to tension. For instance, Mayrand's (2014) research on Arctic environmental governance found that when international law is constrained by a neoliberal bias, it can "relegate environmental concerns to the margins, contrary to its promise."

However, despite the opportunity to re-imagine Arctic institutions, or the legal theory underpinning them (Chapter 5), they appear to be locked into a process of significant structural deepening in response to increasing complexity and change over past decades (see Chapter 3). As a consequence, the "I" variant is deepening the current dominant basin of attraction.

Governance Approach. As I highlighted in Chapters 3, while no Arctic Treaty has been negotiated to date, there *has* been a notable common trend in the normative evolution of both formal and informal governance approaches in an attempt to provide stability amidst change. Through the patchwork of formal and informal efforts, the eight Arctic states continue to keep the region legible for law and governance (Scott 1998); by mapping its terrain, establishing property rights, regulating access and ownership of resources, delegating responsibilities, and providing guidelines for participation. In doing so, the sovereign remains the facilitator and moral authority from which legitimacy is derived in the region.

As with the "W" variant, the "I" variant is broad enough to include a range of formal and informal governance institutions, some of which are competing with the Arctic Council, the preeminent international forum for matters specifically pertaining to the Arctic (Pedersen 2012; Arctic Council 2017a). This includes, for instance, the strategic choice of the Inuit to file a legal petition with the IACHR (see Chapter 4). The Inuit Petition, in a particular, serves as a salient example of how non-state actors can match a worldview that points to the system dynamics of the Arctic to a venue and legal form that allows non-governmental groups, including Indigenous groups, to address state governments at an international level.

At the same time, though, the interpretive nature of Arctic institutions can lead them to become sites of contestation between different worldviews.

The interpretive nature of Arctic institutions lends itself to such structural deepening because it allows actors with different worldviews to strategically draw on its closed and open elements to maintain coherence with both closed and open worldviews. On the one hand, structural deepening occurs within the Arctic Council, the preeminent international forum for matters pertaining to the Arctic (Pedersen 2012; Arctic Council 2017a), through the development of new international agreements (see text box 1). In the case of Arctic shipping and navigation (see Chapter 4), in particular, structural deepening through codification and reductionism seeks to respond to increasing anomalies. At the same time, though, this structural deepening creates more density within the system of Arctic environmental governance and does not, in any way, change the fundamental structures of the institutions on which they are built. In other words, they further lock Arctic environmental governance into the legal form of existing institutions. This, to my mind, speaks to the heart of the incommensurability of law and complexity.

Text Box 1: Externally focused Structural Deepening in the Arctic Council

Moving beyond internal operations to focus on the increasingly complex challenges presented by the Arctic system (Barry et al. 2020b), the Arctic Council started to establish Task Forces and Expert Groups (see Chapter 3). These quasi-permanent structures of the continue to operate with their own issue-specific mandates and modes of operation, producing a wide range of outcomes including guidelines, frameworks, and legal instruments within a set time frame (Smieszek 2020, 53–55). Some of these task forces were integral in the development of complementary satellite bodies like the Arctic Economic Council, the Arctic Offshore Regulators Forum, and the Arctic Coast Guard Forum (Molenaar 2017; Barry et al. 2020b), none of which compete with the Arctic Council. Other Task Forces and Working Groups serve as temporary venues for the negotiations of legally-binding agreements concluded among the eight Arctic states – the SAR agreement, the EPPR agreement, and the *Agreement on Enhancing International Arctic Scientific Cooperation*. While these agreements recognize elements of change and complexity in the Arctic system and exhibit a desire to ensure capacity enhancement, they add little substantive normative strength or governance *per se*. The former two agreements simply reinforce existing international agreements (see Chapters 3 and 4), while the science agreement is primarily of symbolic relevance to the work of the Council – a means of reinforcing the T and the W through a commitment to scientific cooperation. These agreements – and their negotiation under the auspices of the Arctic Council – triggered a discussion on the evolution of the Council from a policy-shaping to a policy-making body – a sentiment re-affirmed in a statement from the Arctic Ministers titled "Vision for the Arctic" (Arctic Council 2013e). The Arctic Council is now a forum where legally relevant state interactions occur.

While some scholars argue that the Council has proven its longevity in dealing with new issues as they arise in the Arctic (Graczyk and Koivurova 2015; Smieszek 2020, 71), the normative evolution toward the legalization of Arctic environmental governance is also leading to governance failure. As I highlighted in Chapter 4, significant knowledge gaps regarding methods of containment, dispersal, and the clean-up of a heavy oil spill remain despite the development of the EPPR agreement. In fact, one could argue that agreements like this – agreements that add little substantive normative strength or governance – may create a false sense of stability and control and could, in fact, reinforce worldviews that encourage the development of polluting technologies.

In addition to this, neither internal, nor externally focused structural deepening guarantee agreement between different state parties. For instance, Arctic Council Ministerial Meetings have witnessed tensions over various issues, ranging from the admittance of new Observers (in 2013), to whether to legalize the Arctic Offshore Oil & Gas Guidelines (Arctic Council and Stockholm Environment Institute 2016; Offerdal 2007), to significant discussions over climate change and the mention of the *Paris Agreement* and the UN Sustainable Development Goals in the final *Fairbanks Declaration* (2017). Most recently, for the first time in the history of the Arctic Council, it proved to be impossible for the eight Arctic states to reach an agreement at the Arctic Council Ministerial Meeting in 2019. The United States refused to sign a declaration that would reference climate change (Balton and Ulmer 2019), thus forcing the Council's Chair, Finland's Minister of Foreign Affairs Timo Soini, to convert what was to be a consensus document into the 2019 *Rovaniemi Joint Ministerial* Statement.[225] The accompanying *Statement by the Chair* (Arctic Council 2019b), in turn, clarified that a majority of states noted the impacts of climate change on Arctic communities, cryosphere, and ecosystems with concern. The non-linearity of this case, in particular, signals a tension in worldviews that fails to reinforce the current dominant institution, leading it to become a sub-optimal WIT set, thus shallowing the basin of attraction surrounding the dominant WIT.

[225] It is important to note that this non-linearity is a function of the U.S. administration under President Donald Trump, rather than a failing of the Arctic process itself. The failure lies with the ability of politics to overwhelm scientific consensus. The success lies in the degree to which climate change remains a part of the ongoing discourse.

I have also noted a concurrent increase in the adoption of new internal rules, guidelines, and plans in the Arctic Council in response to endogenous changes (Smieszek 2020, 69). This includes a rising interest from non-Arctic states in the work of the Council, and exogenous changes like pollution, climate change, or biodiversity loss (see text box 2).

Text Box 2: Internal Structural Deepening in the Arctic Council

While there has been no constitutive change – relating to mandate, membership, consensus-based decision-making, rotating chairmanship, or rules of procedure – to the Council's provisions, under the *Ottawa Declaration*, structural deepening *has* occurred through various operational changes related to its secretariat, subsidiary bodies, Observers, and guidelines. Many of these structural and procedural changes were enabled by Member States, Permanent Participants and Observers through consensus-based decisions, as well as through financial commitments and other resource support.

As the broader worldview of the Arctic has shifted from Closed to Open, there has also been a notable shift in how different actors engaged with the Arctic Council. This was especially visible over the course of the Norwegian (2006-8) and Danish Chairmanships (2009-11), as the Council witnessed a growing number of applications for Observer status, primarily in response to the idea of an increasingly Open Arctic. In response to this interest, and with a desire to maintain some control, Arctic ministers adopted rules to clarify the role and criteria for Observers to the Council at the Nuuk Ministerial Meeting in 2011, in essence bounding the Arctic Council. An *Observer Manual* was subsequently developed under the Swedish Chairmanship (2011-2013) in order to guide the role of Observers in Working Groups and Task Forces (Arctic Council 2013d). The *Manual* further clarified that Observer status is based on the consensus of the ministers of the eight Arctic states and accredited through ministerial declarations (Arctic Council 2013a, Rule 37 and Annex 2, Rule 5), is re-evaluated every four years and may be reversed at any given time. In addition to this, observers must recognize the sovereignty of Arctic states, international law (particularly the LOS), the rights of Indigenous peoples and the work of Permanent Participants (including through financial commitment to their work), as well as provide evidence of their capacity to contribute to scientific research (Arctic Council 1998 Annex 2; see also Durfee and Johnstone 2019, 76). In this way, Arctic states re-asserted a worldview in which they remain the primary actors, countering competing worldviews of a Global Arctic or Common Arctic while still maintaining, and even finessing scientific cooperation between (and the financial contributions of) different actors.

The Arctic Council further established itself as the dominant institution through the founding of its permanent secretariat in Tromsø. While the 1996 *Ottawa Declaration* circumscribed the Council to no permanent secretariat, one was established by a decision made at the 2011 Nuuk ministerial meeting "to strengthen the capacity of the Arctic Council to respond to the challenges and opportunities facing the Arctic" (Arctic Council 2011b); it became operational in 2013. Through this secretariat, the Arctic states have produced a permanent physical institution where interactions relating to the Arctic can coalesce.

There has also been an evolution in the informal social practices of the Council. This is reflected in the direct negotiation of Arctic Council ministerial declarations by SAOs and foreign ministries, and a rise in the rank of officials attending the Council's Ministerial Meetings. By the 2017 Ministerial Meeting in Fairbanks, Alaska, all eight Arctic states were represented by their foreign ministers (Smieszek 2020, 67). Informal practices, like this, signal the growing importance of both the Arctic and the Arctic Council.

While these examples of internal structural deepening can make the inner workings of individual institutions, like the Arctic Council, more coherent and dominant (Smieszek 2019, 62), they cannot necessarily ensure the coherence of the Council with the regulations and norms of other regulatory frameworks relevant to the Arctic (see Chapter 3), coherence within the Open Arctic WIT set, or the Arctic environment more broadly. In fact, it can lead to tension between institutions and/or lock-in a sub-optimal WIT set with the inability to co-evolve with the environment.

At the same time, the fragmented nature of the current approach to Arctic environmental governance means that the informality of the Arctic Council does not necessarily prevent other institutions from undergoing their own structural deepening – like the development of the *Polar Code* under the IMO – or competing with the Council to become the dominant institution in an alternative WIT set. For example, structural deepening has also occurred through a re-commitment by the five Arctic coastal states to existing international governance frameworks (Ilulissat Declaration 2008; see text box 3).

Text Box 3: Illustrating Competition between Arctic WITs: Ilulissat Declaration

The 2008 *Ilulissat Declaration* serves as a salient example of how a changing and increasingly Open Arctic environment interacts with the worldviews of Arctic coastal states, non-littoral states, and Arctic Indigenous peoples and how they each choose to draw on institutions and technologies to realize these worldviews.

In 2008, Canada, Denmark, Norway, Russia and the US signed the *Ilulissat Declaration* to confirm that the current international legal framework provides "a solid foundation for responsible management by the five [Central Arctic Ocean] coastal states and other users of the Arctic Ocean through national implementation and application of relevant provisions." The Declaration reinforced that there is "no need to develop a new comprehensive legal regime to govern the Arctic Ocean." The same five Arctic states took a similar stance in later meetings on shipping and fisheries, which eventually led to the signing of the Arctic Fisheries Agreement.

The signing of the Declaration followed several years of media frenzy surrounding the Arctic which included the release of the 2004 ACIA, record low levels of sea ice on the Arctic Ocean in 2007, and the planting of a Russian flag on the Arctic seabed in 2008. Within this context, the five littoral Arctic states understood the signing of the Declaration as a response to the misinformed idea that an increasingly open Arctic had left a legal vacuum that necessitated a new treaty agreement for the area (see Chapter 5). However, it also elicited significant criticism from Arctic Indigenous peoples and three non-littoral Arctic states: Finland, Iceland, and Sweden. Two criticisms stood out, in particular: First, that it is difficult to draw a clear line between what we consider to be the Arctic marine and land environment – they argued that states like Finland, Sweden, and Iceland may form a part of a marine region without a sea-coast, provided that their adjacent area falls within "the ambit of the 'coastal zone' to require environmental management of a single entity" (Birnie, Boyle, and Redgwell 2009, 393). Second, the Declaration disregarded international instruments referencing Indigenous rights and the human rights of Indigenous peoples, such as the UNDRIP, while upholding state sovereignty – an ongoing struggle related to collective action in international (environmental) law (Shelton 2009, 40). More specifically, though, the Declaration failed to recognize that a state-based notion of Arctic sovereignty is increasingly upended by the recognition of Indigenous peoples' rights to self-determination and the devolution of political power to sub-state governments (Lackenbauer and Greaves 2016b). This is but one area where the two dominant Closed and Open Arctic WITs collide with alternative Indigenous WITs.

As Lackenbauer and Greaves (2016) underscore: "what or whom we choose to designate as sovereign…reveals as much about our society's values and theoretical biases, and indicates whose voices and views we think should be represented within our politics." Indigenous northerners would increasingly argue that Arctic sovereignty is not only the legal right of the state, but also a responsibility which northerners undertake every day.

The contested notion of sovereignty – where Indigenous peoples serve as the basis for state sovereignty – is referenced in the 2009 *Circumpolar Inuit Declaration on Sovereignty in the Arctic* [hereafter the Inuit Declaration], written partly in response to the *Ilulissat Declaration*. The Inuit Declaration questions the authority – the boundaries and ideals – of Arctic states in exerting their decision-making power in the region and affirms that "the foundation, projection and enjoyment of Arctic sovereignty and sovereign rights all require healthy and sustainable communities in the Arctic. In this sense, 'sovereignty begins at home'." (Inuit Circumpolar Council 2009). Put simply: sovereignty in the circumpolar North must be modified to account for how the land, sea, and ice are actually used (see also Byers and Baker 2013; Steinberg 2015).

As an example, for the Inuit of Greenland (who make up 85 per cent of its population) an Open Arctic increasingly lends itself to economic development. Melting sea ice, newly open shipping lanes, new agricultural opportunities, and the potential for resource extraction may provide a bid for statehood. By replicating existing state-based institutions, Greenland could build a national identity that rejects the constraints imposed by Arctic states through their (mis)conception of Indigenous worldviews; it is a nationalism based on anti-colonialism (Steinberg 2015, 141). Pragmatically, it is a chance for the Inuit to move beyond the role of Permanent Participant at the Arctic Council and to gain access to higher levels of decision-making as an Indigenous-led public government alongside other Arctic states (Steinberg 2015, 76). At the same time though, this idea has been criticized by some who claim that it would stray from the root of the Indigenous movement and thus further cement Western power structures and dominance (Steinberg 2015, 67–91; Boldt, Long, and Little Bear 1985).[226]

[226] For many Arctic Indigenous peoples, the circumpolar North is *de facto* transnational (see Keck and Sikkink 1999). The Saami span Norway, Sweden, Finland, and Russia. The Gwich'in and Athabaskan peoples inhabit both the US and Canada. And the Inuit cut across the US, Canada, Greenland, and Russia. A transnational approach, for instance, is revered for embracing Indigenous peoples' rights and going beyond the confines of the nation state to synthesize Indigenous worldviews, as well as draw attention to, Indigenous knowledge (Keck and Sikkink 1999, 91, 93, 100).

The 2008 *Ilulissat Declaration* (see textbox 3) serves as a salient example of the current normative evolution of Arctic environmental governance and the questions that arise in its wake – questions relating to sovereignty and who should sit at the proverbial table. It also points to the interplay between the informal nature of the Arctic Council and the formality of the UNCLOS and how actors choose to draw on different legal forms to either open the area to cooperation or close it off. The declaration managed to cast doubts over the central role of the Arctic Council (Pedersen 2012), thereby deepening the basin. It was further deepened by the fact that non-Arctic states like China, Japan, Korea, France, Germany, the UK, and the European Union have all affirmed the Convention as "the key legal foundation and governance framework for addressing matters relating to the Arctic Ocean." (Young 2016c: 274). Given the immense power surrounding the UNCLOS (Durfee and Johnstone 2019, 251), its unabashed focus on the sovereignty of states, its fundamental premise to provide certainty and stability in oceans governance (Rayfuse 2007a, 204), and the deep basin that it commands as the dominant institution related to oceans, globally, it is explicable why Arctic coastal states would turn to it to essentially re-territorialize the Arctic (Knecht and Keil 2013, 180). It also explains the concerns of Finland, Iceland, Sweden and the Permanent Participants of the Arctic Council.

Theoretical Underpinning. The normative evolution of current governance approaches is underpinned by a legal positivist ontology (see Chapter 5), which leaves Arctic institutions poorly adapted to an Open Arctic. Why? Because there is a dissonance between the nature of change in the Arctic system, defined by characteristics like non-linearity and heightened connectivity, and the reductionism of law, which is built on a Newtonian, mechanistic ontology of linear change and equilibrium which essentially rejects integration, ambiguity, and paradox (see Beinhocker 2006; Unger and Smolin 2015, 49). This Newtonian ontology is a mismatch in cases like the Inuit Petition, where political and technical barriers to positing a clear and undisputed causal link between the causes of climate change and specific human rights violations poses a significant challenge to traditional human rights mechanisms, like the IACHR. Quickly, it becomes clear that the certainties and simplifications upon which many of the existing processes were built cannot reduce complex geophysical processes and their impacts on social-ecological systems to bounded spaces (see Steinberg, Kristoffersen, and Shake 2020, 90). Meanwhile, in the context of Arctic shipping and navigation, the dynamic nature of the Arctic Ocean "creates a problem for establishing legal systems, as these processes are neither purely geophysical, biological, climatological, legal nor political." (Steinberg, Kristoffersen, and Shake 2020, 90). As such, the current conditions provide an opportunity for scholarship to reflect on the legal infrastructure which is imposed on the Arctic and its inhabitants, and the ways in which it permeates through how we understand the Arctic and choose to manage it – this includes the path dependency of legal positivism as the dominant theoretical underpinning of the study of Arctic environmental governance and the ways in which it suggests we respond to increasing change and complexity (Braverman and Johnson 2020, 3).

Building on this, the co-evolution of various WITs would also suggest that there is a vested interest for states to continue to draw on a legal positivist ontology, as opposed to a complex systems ontology which would require actors to focus on the co-evolution of different variants. Successfully maintaining the *status quo* of Arctic states by making dominant Arctic institutions more coherent and by using the law as a tool to ensure that legally relevant interactions coalesce around the dominant WITs, would suggest that a legal positivist ontology is, for now, succeeding for the dominant actors.

D) Technologies are changing to adapt to an Open Arctic, at times becoming increasingly complex.

In response to an increasingly open Arctic, many technologies have been developed and implemented with the aim of improving reliability, or to provide stability. This includes a structural deepening of scientific cooperation through the Working Groups, Expert Groups, and Task Forces of the Arctic Council, as well as various scientific networks like the IASC. It also includes the development of information and communication technology (like satellite tracking, ice sensing and forecasting, broadband communication, imaging, and detection radars), cold-weather technology (such as winterization solutions), transportation technology (like ice breakers, shipping vessels, and ship repair), and industrial technologies (such as pipelines and seaports). These technologies are applied for a variety of purposes including to monitor and adapt to environmental change, to extract resources, and to navigate through uncharted territories (see for example Farré 2014; Zellen and Arctic Institute of North America. 2013; Elferink and Rothwell 2001; Lajeunesse 2012; Stephenson et al. 2013; Wilkman et al. 2016). Communication and information technology, as an example, provides substantive data-processing capacity (Lin 2013, 2; see also Castells 2009; Slaughter 2004; Rosenau 2003; Sassen 2007) which (informal) working groups and networks of collaboration leverage to maximize exchange and synthesize scientific and Indigenous knowledge. The findings therefrom can serve as a basis for technological, institutional, and conceptual innovation. At the same time, the choices behind the trajectories of scientific cooperation – which knowledge is gathered by whom, how, and why – and the technologies developed in response to a changing environment are determined by a variety of worldviews and significantly driven by standards, like the *Polar Code*, set by institutions like the IMO (see Chapters 3 and 4). As such, the evolution of the "T" appears shallow the Closed Arctic basin.

These technologies are clearly intended to meet the *law of requisite variety* – to provide the necessary governance capacity to match an increase in variability in the Arctic system. And so, even though these technologies provide increased stability to some parts of the Arctic system, by bootstrapping upward into more complex elements (Arthur 2009, 204), their increasingly tight coupling with other components in the Arctic system raises the risk of surprising and harmful interactions (see Perrow 1984). For instance, a breakdown in any of the complex communication, cold-weather, or transportation technologies used to navigate through unpredictable Arctic waterways raises the chances of cascading failures through the rest of the Arctic system. As highlighted in Chapter 4, the grounding of the ship M/V *Selendang Ayu* off the coast of Alaska, in 2004 provided a striking example of cascading failures resulting from technological failure, where a cylinder failure shut off the ship's engine, leading it to drift toward land and break in half. This accident poured 1.2 million litres of fuel (and soybean cargo) into the water, only a fraction of which was recovered due to the location's remoteness, weather, and an absence of clean-up equipment. In addition to all of this, six crew members were killed due to unexpectedly challenging rescue efforts.

What is more, given the tightening links between the Arctic and our global systems, there is a risk that localized failures could spread quickly into more distant system components (Buldyrev et al. 2010; Bashan et al. 2013; Helbing 2013; Homer-Dixon 2011; Homer-Dixon et al. 2015)

As I have highlighted here, the Closed WIT is passing through an uncontrolled pathway toward an alternative Open Arctic WIT through a variety of fragmented choices that lack any coherent vision for how

to ensure the well-being of both the Arctic environment and its inhabitants over time. However, through a Kuhnian cycle of sorts, an alternative Open Arctic WIT set could eventually become the dominant WIT set. I argue that this has not yet occurred even though the W and T have evolved because the I is locked in through a process of structural deepening – when new components and functions are added to bring depth, improve performance, provide design sophistication, work around limitations, and enhance reliability within a competitive and co-evolutionary environment.

However, with these three complexity tools, scholars at the intersection of law and complexity might be able to discern the co-evolution of Arctic worldviews, institutions, and technologies together with their material environment. In this way, these tools return to my original intention to explore the potential of reflexive law in the Arctic by cutting across the operative closure of different systems – where they create a sphere for themselves without regard for the material environment or other variants (Teubner 1993)– to provide sufficient cognitive openness – the capacity of a system to learn – to understand the role of law as a tool for maintaining coherence or cause of incoherence across a broader system. In this way, the metaphor can provide significant insight for constructivist legal theory and existing research on law and complexity.

5. Conclusion

It is increasingly clear that the Arctic system is undergoing a transformational shift. It is evident in how the Arctic environment is changing before the eyes of scientists on year-long scientific expeditions, like the MoSAIC. And it is evident in how changes in the Arctic environment are impacting the daily lives of Arctic Indigenous Peoples, like the Inuit, who seek to hold states accountable for their contributions to this change.

Worldviews of the Arctic are shifting from a pristine and frozen environment to one that is increasingly open to new opportunities and risks, made visible by rivers carrying fuel and sinking cities. Technologies are increasingly also shifting to accommodate this new material reality. However, current approaches to Arctic environmental governance appear to be on the same pathway as before, glancing past the vast complexities of the Arctic environment and its peoples, as outlined in the many scientific assessments and reports produced by these institutions, no less.

This project was built on a curiosity to understand why scholars do not apply the same complex systems ontology used in these assessments and reports to also understand how institutions of Arctic environmental governance, specifically the law, co-evolves with a rapidly changing Arctic and the ways in which a greater understanding of these connections might inform our governance choices moving forward. More precisely, I set out to understand whether the emerging material reality of the Arctic system is fundamentally incommensurable with the functional requirements of the law that seeks to govern it.

Over the course of the first five chapters I argued that that is, in fact, the case. The current legal positivist underpinning of Arctic environmental governance is incommensurable with the constitutive and behavioural characteristics which increasingly define the Arctic system. Throughout these chapters, I observed several elements of incommensurability between the ontological, epistemological, and normative commitments of complexity science and the law. In search of a potential alternative legal approach that could accommodate the Arctic's complexity, I turned to other, non-positivist legal theories. However, they provided little guidance.

Finally, having diagnosed the problem, and recognizing that the law is integral to our ability to manage the Arctic system moving forward, the concluding chapter outlines a prospective research agenda for bringing together complexity science and Arctic environmental governance using three specific complexity tools. With this research agenda, I seek to respond to a specific call to action from Kotzé and Kim (2019)

to bring together complexity theory and the juridical sciences. I conclude that it is not only with a new vocabulary but also with a new set of tools that we can truly begin to reimagine Arctic environmental governance and the role of law specifically.

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Appendix 1: A Typology of Ten Ice Types

Ice Type	Description
New Ice	Recently formed ice composed of ice crystals that are only weakly froze together (if at all) and have a definite form only while they are afloat
Nilas	A thin elastic crust of ice (up to 10 cm thick), easily bending on waves and swell and under pressure growing in a pattern of interlocking “fingers” (finger rafting)
Young Ice	Sea ice in the transition stage between nilas and first-year ice; 10-30 in thickness
First-Year Ice	Sea ice of not more than one winter's growth, developing from young ice having a thickness of 30 cm or more
Multiyear Ice	Sea ice that has survived at least one summer’s melt; topographic features generally smoother than first-year ice and can be a few meters thick. Old ice is also much harder than first year ice, and can be much more damaging to ships, if hit at a normal cruise speed
Ice Massifs	Extensive accumulations of close or very close ice that are found in the same region every summer (in Johanessen et al. 2007: 257)
Drift Ice	Ice floating on the surface of water in cold regions; usually carried along by winds and sea currents
Pack Ice	When drift ice is driven together into a large single mass; wind and currents can pile up ice to form ridges 3-4 metres high, creating obstacles difficult for powerful icebreakers to penetrate; typically identified by high percentage of surface coverage by ice (80-100%).
Ice Floe	Large piece of drift ice that might range from tens of metres to several km’s in diameter
Ice Field	Wider chunks of ice floes

Appendix 2: List of Formal and Informal Agreements

Formal Regional (15)

Convention Relating to Fur Seals in Bering Sea	(1894)
North Pacific Fur Seals Convention	(1911)
Agreement relating to creation of the international ice patrol	(1913)
European Convention on Human Rights	(1950)
North Atlantic Ice Patrol Financial Agreement	(1956)
Interim Convention on Conservation of North Pacific Fur Seal	(1957)
Inter-American Convention on Human Rights	(1969)
Agreement on Conservation of Polar Bears	(1973)
The European Charter for Regional or Minority Languages	(1992)
Agreement on Cooperation in Research, Conservation & Management of Marine Mammals in the North Atlantic	(1992)
Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic	(2011)
Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic	(2013)
Polar Code	(2017)
Agreement on Enhancing International Arctic Scientific Cooperation	(2017)
International Agreement to Prevent Unregulated High Seas Fisheries in the central Arctic Ocean	(2018)

Formal Global (30)

Treaty Concerning the Archipelago of Spitsbergen	(1920)
Convention on Migratory Species of Wild Animals	(1940)
International Convention on the Regulation of Whaling	(1946)
Indigenous and Tribal Populations Convention (ILO Convention 107)	(1957)
International Covenant on Civil and Political Rights	(1966)
International Covenant on Economic, Social, and Cultural Rights	(1966)
Optional Protocol to the ICCPR	(1966)
Convention on Elimination of all Forms of Racial Discrimination	(1969)
Ramsar Convention on Wetlands of International Importance	(1971)
United Nations Convention on the Law of the Sea	(1972)
Convention Concerning the Protection of the World Cultural and Natural Heritage	(1972)
Convention on the Prevention of Marine Pollution by Dumping of Water and Other Matter	(1972)
International Convention for the Prevention of Pollution from Ships	(1973)
Convention on International Trade in Endangered Species	(1973)
International Convention on Safety of Life	(1974)
Convention on Long-Range Transboundary Air Pollution	(1979)
Vienna Convention for the Protection of the Ozone Layer (Montreal Protocol)	(1985)
Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal	(1989)
International Labor Organization's Convention concerning Indigenous and Tribal Peoples in Independent Countries (ILO Convention No. 169)	(1989)
Espoo Convention on Environmental Impact Assessment in a Transboundary Context	(1991)
United Nations Convention on Biological Diversity	(1992)
United Nations Framework Convention on Climate Change	(1992)
Straddling Stock Agreement	(1995)
Protocol on the Prevention of Marine Pollution by Dumping of Water and Other Matter	(1996)
Kyoto Protocol	(1997)
Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters	(1998)

Stockholm Convention on Persistent Organic Pollutants	(2002)
Nagoya Protocol	(2010)
Minamata Convention	(2013)
Paris Agreement	(2016)

Informal Regional (27)

The American Declaration of the Rights and Duties of Man	(1948)
Rovaniemi Declaration On The Protection Of The Arctic Environment	(1991)
Nuuk Declaration	(1993)
Joint Communique and Declaration of the Establishment of the Arctic Council	(1996)
Inuvik Declaration	(1996)
Alta Declaration	(1997)
Guidelines for Environmental Impact Assessment in the Arctic	(1997)
Iqaluit Declaration	(1998)
Guidelines for Ships Operating in Arctic Ice-Covered Waters	(2002)
Inari Declaration	(2002)
Arctic Waters Oil Transfer Guidelines	(2004)
Arctic Marine Strategic Plan	(2004)
Reykjavik Declaration	(2004)
Salekhard Declaration	(2006)
Arctic Offshore Oil and Gas Guidelines	(2009)
Guidelines for Ships Operating in Polar Waters	(2009)
Tromso Declaration	(2009)
Nuuk Declaration	(2013)
Arctic Council Observer Manual for Subsidiary Bodies	(2013)
Arctic Council Rules of Procedure	(2013)
Iqaluit Declaration	(2015)
Guidelines for Relationships with Outside Bodies	(2016)
Arctic Council Communications and Outreach Guidelines	(2016)
Updated Communications Strategy and the Communications and Outreach Guidelines	(2017)
Fairbanks Declaration	(2017)
Working Group Common Operating Guidelines	(2017)
Guidelines for Implementing an Ecosystem Approach to Management of Arctic Marine Ecosystems	(2019)

Informal Global (3)

United Nations Declaration of Human Rights	(1948)
Akwe: Kon voluntary guidelines	(2004)
United Nations Declaration on the Rights of Indigenous Peoples	(2007)

Appendix 3: Maritime Zones

Maritime Zones	Legislative & Enforcement Control of Coastal States
Internal Waters	Waters within the baselines — the low water line of the shore — are designated as internal waters (UNCLOS art. 7 and 10). In internal waters, such as ports or bays, coastal states — including all Arctic coastal states — exercise full sovereignty and maximum jurisdiction over ships (Ellis and Brigham 2009, 51). This includes their potential to set conditions for entry to domestic ports (for example, for ships carrying radioactive waste) or set limits on discharge from ships. Port states also have inspection and enforcement powers should pollution occur in the port, in internal waters, in territorial seas, or the EEZs of other coastal states who request the port state's assistance in enforcing pollution offences. The same holds true with regard to pollution offences on the Arctic high seas. Ice shelves are not taken into account and are considered "sea," instead (Elferink and Rothwell 2001, 339–441).
Territorial Waters	Territorial waters fall within a 12-nautical mile limit (UNCLOS, Art. 3). While coastal states enjoy full sovereignty in territorial waters (and in the airspace above), foreign ships retain the right to innocent passage — continuous and expeditious, and in no way "prejudicial to the peace, good order and security of the coastal state" (Ellis and Brigham 2009, 51) — up to the baseline (UNCLOS, Art. 17-26). Examples of prejudicial behaviour include unapproved research vessels or willful pollution from ships in territorial seas. Under UNCLOS, coastal states maintain the authority to adopt laws and regulations applicable to foreign ships transiting through territorial seas. Arctic coastal states can also apply domestic laws in relation to the safety of navigation, preservation of the marine environment and marine pollution control of internal waters so long as it does not impair the right of innocent passage. While this applies to all Arctic coastal states, Greenland has a 3-nautical mile territorial sea due to the length of its sparsely populated coast, and its lack of resources to ensure the security and supervision of vessels, and the protection of the marine environment to a 12-nautical mile limit (Order no. 191 of 7 May 1963 on the Delimitation of the Territorial Sea of Greenland, s1(2)). Still, its exclusive rights to marine rescues in the Exclusive Economic Zone and on the shelf are secured. Alaska also exercises jurisdiction up to 3-nautical miles with the federal government exercising authority beyond this (Submerged Lands Act 1953, 43 U.S.C. 1301 (a) (2), 1311 (a) (2012)).
Contiguous Zone	Coastal states can claim a 24-nautical mile contiguous zone. Within this zone, states can exercise control over foreign ships to prevent their infringement, as well as enforce violations of customs, fiscal, immigration or sanitary laws and regulations (UNCLOS, Art. 33).
Exclusive Economic Zone	The EEZ measures up to 200 nautical miles from the baseline. Within the EEZ, coastal states maintain sovereign rights to explore, exploit, conserve, and manage natural resources. "Rocks which cannot sustain human habitation or economic life of their own" have a territorial sea but no EEZ or continental shelf (Durfee and Johnstone 2019, 184; Rothwell and Stephens 2010, 82). Coastal states also enjoy sovereign rights over resources within the EEZ including living marine resources (fish and mammals) and energy (infrastructure like wind turbines) (UNCLOS, Art. 56, 60). Coastal states maintain jurisdiction over the protection of the marine environment. Article 234 (outlined below) gives coastal states the right to adopt and enforce non-discriminatory laws and regulations for the prevention, reduction and control of marine pollution from vessels in ice-covered areas (for more than half the year) within the limits of the EEZ. When it comes to the regulation of shipping in these waters, foreign ships enjoy freedom of navigation up to territorial waters but must conform to international rules and standards established under the International Maritime Organization (IMO). Still, coastal states retain limited ability to enforce international rules and standards to prevent pollution — they only have the ability to inspect or impose monetary penalties when there is serious damage to the marine environment (B. Ellis and Brigham 2009, 52). In theory, and with permission from the coastal state, other states may conduct marine scientific research (UNCLOS, Art. 246).

Maritime Zones (cont'd)	Legislative & Enforcement Control of Coastal States (cont'd)
Continental Shelf	All Arctic coastal states have sovereign rights over the sea-floor (an extension of the territory) up to 200-nautical miles from the baseline, including everything on or below it (Durfee and Johnstone 2019, 185). Procedures for establishing sovereign rights over the extended outer continental shelf of Arctic coastal states — beyond 200 nautical miles, and comprising seabed and subsoil — are dependent upon geological and bathymetric conditions (Byers and Baker 2013; Byers 2013; see Durfee and Johnstone 2019, 187 for a full overview). Subject to Article 76, parties to UNCLOS wishing to establish these rights must submit scientific data within ten years of ratifying the Convention. The delineation of the continental shelf then takes place through the Commission on the Limits of the Continental Shelf (CLCS) whose body of scientists, elected by UNCLOS, provides final, binding recommendations on UNCLOS parties. The International Sea-Bed Authority is charged with organizing and controlling sovereign exploration and exploitation of resources in the area beyond 200 nautical miles (Byers 2013; Byers and Baker 2013; Koivurova, Molenaar, and VanderZwaag 2009).
High Seas	The Arctic high seas — including the Central Arctic Ocean, the *Loophole* in the Barents Sea, the *Banana Hole* in the Norwegian Sea and the *Donut Hole* in the Central Bering Sea (Schönfeldt 2017, xxxvii) — are irreducible to national or private appropriation and guided by *res communis*, the principle of the common heritage of mankind (Shelton 2009, 34–35). On the high seas, all states retain the freedom to fish (although, it is not a free for all) and to conduct scientific research, among other things. When it comes to safety, environment, and security, transiting ships are subject to the global rules and standards of the IMO, simply because coastal state authority does not extend to the high seas. Coastal states retain limited jurisdiction over foreign ships on the high seas and in international straits due to the latter's right to transit passage (Ellis and Brigham 2009, 53). The flag state is granted exclusive jurisdiction, with limited exceptions. Still, states bordering on straits can adopt ship-source pollution laws in accordance with international standards. The Seabed Disputes Chamber, a special chamber of the International Tribunal for the Law of the Sea, supports the need for a transboundary Environmental Impact Assessment (EIA) when activity poses a risk of damage to other states and areas beyond national jurisdiction, such as the high seas (Durfee and Johnstone 2019, 231). It is also the first major international court to recognize the precautionary approach (see section 2.2.2.) as a part of customary law.[227]

[227] *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area* (Advisory opinion) 2011, International Tribunal for the Law of the Sea: Seabed Disputes Chamber are No. 17, para 45.

Appendix 4: Complex Adaptive System Emergence Properties in the International Legal System (adapted from Ruhl 2008)

System Property	CAS Theory Principles	International Legal System Examples
Emergence and aggregation	System behaviour emergences from the aggregation of network causal chains which cannot be explained by examining any isolated part of the system.	International courts and tribunals develop doctrine from hundreds of international cases over time. International law is negotiated and implemented through domestic rules and policies of various administrations, thereby changing the contours of the regime over time (e.g., US pulls out of *Paris Agreement).*
Path dependence	The next state of the system is constrained by the past decisions, events and information that have brought the system to its present state, even if no longer relevant for their original purposes	The common law judicial practice of following precedent can constrain judicial decisions going forward. If a "large" event occurs, such as a new treaty or rule, path dependence impedes returning to the prior state.
Self-organized structure	The system tends to organize around a set of deep structural rules that lend stability to system behaviour.	The UNCLOS provides a deeply self-organized structure around the governance of the oceans.
Critical states and punctuated equilibrium	Notwithstanding deep stable structure traits, dynamic qualities of the system (nonlinear relationships, network feedback) lead to a "stable disequilibrium" of evolutionary change with potential for punctuations in equilibrium by 'large' events.	Rise in Multilateral Environmental Agreements starting in the 1970s. Sovereign states amend constitutions periodically. Extreme political regime shifts can substantially change style and content of domestic legal instruments and institutions, thereby impacting international legal processes.
Adaptive resistance and resilience capacity	As a result of these internal behaviors, the system as a whole proves *resistant* to environmental perturbations and *resilient* at returning to or near its self-organized critical states following a perturbation.	International treaties and sovereign constitutions prove difficult to amend. Financial regulations temper unstable markets. Environmental regulations change incentives for providing certain environmental conditions, and actors' expectations about these conditions, leading to self-reinforcing new environmental conditions.
Phase transitions	If pushed too far from its self-organized critical states, however, either by a massive perturbation or by constant pressure from elsewhere perturbations, the system could "tip" in a nonlinear and potentially irreversible move into a new set of behaviours.	Sovereign nations adopt new constitution. Civil unrest leading to change in political structures (e.g., democratic to authoritarian)

Design Issue	CAS Theory Principles	Legal System Examples
Sensitivity to initial conditions	Due to feedback, nonlinearity, and emergence, relatively small changes in starting conditions can lead to relatively large differences in system dynamics.	Minor changes in wording in a treaty or convention could have profound implications for its application.
Conflicting constraints on the fitness landscape	Changes in one system component to promote fitness may be limited by properties of other system components also designed to promote fitness.	Stricter environmental regulation can impose costly economic effects. Provisions in environmental conventions that contradict World Trade Organization rules.
Co-evolutionary fitness landscapes and 'Red Queen' effects	Improvements in system A's fitness prompt adaptive co-evolutionary moves in other systems that could reduce system A's fitness possibilities under its new configuration, prompting yet further adaptation in system A.	The IMO *Polar Code* New tax measures lead to new tax avoidance strategies, which lead to new tax measures, and so on.
Irreducibility of system behaviour	Because emergence is a system scope phenomenon, system behaviour cannot be understood and designed by studying a single component.	One cannot understand international law by studying one case.
Irreversibility of system states	Because the present system state is a product of all information that has flowed through the system to that point in all past states, the system dynamics cannot be reversed to past states, but only steered into new directions approximating where the past might have led had different decisions been made then.	Repeal of regulatory law, or overruling of a judicial precedent, cannot rewind the world back to the conditions that existed just prior to when the law or prior ruling was promulgated.
Impermanently optimizable fitness	Because of co-evolutionary fitness landscape effects, superior fitness cannot be "locked-in" permanently and attempts to do so may prove counter-productive.	Severe global drought conditions undermine the stability of water allocation law regimes. Migration of fish species due to environmental change undermines the stability of fish stock allocation regimes.
Unpredictable future states	Taking all of the CAS properties into account, the future states and "big" events of a system are not predictable over relevant time horizons.	If climate change is not subdued, what will environmental law, insurance law, contracts law, financing law, and other fields affected by climate change look like in 50 years?

Appendix 5: Indigenous WITs

The Arctic is home to over one million Indigenous peoples: including the Yupik and Inuit (Iñupiat, Inuvialut, and Kalaallit), Saami, Nenets, Khanty, Evenk and Chukchi, Aleut. As with any group, there is no coherent Indigenous worldview.

Illustration 2: Demography of Indigenous peoples of the Arctic based on linguistic groups (major groups) (Source: Hugo Ahlenius, UNEP/GRID-Arendal) [228]

Instead, there is a great variation in Indigenous worldviews, which reflect self-definition, language, material culture, location, and land use patterns. There are also long-standing Indigenous institutions, such as Indigenous legal orders (Borrows 2017; Napoleon 2007; 2013), and technologies, like herding skills. These worldviews, institutions, and technologies have often been heralded for their ability to adapt to changing conditions. Although I do not explicitly focus on Indigenous worldviews, institutions, and technologies *per se,* they are absolutely crucial to our understanding of the past, present, and future of the Arctic and can provide key insights into substantive and procedural gaps in current approaches to Arctic environmental governance. As an example, Indigenous peoples' cultural identity and interrelationships with the natural and spiritual world distinguish Indigenous worldviews but may at times be incongruent with the dominant – Closed and Open – understandings of the Arctic.

[228] Accessed at: https://www.grida.no/resources/7015.

The lives of Arctic Indigenous peoples are often idealized, however, with their multifarious worldviews essentialized for the purposes of rational western Arctic WITs. Often, this process of essentializing Indigenous worldviews into one can lead to a clear tension, between the archetypical (resisting full assimilation and cultural loss) and the modern (adapting to and benefiting from western culture) (Steinberg 2015, 136). The archetypical image of Indigenous peoples sustainably subsisting on traditional livelihoods – hunting, fishing, and reindeer herding – serves as a double-edged sword. On the one hand, it confers special claims to traditional land, sea and ice. It also reflects a "trend toward revitalization of Indigenous languages and cultures and the strengthening of northern identities," as expressed in the Arctic Human Development Report (Larsen, Fondahl, and Nordic Council of Ministers 2015, 144). On the other hand, this archetypical image bounds Indigenous peoples to certain political and geographical spaces and is often used to subjugate Indigenous peoples and their knowledge to colonial and national interests by states and environmental non-governmental organizations alike. For instance, the presence of Arctic Indigenous peoples serves as the basis of state sovereignty claims in the northern Canada; with the 1953 relocation of 87 Inuit to Grise Fiord by the Canadian government as a paradigmatic example. Such cases normalize Indigenous-state relations, leaving state sovereignty largely unchallenged.

At the same time, many Arctic Indigenous peoples increasingly supplement their primary incomes with traditional activities (rather than the other way around), live in permanent settlements, and utilize technology like snowmobiles and reindeer tracking apps on a daily basis. Within the bounds of dominant western WITs, the (often vague) notion of self-determination – demanding social justice, cultural integrity, sustainable development, and self-government – embraces Indigenous worldviews, playing out in the Arctic in two different ways: through the pursuit of Indigenous statehood in Greenland and transnational networks of Indigenous peoples, like the Inuit Circumpolar Council (Nuttall and Callaghan 2000, 394; Daes 1996; Meijknecht 2001; Steinberg 2015). This phenomenon is particularly visible in the shift from a Closed to an Open Arctic (see text box on the Ilulissat Declaration).

Similar to delineating the Arctic, investment in research is no innocent affair. Neither knowledge generation, nor technological development, are purely objective. Systemic biases are at work (Lin 2013, 181; Schnaiberg 1980, 279–81). Arctic reports and assessments are the product of deliberative processes, which often frame a shifting Arctic landscape as a technocratic problem (Steinberg 2015). Some scholars point to a colonial undertone, where research agendas are not be placed in the proper spatial or temporal framework, thereby failing to acknowledge Indigenous worldviews (Nilsson and Koivurova 2016, 184). Forbes and Stammler (2009, 28), for instance, point to three specific areas which could be reframed to accommodate Indigenous worldviews, when collaborating with circumpolar reindeer herders: from climate change to weather; from wildlife management to herding skills; and from Indigenous traditional knowledge to ways of engaging with the tundra.