Power and participation: narrative framings of disaster, climate change, and health in Arctic North America

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Intellectual property and publication statement

The candidate confirms that the work submitted is their own, except where work which has formed part of jointly authored publications has been included. The contribution of the candidate and the other authors to this work has been explicitly indicated below. The candidate confirms that appropriate credit has been given within the thesis where reference has been made to the work of others. Chapters two, three and four of this thesis comprise jointly authored publications. Authors are listed in order of contribution.

Chapter 2: Davis, K., Ford, J. D., Quinn, C. H., Mosurska, A., Flynn, M., Harper, S. L., & IHACC Research Team. (2022). Shifting safeties and mobilities on the land in Arctic North America: A systematic approach to identifying the root causes of disaster. Sustainability, 14(12), 7061.

K.D., J.D.F., C.H.Q. and S.L.H conceptualised the research focus and approach with additional support from A.M. and M.F. K.D. carried out the data collection, formal analysis and original draft preparation. All authors reviewed and edited the manuscript and agreed to the final published version of the manuscript.

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K.D., J.D.F., C.H.Q. and S.L.H conceptualised the research focus and approach. K.D. carried out the data collection, formal analysis and original draft preparation. All authors reviewed and edited the manuscript and agreed to the final published version of the manuscript. The Indigenous Health Adaptation to Climate Change (IHACC) Research Team (University of Alberta, Edmonton, Alberta, Canada) additionally contributed to the conceptualization of the work and to reading and editing of the manuscript. Members of the IHACC team include Shuaib Lwasa, Patricia J. García, Didacus B. Namanya, Lea Berrang-Ford, and Cesar Carcamo.

The candidate (K.D.) is the lead author of the three publications listed above. K.D. conceptualised and designed the research approach and methodologies and carried out the data collection and

analysis that is presented in each publication. Each article was co-authored with the candidate's supervisors (J.D.F., C.H.Q. and S.L.H.) and two articles were co-authored with other PhD students in the candidate's research network and lab group (A.M. and M.F.). The contributions made by each author have been detailed above and are listed within each paper. Some of the section, figure and table numbering in chapters two and four may differ to the published format. These have been edited here for consistency throughout this thesis.

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Rationale for thesis by publication

Due to the variety of methods, theoretical approaches and methodologies used, this research is most appropriately presented in three separate publications, each addressing interrelated but distinct research gaps. The progress of the research was such that it was possible to submit research for peer review during the PhD, enabling the research to contribute to broader research debates, and maximising the potential impact of the research.

Thesis structure outline

This thesis is divided into five chapters. **Chapter one** provides a rationale and introduction to the thesis. It gives a background to the relevant theory and research within the fields of critical disaster studies, public health, and narratives and discourse, as well as how each of these relate to each other in the context of climate change and disaster risk more broadly. This is followed by a description of the geographic context (Indigenous Arctic North America) and the relevance of this research and theory to the lives of Inuit in this context. A summary of the research gap is provided, along with an overview of the two overarching research questions of the thesis, the aims and objectives. This chapter is concluded with a description of the research design of this thesis, including a summary of the research approaches used and the value of interdisciplinary approaches to research that seeks to understand human life in the context of climatic change.

The three chapters that follow chapter one (chapters two to four) present two published journal articles and one manuscript in preparation for publication, which together comprise the core research work of this thesis.

Chapter two presents the results of a systematic literature review to identify the root causes of constrained mobility for Inuit in Arctic North America. This paper presents an attempt to systematically review the barriers to travel for Inuit across the whole of Arctic North America, drawing insights from both Canada and Alaska, and using a framework from disaster studies to identify causal mechanisms through which barriers to travel, and to safe travel, are created. Results show that root causes of constrained mobility are embedded in historic and ongoing colonial policies such as histories of residential schooling, forced relocation and sedentarization and contemporary environmental resource management and policy, which interact with national and international economic contexts to constrain travel. Because of relationships to land and importance of travel for Inuit, this disruption to travel has ongoing impacts on physical, mental and spiritual health. Results also emphasise the importance of attention to the ways that governance can constrain daily and weekly patterns of movement, particularly in the context of climate change.

Chapter three describes an approach to identifying narratives of climate change and health present in Canadian governmental policy. The goal of this is to understand if and how dominant narratives of climate change and health in Arctic North America are addressing the root causes of disaster for Inuit (identified in chapter two). Chapter two focused on mobility because of its central importance for Inuit health and the pivotal role it can have in understanding the root causes of loss and harm for Inuit in the context of socioenvironmental change. Chapter three moves to a broader focus on health. It seeks to establish whether the discourses and narratives surrounding climate change and

health policy engage with the root causes identified in chapter two. It argues that this will be required if narratives are to promote solutions that can address these root causes. It identifies a lack of engagement with root causes in both problem identification and suggested solutions in the most dominant narrative present in governmental policy in Canada. It finds that solutions proposed by the most dominant narrative focuses on technology and innovation designed to preserve the status quo. The two most dominant narratives do not engage with power shifting and place responsibility for action on Indigenous communities. This leaves policy action open to tokenistic attempts at participation and leadership, and extractive research processes.

Chapter four examines how participation is reported within modelling research that uses participatory approaches, focusing on the Circumpolar Arctic. A systematic scoping review analyses the degree of participation at each stage of the research process for each article identified. It identifies a diversity of topics, modelling approaches, and participant groups, most of which occurred in Arctic North America, and all of which engaged with non-Western knowledge types to some degree. Participation was most commonly reported at the model generation and participant identification stages, and least commonly reported in the choice of modelling type. Participatory scores — based on the number and degree of participatory stages of a study — were higher where authors gave instrumental or transformative rationales for the use of participation, and among studies that described prioritising non-Western knowledge types. Detailed reporting of participatory processes was frequently absent, suggesting a need for clearer discussions of these issues in the descriptions of the process. The scope also moves beyond Arctic North America to incorporate the wide diversity of approaches used to engage communities in research across the region and to enable comparison across countries and contexts within the Arctic, each of which has different specific relationships with Indigenous Peoples within their borders and different norms for engagement with those Indigenous Peoples in research.

Chapter five discusses the findings and implications of the three papers in chapters two to four. It first offers a narrative summary of the findings of the thesis, and how each paper builds upon the others to produce these findings. This is structured around the two overarching research questions of the thesis. This is followed by a discussion of a key, cross-cutting theme that emerges from these findings, which is that of power, unequal power relations, and a lack of attention to the need to change power relations. One aspect of this is the way that inequities and power imbalances structure the processes that create unequal health outcomes in the context of climate change. Others include the way that power acts through narratives (which shape collective understanding of climate change), the differential abilities people have to create and influence these dominant narratives, the lack of power-shifting reported in processes of participatory research that seek to

produce policy-relevant knowledge, and how each of these lead to a reinforcing of existing power structures. The role of narrative in creating change is discussed, including examples of those leading this change. This is followed by a discussion of the limitations of the research presented in this thesis and, finally, by some concluding remarks and priority areas for future research.

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To Mum and Dad, thank you for sending me out into the world and supporting whatever I choose to do. To El and Ro, I have been so lucky to grow up with such fierce, inspirational women. Seeing you at the beginning of your careers is so exciting and inspiring.

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To Chris, thank you for always being there. Having you here puts everything into perspective.

Positionality statement

Given that this thesis comprises work in an Indigenous context, it is important that I situate myself as an individual within this research. This research has been a long journey, and is the product of many different ideas, interests, conversations and external factors, not least a global pandemic, which has affected two and half years of this project.

I am a white middle class woman based at a British academic institution. I have lived my entire life in urban spaces and my family comes from South London. Being from the South of England, I have privileges that are the result of historical and ongoing inequities within this country. Now, I am hugely lucky to work in the North of England and to call it home.

I came to this PhD project after a period of years working in academia, having decided that I loved the process of research and wanted a research career. At that time, it seemed that a PhD was a necessary step towards that path, but I did take a number of years to consider whether it was the best option for me. My reluctance came, in large, from an increasing understanding of the ongoing role of academic institutions as tools of imperialism and colonialism. Additionally, as the first in my family to pursue a doctorate, there were simply a lot of unknowns. I have some wonderful past colleagues to thank for talking these things through with me, and for embodying the creative, critical and disruptive approach to academic research that inspired me, in the end, to say yes.

I knew I wanted to carry out a PhD in a way that produced something of wider value, as I had been used to working in this way in previous research positions, seeing my role as more of a consultant to groups or communities that wanted research input on a particular issue. This advertised project appealed a great deal for that reason. The research was going to be driven by community priorities and as part of a much larger and ongoing project with long-term goals and existing relationships. I have since come to understand in much greater depth the profound ways in which contemporary academic research is influenced by the legacies of imperialism and colonialism, and the ways in which all academic research is still imbued with these influences (Smith, 1999).

I have had the opportunity to visit North America only a few times, and Inuit Nunangat even fewer. The relevance of my location within British academia is particularly important to any research that is focused on an Indigenous context because of British academia's historic role in the colonial project, creating harmful and orientalising depictions and narratives of Indigenous Peoples (Said, 2003), and directly justifying colonial violence (Smith, 1999). My location is also important in light of the disruptions of the pandemic and the limits that this brought to my ability to be present in Inuit Nunangat and to build and maintain the relationships that should be at the heart of research more broadly (Howitt, 2020). Questions around how to move forward in the best and most respectful

ways possible, in the face of external factors such as the pandemic, have been ongoing throughout the PhD process.

The first UK COVID-19 lockdown began one year into the project, and just as I was about to start data collection. The changes brought about by the pandemic have closed off many opportunities but opened up many others and each of these has been a chance for reflection about how to do research, how to do this research in particular, and my own position and role within it all. The biggest impact of the pandemic on this work was curtailing the opportunities for building relationships, and codesigning research, with Inuit in Nunatsiavut as originally planned, building on many years of work and relationships that my supervisors have established in the region. When the pandemic hit, Inuit communities in Arctic North America took time to focus on their wellbeing and safety. For many, this meant closing communities to outsiders, and understandably taking time away from research and the demands of collaborative research projects. Making demands of our research collaborators at this time would have been deeply inappropriate, and so this project had to continue, adapt and evolve to move away from the anticipated community-led participatory research, and accept that the research would not have input from Inuit in the ways originally strived for. This did not mean no input from Inuit voices and priorities, however, and ways were sought to move forward with research questions and goals that still reflected Inuit priorities and concerns, drawing in particular from the vast body of existing research and other published work by Indigenous scholars and Inuit organisations.

I have learned a huge amount during the years of my PhD. I have gained a great deal of confidence in my own ability and way of doing research. At the same time, I have spent a lot of time feeling uncomfortable about carrying out a PhD in this research area. I have felt the contradictions between carrying out research that truly centres Indigenous priorities and trying to do so from within an academic institution that sets out requirements of the PhD that include time limits, focus on specific outputs and narrow concepts of ethical approval and data ownership. These uncomfortable feelings were also important and constantly pushed me to think deeply about what I was doing, why, and how I could do it better and in relation to Indigenous priorities. I had a number of discussions with colleagues about these tensions. Reassessing what scope there was to contribute to a larger Indigenous research agenda within the structures of the PhD and during a global pandemic was an ongoing process throughout the entire PhD, which raised many questions. These are not mine to answer but have pushed me to think more deeply throughout the PhD. Some of these questions include:

- How do we (and can we) seek to carry out research that truly centres Indigenous priorities when we are situated within colonial institutions?

- What is the best use of the privileged role of the academic researcher?
- *Is* there a role for academic researchers in this research area?
- Can researchers ever do work that does not ultimately serve their own career goals (particularly early career researchers pursuing a PhD)?
- Given the significant problem of research burden and duplication of primary data collection, is it appropriate for me to request Inuit collaboration or input on research that is not initiated by Inuit and stemming directly from Inuit priorities?
- Is it acceptable for me to *not* seek Inuit collaboration on research that concerns Inuit?
- Can my research be truly relation-centred in just three years and during a global pandemic?
- How does accountability sit within remote research processes and increased physical distance brought about by the pandemic?

I will carry these questions forward through my research career. They continue to help me take a step back and to critically focus on institutions and power relations that undermine Indigenous research agendas as well as Indigenous rights more broadly. And they continue to encourage me to reflect critically on my own position of power and privilege, and the opportunities and risks of harm to others that that brings.

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Abstract

Disasters are the outcome of social, political, and economic conditions and processes, particularly in the context of climate change. However, dominant narratives of climate change and health persistently frame climate change as an external threat and driver of harm. This obscures the root causes of disaster, such as inequity, colonialism, and poor governance. There are increasing calls to shift dominant narratives on climate change to encompass the root causes of disaster, and interest in the re-telling of climate change and health narratives from Indigenous perspectives. This thesis critically analyses the root causes of disaster for Inuit in Arctic North America (a region experiencing rapid climatic change), the ways that these are addressed in narratives about climate change and health, and how these narratives are constructed. Specifically, it focuses on the ongoing disruption of time spent on the land, which is reported to impact the physical and emotional health of Inuit as a 'creeping disaster', and which has been linked by some to climate change.

First, based on the 'forensic investigations of disaster' approach, the literature is systematically reviewed, using qualitative causal analysis, to identify the root causes of constrained mobility for Inuit in Arctic North America. It identifies barriers to time spent on the land, which are driven by processes of governance and inequality, as opposed to environmental hazards. Second, narrative analysis is used to unpack how Canadian government policy frames the problems, solutions, and responsibilities of health and climate change. Findings suggest that dominant narratives do not engage with the social determinants of health or root causes of disaster, and fail to propose solutions that address inequality, power-relations, or colonialism. Narratives that do engage with these issues are marginalised by the power of the dominant narratives, and do not appear to be shaping proposed solutions. Third, as there are suggestions that increased engagement of Indigenous Peoples in research and policymaking may pluralise these policy narratives, this thesis critically examines engagement with diverse knowledge types in research exploring climate-sensitive processes in an Arctic setting. Findings suggest that the degree of power afforded to Inuit in the research processes is frequently limited or not detailed, suggesting a need for clearer reporting and greater engagement in research design.

This thesis, therefore, argues that dominant policy narratives of climate change and health in Arctic North America conceal the root causes of harm and propose solutions that fall short of addressing them. Opportunities to shift the narrative are missed due, in part, to limited attention to power in participatory knowledge production. The intense focus on climate change as an external driver of harm in narratives about Arctic North America is problematic. In the context of climate change, action is needed that addresses the root causes of harm, including colonial legacies, power

imbalances and inequities. We need shared narratives that can push us to imagine and engender this change.

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1 Research rationale and background to the thesis

1.1 Research rationale

Disasters are the outcome of social, political, and economic conditions and processes, particularly in the context of climate change (Hewitt, 1983; Oliver-Smith & Hoffman, 2019). However, dominant narratives of climate change and health persistently frame climate change as an external threat and driver of harm, obscuring the root causes of disaster, such as inequity, colonialism, and poor governance (Faas et al., 2019; Liverman, 2009; Roberts & Pelling, 2020). There are increasing calls to shift dominant narratives on climate change to encompass the root causes of disaster, and interest in the re-telling of climate change and health narratives from Indigenous perspectives (Oliver-Smith et al., 2016; Whyte, 2017). In Arctic North America, ongoing legacies of colonisation, contemporary colonial policy, and inequities exist alongside climatic changes (Mattar et al., 2020). In particular, mobility is an issue of concern and priority to Inuit because of the importance of being on the land for physical, emotional, spiritual and community health (Cunsolo Willox et al., 2013). Research and policy in the region increasingly addresses the impacts of climate change and focuses on community adaptation to climate change, but it is not clear to what extent policy narratives address the root causes of disaster in this context (Cameron, 2012). Additionally, it is not clear how much power is afforded to Arctic Indigenous Peoples in their contribution to these narratives and to the identification of solutions (Flynn & Ford, 2020). Research is needed that deconstructs dominant policy narratives, analyses the degree to which these engage with the root causes of disaster and harm in the context of climate change, and examines the power processes involved in shaping these narratives.

1.2 Research context

1.2.1 The development of a critical approach to disaster research

Starting around the 1970s, a critical body of disaster scholarship began to point to the fact that disasters and disaster risk are socially constructed, because it is the social, political and economic structure of society (both locally and at a global level) that creates and shapes peoples' differential risk in the context of hazards (Blaikie et al., 2014; Hewitt, 1983; Oliver-Smith, 2022; Wisner et al., 1977). Ultimately, it is argued, disasters happen through human choice, particularly through political and policy choices that grant power to some over others and create inequities within societies (Kelman, 2020). These inequities, and therefore disaster outcomes, run along lines of oppression including inequities based on race, Indigeneity, gender, age, disability, religion and others (Ahmad, 2018; O'Keefe et al., 1976). This highlights the central role of unequal power relations in disaster

causation, with decisions made by those with power shaping the experiences of those with less power. These human choices, practices and power relations are structural, in that they directly relate to the ways that power and resources are shared within society, and they also shape, and reinforce, social, economic and political institutions and processes (Kelman, 2020; Kelman et al., 2017). These processes will, therefore, be referred to in this thesis as 'structural'. Critical disaster scholarship highlights how these structural processes become the drivers of disaster risk and disaster and are thus often referred to as 'the root causes of disaster' (Oliver-Smith & Hoffman, 2019). Research has shown direct and indirect causal pathways between these root causes and disaster outcomes (Oliver-Smith et al., 2017). Broadly, these root causes include, but are not limited to, colonisation, globalisation, poverty and global patriarchy, and the ways that these have been embedded into global development processes (Bonilla, 2020; Chmutina et al., 2021; Howitt et al., 2012; Hsu et al., 2014). However, the ways that these will manifest locally will depend on a diverse array of contextual factors (Wisner et al., 1977) and experiences of disasters are the result of structural processes and inequities at multiple intersecting levels of society and governance (Sultana, 2020). Thus, disaster risk is inseparable from development dynamics, and could be seen as a problem *with* conventional development processes (Kelman et al., 2017). For example, Chmutina et al., (2021, p. 780) point out that "because the World Bank is tied directly to the centres of power in a global capitalist economy, it cannot act to redress the inequalities that fuel that economy, but rather is called upon to reproduce them" This suggests that disaster risk reduction should be considered an issue that is indistinguishable from development and the status quo (Hickel, 2019; Sultana, 2018).

Given this, meaningful disaster risk reduction efforts must focus on addressing structural root causes such as poverty, colonial policies, institutional racism and equity more broadly, and the power-imbalances that underly these (Gaillard & Mercer, 2013). Nevertheless, disaster risk reduction efforts have a history of treating disasters as disruptions to the normal functioning of a system, and of ultimately seeking to protect the status quo from such temporary disruptions (Bankoff, 2019). This is characterised by a focus on physical hazards and reaction and response to relieve the impacts of disaster, but arguably not on the root causes (Cheek & Chmutina, 2021). In seeking to protect the status quo from disruption, this approach ignores the fact that the disaster is generated by structures within the status quo (Hewitt, 1983; Oliver-Smith et al., 2016) and many have argued that this will need to change if the targets of the Sendai Framework for Disaster Risk Reduction 2015-2030 are to be achieved (Chmutina et al., 2021).

In efforts to counter this hazard-focused approach to disaster, there is a developing research agenda that seeks to link root causes and their local effects in order to identify appropriate policy

approaches and practices to reduce these factors that lead to risk in the context of disaster (Oliver-Smith et al., 2016). A key step towards being able to address the root causes of disaster in specific contexts includes research directed at these more locally contextual structural processes that create disaster (Peters et al., 2021). Given the observation that disaster risk reduction is an issue of development, there is suggestion that the Sendai Framework for Disaster Risk Reduction, the main mechanism for promoting and implementing disaster risk reduction, should better integrate development data in frameworks for monitoring and evaluating disaster risk reduction action (Chmutina et al., 2021). Ongoing research challenges include a historic lack of interdisciplinary research and participatory action research into the root causes of disaster (Alcántara-Ayala et al., 2015), as well as insufficient disaster data that are disaggregated by gender, age, class, race and other social characteristics and which are essential for the identification of inequities in disaster impacts and experiences (Mazurana et al., 2013).

1.2.2 The application of disaster scholarship to the study of climate change

Climate change adaptation is an increasingly important form of disaster risk reduction (Kelman et al., 2017). Anthropogenic climate change is causing increased frequency and intensity of both rapid and slow-onset hazards, both of which have the potential to be associated with disasters if structural factors that create disaster risk are present (Pörtner et al., 2022). As with other forms of disaster risk reduction, therefore, meaningful action will need to address the structural root causes. There is a vast and expanding body of research that looks at the intersection of climate change and human life and the ways that humanity will need to adapt in the context of climatic change, drawing from a wide range of disciplines and theory (Hall & Sanders, 2015), but much does not draw directly from the long history of critical disaster scholarship in seeking to understand the causes of risk and harm (Kelman et al., 2017). This means that hazard-focused approaches to climate change are prevalent, and exist alongside research that takes a more critical approach to the structural drivers of harm in the context of climate change (O'Brien et al., 2007). There is thus also a need for more research that seeks to identify the structural root causes of harm, and identify appropriate policy solutions, in the context of climate change.

1.2.3 The social determinants of health and their relevance to disaster

Structural factors that comprise the root causes of disaster are often referred to in health research as the "social determinants of health", because these factors also cause inequities in health and mortality outcomes in populations more broadly, in the context of a hazard or not (Marmot, 2020). The social determinants of health were put forward by Marmot (Marmot et al., 2008) to describe how structural inequities create differential health outcomes, within and between societies,

depending upon social status and inequities, such as gender, class and race. They have been fundamental in achieving wider understanding of the ways that unequal structural processes manifest as harm. Marmot et al., (2008, p. 1) define the social determinants of health as: "the result of a toxic combination of poor social policies and programmes, unfair economic arrangements, and bad politics". When compared to the root causes of disaster, defined in disaster scholarship as "underlying drivers, such as environmental degradation, social and economic inequality, poorly planned and managed urban development and weak or ineffective governance" (Oliver-Smith et al., 2016, p. 5), the relevance between the two concepts is clear. Both concepts are referring to harm to human life, health and wellbeing and both definitions highlight the key role of power and governance in driving this harm. Additionally, both emphasise that these conditions are not "natural" phenomena.

From the perspective of disaster scholarship, drawing from literature on the social determinants of health can help to highlight the fact that structural factors create harm even in the absence of a 'hazard', meaning that the *disaster* is indistinguishable from the status quo (Fuentealba, 2021; Oliver-Smith et al., 2016). From the perspective of health research, drawing from critical disaster scholarship can help to conceptualise widespread health inequity as a disaster in and of itself. This thesis draws simultaneously from these two bodies of literature, as this bringing together of concepts and ideas from different disciplines challenges and pushes forward thinking around concepts and definitions of disaster, which it argues are particularly valuable in the complex context of climate change.

1.2.4 Expanding definitions of disaster

Defining disaster is complex and many attempts to define what constitutes a 'disaster' are still based upon the associated hazard and the degree of impact, such as number of people affected or degree of financial destruction (Quarantelli, 1998). Research from critical disaster scholarship has pushed back on the need for strict definitions, arguing that interpretation and subjective significance of crises should be more important than specific physical damage or outcomes (Oliver-Smith, 2019). Climate change will likely be associated with slow and creeping hazards as well as rapid-onset extreme weather events, requiring an understanding of disasters that encompasses diverse timescales and speeds, such as drawn out processes of pollution and environmental degradation that do not tend to be included in ideas of rapid-onset calamity (Fortun et al., 2017). This means recognising intangible forms of loss as a disaster (Tschakert et al., 2019). It also involves the realisation that all disasters are shaped over significant time periods, because the structural conditions that create disaster, even in the context of rapid-onset hazards, develop and evolve over

long periods of time and sometimes hundreds of years (Oliver-Smith, 2019). This, therefore, troubles the notion of disasters as discrete events (Disasters Deconstructed, 2021), reframing them as "time-delayed manifestations of structural violence and maldevelopment" (Chmutina et al., 2021, p. 787).

1.2.5 Discourses and narratives of climate change

These ways that we frame disasters conceptually and in wider discourse are important because they dictate our understandings of the causal process and possible solutions (Mroz et al., 2021). Despite evidence of the structural root causes of disaster in the context of climate change, dominant discourses and narratives of climate change continue to externalise the threat of climate change, framing climate change as *the* driver of harm and disaster and distracting from the root causes of harm to encourage a focus on adaptation efforts that make incremental and superficial adjustments to protect the status quo (Lahsen & Ribot, 2021). For example, discourses that label women as 'virtuous or vulnerable' have been criticised for deflecting attention away from institutional power relations and inequalities at all levels (Arora-Jonsson, 2011). This demonstrates how powerful discourses about climate change can be.

Discourses comprise distinct ways of representing certain aspects of social life and the world more broadly, primarily through language, which legitimises and platforms certain ideas over others (Foucault, 1972; Gee & Handford, 2012). Foucault (1972) points out how specific social systems produce knowledge and meaning in the form of discourses, with very real impacts on the organisation and structure of social life. In constructing the framing of certain things, discourses define people's understanding and interpretation of the world and set agendas for action, and it is often those with power and a platform who get to create or reinforce discourses (Chmutina et al., 2019; Elizabeth Marino & Peter Schweitzer, 2016; Hajer & Versteeg, 2005; Leipold & Winkel, 2017). Discourses, therefore, are created and exist in complex and evolving hierarchies of power (Foucault, 1972).

Narratives are a particular type of discourse that tell stories, or accounts of series of actions and events that unfold over time (Somers, 1994). They can span past, present, future and alternative realities (Bruner, 2004; Mroz et al., 2021). They are "world-making" (Bruner, 2004), in that they are a tool through which social actors "interpret, navigate, and (re)constitute the social world" (Edgell et al., 2016). The particular power of a narrative is in its ability to draw together diverse events, processes and experiences of human life into unified, goal-directed processes (Polkinghorne, 1995). They can frame a problem and propose solutions while concealing others. Paschen & Ison (2014, p. 1083) explain the importance of narratives to environmental and climate challenges: "how we 'story' the environment determines how we understand and practice adaptation, how risks are defined,

who is authorized as actors in the change debate, and the range of policy options considered". In this sense, narratives have influence through a definition of power as diffuse and surrounding us in an atmosphere of influences (Eve Tuck, 2015).

There is understanding that narratives can be used strategically to engender action on climate change (Bushell et al., 2015, 2017). Many common narratives have focused on leveraging action on mitigation, attempting to frame the problem in such a way that it drives this action (Bevan et al., 2020; Bushell et al., 2017). This has often been carried out in a way which places the source of the problem entirely within the 'external' climatic change, rather than identifying risk within society, so that climate change is a "fundamentally exogenous event… [with] decontextualised externalities" where "social actors involved are detached from their context and history" (Oliver-Smith et al., 2016, p. 5). Examples of this include the 'sinking' Small Island Developing States (Weatherill, 2022), and the Arctic 'front line' of climate change (Crate & Nuttall, 2016), both of which imply the need to rescue 'climate victims' through mitigation (Fløttum & Gjerstad, 2017). Some have focused on reframing the narrative around adaptation from one proposing reactive, incremental adjustments to narratives that focus on addressing root causes through 'transformative' (Ajulo et al., 2020; Gillard et al., 2016), 'justice' (Mattar et al., 2020) and 'intersectional' (Amorim-Maia et al., 2022) framings.

Narratives are particularly key to public policy, the purpose of which is to identify problems and propose solutions and ways forward (Roe, 1994). Policy-making is a particularly powerful discursive space responsible for creating shared meaning around challenges facing humanity through the framing of such challenges and putting forward solutions (Feindt & Oels, 2005; Hajer & Versteeg, 2005; Iannantuono & Eyles, 1999). Policy makes up part of the political economy, which comprises the processes through which "ideas, power and resources are conceptualised, negotiated and implemented by different groups at different scales" (Tanner & Allouche, 2011) (p2). Policy documents can provide powerful narratives, that define how things are collectively or publicly understood, what solutions and futures may be thought of as possible and can drown out other narratives. Policy-making, therefore, is a fundamentally narrative process (Fischer & Forester, 1993; Mroz et al., 2021) and it is important that policy narratives engage with the root causes of disaster in the context of climate change. If they do not, the root causes can be concealed and approaches may be suggested that only act to reinforce the unequal status quo (Lahsen & Ribot, 2021). As Oliver-Smith et al., (2016, p. 5) explain, disaster risk reduction that seeks to preserve the status quo is: "Attempting to protect development from the socially constructed consequences of its own contradictions". It is worth critically interrogating policy narratives that focus on climate change, particularly those that focus on climate change and health, for the degree to which they engage with narratives of the root causes of disaster.

It is also important to consider power when analysing narratives. Narratives produced by those with power often become dominant narratives because of the way that those narratives are given platforms (Marino & Ribot, 2012). It is important to consider who has not been included in producing dominant narratives on various issues, including Indigenous Peoples, people of colour and people from the Global South (Elizabeth Marino & Peter Schweitzer, 2016; Lindroth & Sinevaara-Niskanen, 2017). Narratives often act to conceal power and power relations, such as through the trend for 'resilience' framings that can imply that responsibility for adaptation lies with communities and Indigenous Peoples while concealing the roles and responsibilities of government and governance and histories of oppression and colonialism (Mikulewicz, 2019). Narratives can also cause harm to those with less power – for example narratives that contain deficit framings surrounding Indigenous Peoples have been historically very common, and can act to reinforce stereotypes and expectations of outcomes (Marino & Ribot, 2012; Walter & Andersen, 2013).

1.2.6 Research context: Inuit Nunangat

Arctic North America is experiencing rapid and profound climatic and environmental change (AMAP, 2017, 2018; Ford et al., 2015; Larsen, 2014). Dominant narratives in research, policy and media continue to frame the region as the 'front-line' of climate change, being at heightened risk, and as a resource frontier (Bravo, 2009; Stoddart & Smith, 2016). Despite significant Indigenous leadership and activism over the past few decades (Huntington, 1998; ITK, 2017; Watt-Cloutier, 2015), Indigenous priorities and concerns have been overlooked, and dominant narratives regularly do not go beyond labelling people as 'vulnerable' or 'resilient' (Callison, 2017; Cameron, 2012; Hall & Sanders, 2015). However, for the last century, Inuit have experienced rapid social, economic, political, and demographic changes, primarily stemming from ongoing colonisation of the region, and it is this settler colonial context of rapid change and upheaval in which climate change is now experienced (Truth and Reconciliation Commission of Canada, 2015). In particular, Inuit have had to contend with extreme changes to mobility over the past fifty years (Whyte et al., 2019). Sedentarization, forced relocations, slaughter of sled dogs by the Royal Canadian Mounted Police and environmental governance approaches that limit access to certain regions or prevent harvesting of certain species have all been features of this (Bennett, 2018; Dinero, 2013; Panikkar & Lemmond, 2020; Rodon & Schott, 2014). These have been compounded by external factors such as international policy, precarity to external markets, forced wage economy and arrival of extractive industries to the region (Fidel et al., 2014; Ford et al., 2013; McNeeley & Shulski, 2011). Inuit narratives of climate change focus on community, culture, land rights, food sovereignty and histories of colonialism, and call for Inuit leadership to be at the heart of any action (Caughey et al., 2022; ITK, 2019). We can see that multiple narratives exist around these issues, in tension and sometimes

synchronicity with each other, but always in these structures of power so that particular narratives about climate change are able to become dominant (Paschen & Ison, 2014).

1.2.7 Indigenous social determinants of health

These structural factors, and the ways that they create profoundly inequitable health outcomes, are represented in the 'Indigenous Social Determinants of Health' (Reading, 2015). Indigenous Social Determinants identified by Indigenous Peoples and organisations, include not only root causes such as income, education, health services, gender, age and disability, but also historic and contemporary settler colonisation and associated trauma (Bambra et al., 2010; Chatwood et al., 2012; Driscoll et al., 2013; Inuit Tapiriit Kanatami, 2014). Indigenous Social Determinants of Health centre self-determination, Indigenous Knowledges and languages, spirituality, and connection to land as positive drivers of health (Cueva et al., 2021a; Greenwood & de Leeuw, 2012; Healey, 2018; Redvers, 2020; Tagalik et al., 2018). For Inuit, this connection to land is at the heart of cultural and community life (Cunsolo Willox et al., 2012; Healey, 2016; Ljubicic et al., 2022; Sakakibara, 2011, 2017; Todd, 2016; Watt-Cloutier, 2020) and time spent on the land has deep cultural and social importance for Inuit identity, spirituality and wellbeing (Adams et al., 2022; Cueva et al., 2021; Cunsolo Willox et al., 2013; Petrasek MacDonald et al., 2015; Redvers, 2016; Sawatzky et al., 2021). Sheila Watt-Cloutier writes that for youth, the land is a place for "learning and absorbing all the essential skills, aptitudes and attitudes required to survive and thrive on the land when their own time to be autonomous comes. In so many ways, the land never fails to invigorate and teach. Family and communal bonds are restored, and our spirits uplifted. We become healthier in mind and body, nourished by the country food the land and sea provides" (Watt-Cloutier, 2020). Thus, changes to mobility and time spent on the land are of deep concern to Inuit (Cunsolo Willox et al., 2013). There is increasing consensus in Arctic North America that meaningful policy action to address the social determinants of ill-health will need to acknowledge and integrate Indigenous rights and knowledges to support community-led critical research approaches, monitoring and assessment (Cueva et al., 2021a).

1.3 Research gap

It is clear that broader narratives about climate change and health, in policy and media in particular, vary a great deal in how they engage with and address the root causes of disaster in the context of climate change. There are calls for research that goes beyond conventional governance analysis to analyse broader influences on policy processes, including narratives (Naess et al., 2011; Tanner & Allouche, 2011). Little research has analysed the extent to which Canadian governmental policy narratives engage with the root causes of harm in the context of climate change, but given an increased push towards reconciliation (Truth and Reconciliation Commission of Canada, 2015) it is

important to analyse the degree to which policy (particularly that relevant to Indigenous Peoples in Canada) addresses root causes such as colonisation. A number of approaches to policy analysis in Arctic North America have conceptualised climate adaptation policies, but few have taken a step back to critically analyse the powerful narratives contained explicitly or implicitly within these documents, which often dictate and define solutions.

To understand whether policy narratives are engaging with root causes, requires an understanding of root causes of harm and disaster in the context of climate change in Arctic North America, particularly in relation to mobilities. Research into the ways that peoples' mobilities will change in the context of climate and environmental change is growing (Tschakert & Neef, 2022). Much of this research focuses on large scale migration (Santos & Mourato, 2022), but less has focused on people for whom mobility is changing in more complex or nuanced ways, including those for whom travel is more cyclical and a part of daily, weekly or seasonal life (Hannam et al., 2006; Huntington, 2019; Huntington et al., 2019). Given that, for Inuit in Arctic North America, the land is key to physical, mental and spiritual health (Cueva et al., 2021; Petrasek MacDonald et al., 2015; Redvers, 2016; Sawatzky et al., 2019), reported disruption to time spent on the land can be conceptualised as a creeping disaster and should be a priority area for research that seeks to understand shifting mobilities in the context of climate change and policy actions that can avoid harm to health. Among the growing body of research into the social dimensions of climate change for Inuit in Arctic North America, few have focused specifically on the root causes of changing mobility, and much research is at community level or is region-specific. Additionally, little of this research draws directly from critical disaster scholarship.

Understanding the power and production of policy narratives in Arctic North America also requires an understanding of the processes of participation that are involved in policy-focused knowledge production, and which contribute to shaping the dominant policy narratives around climate change and health. The Arctic is the site of a significant amount of climate modelling research, focusing primarily on the physical sciences (Ford et al., 2014; Hua et al., 2012), with stakeholders and rightsholders increasingly engaged (Duyck, 2011; Ernst & van Riemsdijk, 2013; Flynn et al., 2018; Maynard, 2014; Meredith et al., 2019; Nakashima et al., 2012) but what is unclear is the degree to which participants have power in the research process that ultimately leads to them being able to shape dominant narratives around the intersection of climate change and social processes (Brunet et al., 2014; Carter et al., 2019; Flynn & Ford, 2020; Ford et al., 2016; Jones et al., 2018; Mosurska & Ford, 2020).

1.4 Aims, overarching research questions, and objectives

The aim of this thesis is to critically examine power, participation and engagement with the root causes of disaster in the creation of policy narratives around climate change and health in Arctic Canada. This thesis thus revolves around two overarching research questions (Figure 1.1). The first asks: 'How are dominant narratives of climate change and health in Arctic North America addressing the root causes of disaster for Inuit?' The second asks: 'How is Inuit Knowledge being engaged in these narratives of climate change and health?'

Given the lack of systematic understanding of the root causes of changing mobility across Arctic North America, objective one of this thesis sets out to identify the root causes of constrained mobility for Inuit in Arctic North America. Secondly, addressing a gap in research that analyses policy through a narrative framework and that seeks to understand how narratives operate in climate policy more broadly, objective two sets out to identify narratives of climate change and health present in Canadian governmental policy documents.

Objective two also helps to address the overarching research question two, looking at the ways that Inuit Knowledge and narratives that represent Inuit priorities are present within dominant policy narratives, which has been the focus of little research. Finally, objective three critically examines engagement with diverse knowledge types in research modelling climate-sensitive processes in an Arctic setting. This seeks to further our growing understanding of how power is operationalised in policy-focused knowledge production and targets an ongoing lack of clarity about the degree to which participants have power in the research process in participatory research in the Arctic.

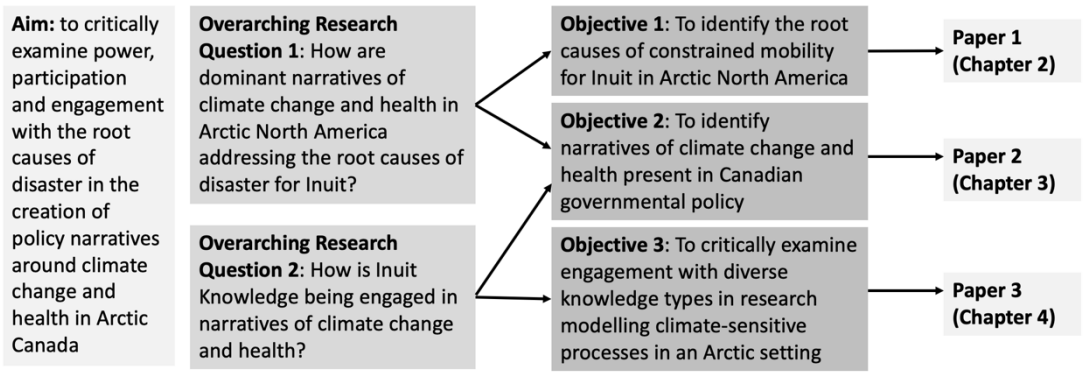

Figure 1.1: Graphical illustration of papers and their relationship to overarching research questions, aims, and objectives

The following three chapters present the results of the research that make up this thesis. These comprise two published journal articles (chapters two and four) and one manuscript in preparation for publication (chapter three).

Chapter two presents the results of a systematic literature review to identify the root causes of harm for Inuit in the context of climate change. Due to the central importance of travel and time spent on the land for Inuit spiritual, mental and physical health, it focuses on the phenomenon of constrained mobility for Inuit in Arctic North America. This issue is increasingly noted as a concern in the context of climate change, but chapter two presents an attempt to systematically review the barriers to travel for Inuit across the whole of Arctic North America, drawing insights from both Canada and Alaska, and using a framework from disaster studies to identify causal mechanisms through which barriers to travel, and to safe travel, are created. Results show that root causes of constrained mobility are embedded in historic and ongoing colonial policies such as histories of residential schooling, forced relocation and sedentarization and contemporary environmental resource management and policy, which interact with national and international economic contexts to constrain travel. Because of relationships to land and importance of travel for Inuit, this disruption to travel has ongoing impacts on physical, mental and spiritual health. This also acts to reduce flexibility in the context of a changing climate. Results emphasise the importance of attention to the ways that governance can constrain daily and weekly patterns of movement, particularly in the context of climate change. The findings provide evidence on the root causes of harm in the context of climate change, which can provide insight and guidance for the targeting of adaptation and policy change in the face of climate change.

Chapter three describes an approach to identifying narratives of climate change and health present in Canadian governmental policy, with the goal of understanding if and how dominant narratives of climate change and health in Arctic North America are addressing the root causes of disaster for Inuit identified in chapter two. Chapter two focused on mobility because of its central importance for Inuit health and the pivotal role it can have in understanding the root causes of loss and harm for Inuit in the context of a number of wider processes of socioenvironmental change. Chapter three moves to a broader focus on health, as it seeks to establish whether the discourses and narratives surrounding climate change and health policy are making space for understandings of the root causes identified in chapter two, which it argues are required for narratives that promote solutions that can address these root causes. It identifies a lack of engagement with root causes in both problem identification and suggested solutions in dominant narratives in governmental policy in Canada. It finds that solutions proposed by the most dominant narrative focus on technology and innovation designed to preserve the status quo. Another dominant narrative superficially aligns with Indigenous priorities for action in the context of climate change but does not engage with power shifting and places responsibility for action on Indigenous communities. These findings highlight the

value of analysing narratives within policy documents, point to the power that dominant narratives hold, and the value of, and potential for, changing these dominant narratives.

Chapter four examines how participation is reported within modelling research that uses participatory approaches, focusing on the Circumpolar Arctic. A systematic scoping review analyses the degree of participation at each stage of the research process for each article identified. It identifies a diversity of topics, modelling approaches, and participant groups, most of which occurred in Arctic North America, and all of which engaged with non-Western knowledge types to some degree. Participation was most commonly reported at the model generation and participant identification stages, and least commonly reported in the choice of modelling type. Participatory scores — based on the number and degree of participatory stages of a study — were higher where authors gave instrumental or transformative rationales for the use of participation, and among studies that described prioritising non-Western knowledge types. Detailed reporting of participatory processes was frequently absent, suggesting a need for clearer discussions of these issues in the descriptions of the process. The scope also moves beyond Arctic North America to incorporate the wide diversity of approaches used to engage communities in research across the region and to enable comparison across countries and contexts within the Arctic, each of which has different and specific relationships with Indigenous Peoples within their borders and different norms for engagement with those Indigenous Peoples in research. This chapter builds on limited existing understanding about how power dynamics operate within participatory research processes in the Arctic more broadly, and findings may be indicative of potential barriers for engagement of diverse knowledge types in policy making,

Chapter five discusses the findings and implications of the three papers in chapters two to four. It first offers a narrative summary of the findings of the thesis, and how each paper builds upon the others to produce these findings. This is structured around the two overarching questions of the thesis. This is followed by a discussion of a key, cross-cutting theme that emerges from these findings, which is that of power, unequal power relations, and a lack of attention to the need to change power relations. One key aspect of this is the ways that inequities and power imbalances structure the processes that create unequal health outcomes in the context of climate change. Others include the ways that power acts through narratives (which shape collective understanding of climate change), the differential abilities people have to create and influence these dominant narratives, the lack of power-shifting reported in processes of participatory research that seek to produce policy-relevant knowledge, and how each of these lead to a reinforcing of existing power structures. The role of narrative in creating change is discussed, including examples of those leading

this change. This is followed by a discussion of the limitations of the research presented in this thesis and finally by some concluding remarks and priority areas for future research.

1.5 Research design

1.5.1 Value of interdisciplinary approaches

This thesis draws from a number of disciplines, including disaster studies, public health, development studies and the field of mobilities research. Each discipline brings an important contribution to this work. Disasters and health have significant overlap, in part because the impacts of disaster that are often of most concern include the impacts on peoples' physical and mental health. As discussed previously, this thesis draws from theory in disasters studies that highlights how structural inequities in society lead to disaster (the root causes of disaster), and from public health theory that highlights how structural inequities in society lead to an unequal burden of ill-health (the social determinants of health). These theoretical constructs reflect aspects of one another and are useful to draw from in a way that they can be in conversation with each other. Drawing from both disciplines in this way allows the strengths of each to influence this work, and for this research to remain grounded in the critical and ethical contributions that both have developed to this complex area of research, while pushing back on disciplinary silos (Hall & Sanders, 2015).

Ideas from development studies are drawn on throughout the thesis, and particularly in chapter four, which draws directly from critical theory about participation in research. The focus of much of development studies has been to understand the ways that sustainable development can reduce suffering, and for this reason, many argue that disaster risk reduction (including climate adaptation) that fully seeks to address the societal structural causes of risk and disaster is essentially a form of sustainable development (Chmutina et al., 2021; Kelman et al., 2017). It makes sense that theory from development studies and from disaster risk reduction thus will be of reciprocal value and that there should be conversation between these disciplines.

There are calls for greater participation in both disaster risk reduction and development studies more broadly (Gaillard & Mercer, 2013; Leal, 2007). Participatory approaches to research emerged from a movement to politically empower oppressed people through action-oriented research, emancipatory ideals and critical approaches to research that does not engage people (Chambers, 1994). Participatory approaches to research have since spread into many disciplines, but there has been significant critique of research that uses 'participation' as a buzzword, tokenising shallow engagement and not bringing about power shifts in line with the emancipatory origins of the idea (Castleden et al., 2012; Ford et al., 2018; Leal, 2007; Reed, 2008). This can lead to further marginalisation and reinforcement of existing power relations (Berrang-Ford et al., 2018; Cornwall & Jewkes, 1995; Guta et al., 2013; Janes, 2016).

These research approaches, and their critiques, are of key relevance to an increased movement within research to engage with non-Western knowledge types, including Indigenous Knowledge, practitioner knowledge and other non-Western knowledge types (Naess, 2013). There has been an increase in research that explicitly sets out to 'engage', 'bridge', 'combine', 'connect' and 'integrate' Western Science or knowledge with non-Western knowledge types (Maynard, 2014; Meredith et al., 2019; Nakashima et al., 2012). This has been particularly common in research on environmental resource management, disaster risk reduction and climate change (David-Chavez, 2019). With this move has also come critiques suggesting that this research can often be 'extractive', meaning that external researchers draw from Indigenous Knowledge systems with the communities who hold them having minimal involvement or decision-making power (David-Chavez & Gavin, 2018).

It is evident that each of these disciplines and associated theories have relevance not only to each other but to the study of the complex interdisciplinary problems at the heart of this thesis. However, a particularly important way in which each of these disciplines contributes to the work in this thesis, is through the explicit focus on power relations (Arnstein, 1969; Faas et al., 2019; Marmot et al., 2008). Power exists as a relational process (Weber 1978). While power has been defined as 'power over' another person or thing (Dahl, 1957; Hobbes, 1969), it has also been defined as the ability to act collectively (Arendt, 1970). This thesis draws, in particular, from Foucault's description of power as something that can only exist within a network, and is implicated in all actions, thoughts and speech (Foucault, 1982), as this definition clarifies how and why discourses and narratives hold power, as discussed above. However, as Eve Tuck points out, many definitions of power have been colonial in that they assume a limited amount of power is available and that it is only visible when wielded above others, but that power is, in fact, "diffuse, abundant, connective and relational" (Eve Tuck, 2015). Given that normative narratives around 'participation' and 'engagement' of Indigenous Peoples, particularly in the context of climate change, often go un-interrogated, it is important to recentre power relations when researching these processes (David-Chavez & Gavin, 2018).

1.5.2 Research approaches used

The Forensic Investigation of Disaster (FORIN) conceptual framework outlines the social construction of disaster and proposes future directions for disaster research that seeks to evaluate and address the root causes of disaster (Oliver-Smith et al., 2016). This includes the use of diverse research approaches, and stakeholder engagement, to identify where disaster causes are socially constructed and ways in which they can be reduced or avoided and to feed into broader understandings of these processes. In this sense, the objectives of this thesis sit within these broader research objectives of the FORIN conceptual framework. Other non-research objectives of the FORIN framework include

influencing disaster education on the topic of the creation of disaster risk, providing research tools to local organisations, shifting understandings of disaster in the media, increasing the breadth of policy approaches used to address disasters and promoting the achievement of social equity through these objectives.

One of the objectives of the FORIN framework is to promote greater meta-synthesis of research and data on disasters, so that common underlying root cause processes can be identified to the extent that they can then be acted upon. This thesis builds on this goal, and chapter two details the systematic review and analysis of research discussing root causes of constraints to mobility for Inuit in Arctic North America. Systematic approaches have been most widely used in health research where their importance for translating bodies of research into information useful to decision-makers is clear (Gopalakrishnan & Ganeshkumar 2013). Increasingly, the important role of systematic reviews in the comprehensive and rigorous synthesis, standardisation, and for the policy impact of research, is recognised, particularly in the climate change and disasters field (Ford & Berrang-Ford, 2016; Haddaway & Pullin, 2014; Paez, 2017; Petticrew & McCartney, 2011; Waddington et al., 2012). Systematic reviews create space for creative integration of research and data from different disciplines, essential for addressing complex global challenges, and not doing so risks deepening divides between disciplines and physical and social scientists for example (Berrang-Ford et al 2015).

The social sciences of climate change have been the subject of calls for improved methodological approaches for research synthesis, and in the context of global assessments of climate change, disaster and development, such as the IPCC reports, there have been calls for more research synthesis methods that are transparent, clearly defined, and that limit bias (Petticrew & McCartney 2011, Waddington et al 2012). Grey literature can also make important contributions to systematic reviews (Paez 2017). In Indigenous contexts, grey literature, such as community reports and Indigenous policies, are particularly important to draw from and may not be included in larger syntheses of research if systematic reviews do not draw from them. The challenges of systematic reviews, including the need to integrate multiple data sources and formats, can also be important spaces for learning, and provide key messages for future approaches to primary data collection.

As there is a vast body of data in existence from community-based research (Ford et al., 2016), much of which focuses on relevant issues, it makes sense to draw from this data. It also makes sense not to replicate research, particularly given the risk of research burden on communities, with histories of Indigenous Peoples being over-researched (Smith, 1999) and Inuit suggesting that they are ‘the most researched people’ (Wilson, 2008). There is also a need to not always focus in on communities, and particularly Indigenous Peoples, as being the ‘location’ of the problem – such deficit framings are harmful to individuals and communities and perpetuate stereotypes (Walter & Andersen, 2013). As

Chmutina et al (2021, p. 786) express, drawing from Judith Butler: “here lies the opportunity to correct the error of essentializing precarious material conditions with particular identities. Instead, we must turn our gaze toward the mechanisms of oppression”. Therefore, there is value in ‘studying up’, which involves studying the middle and upper ends of the social power structure, as well as the lower (Nader, 1972).

One of the ways in which secondary data are analysed in this thesis is narrative analysis. Narratives can be divided up into various components. For example, Burke’s ‘Dramatistic Pentad’ proposes five key narrative elements that include the act (what is done), the scene (the context in which it is done), the agent (who does it), the agency (how it is done) and the purpose or motive (why it is done) (Burke, 1945; 1955). We can use narrative analysis to deconstruct and interrogate narratives (Edgell et al., 2016; Mroz et al., 2021) to make visible the values and underlying assumptions involved in the production of policy, and thus the power over authorship of the narrative (Culler, 2014). The ‘metanarrative’, or overall story that a policy document tells, can reveal the powers that shape and determine the process of narrative creation in policy (Iannantuono & Eyles, 1999). There is a diversity of approaches to narrative analysis, and these have been used in a variety of contexts (Polkinghorne, 1995; Thornborrow, 2012). We are interested in “analysis of narratives”, or “paradigmatic analysis”, which involves the collection of existing narratives, their deconstruction into common elements, and creation of taxonomies or categories (Polkinghorne, 1995). This is because we seek to deconstruct and examine the narratives that are present in policy documents to understand how these are constructed (how the problem is framed and how solutions are proposed for example), how they engage with the root causes of challenges to health in the context of climate change, and how they may be powerfully concealing alternative framings of problems and solutions.

The narratives of concern to this thesis are primarily policy narratives. Policy is broadly defined as “a set of ideas or a plan of what to do in particular situations” (Cambridge Dictionary, 2022). Deconstruction of policy narratives in climate change discourse can encourage consideration of the `framing' process involved in policy (Iannantuono & Eyles, 1999; Roe, 1994), situating it within the social and cultural context in which it comes to have meaning (Yanow, 1993). In policy, storylines seamlessly integrate facts and values (Iannantuono & Eyles, 1999).

The research that this thesis presents is, therefore, deeply interdisciplinary, drawing on theory from disaster studies, public health, development studies and discourse theory, as well as methods from public health (systematic review approaches), literary theory (narrative analysis), and policy analysis. Each of these theories or methodologies have particular value in centring or deconstructing power and power relations.

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2 Shifting safeties and mobilities on the land in Arctic North America: A systematic approach to identifying the root causes of disaster

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Abstract

Amid the surge in research on mobility and migration in the context of environmental change, little research has focused on the experiences of people for whom travel is cyclical and a part of daily, weekly, or seasonal life. For Inuit in Arctic North America, the land is the heart of cultural and community life. Disruption to time spent on the land is reported to impact the emotional health and well-being of individuals and communities. There is concern that environmental change is creating barriers to safe travel, constituting a creeping disaster. We systematically review and evaluate the literature for discussion of barriers to travel for Inuit in Arctic North America, using an approach from the field of disaster anthropology to identify root causes of constraints to mobility. We identify root causes of risk and barriers to time spent on the land. These emerge from historic and contemporary colonial policy and inequality, as opposed to environmental hazards per se, impacting people's mobility in profound ways and enacting a form of slow violence. These results suggest a need to understand the underlying processes and institutions that put people at risk.

Keywords: Inuit; disaster; climate change; Arctic; root causes; environmental justice; mobilities; risk; colonialism

2.1 Introduction

Mobilities research addresses peoples' movement over time and space in the context of emerging global challenges relating to environmental and social change, justice and security (D'Andrea et al., 2011). In addition to the important role of governance and institutions in enabling and constraining the movement of people, a large amount of mobilities literature is coming to focus on mobility in the context of climate and environmental change (Bettini, 2017; Bettini & Gioli, 2016). Much of this research focuses on large scale migration (Wiegel et al., 2019). However, this has been criticised for reinforcing misleading narratives that frame climate change as the main driver of migration, and the migration itself as a security crisis of one-directional travel of people across borders (Boas et al., 2019; McLeman et al., 2014). Some research has added nuance to this narrow approach by highlighting populations for which mobility is restricted or prevented through structures of poverty and precarious livelihoods (Black et al., 2017; Nawrotzki & DeWaard, 2018), often referred to as

populations “trapped in place”. There is a significant lack of research that engages with those for whom mobility is changing in more complex or nuanced ways, including those for whom travel is more cyclical and a part of daily, weekly or seasonal life (Hannam et al., 2006; Huntington, 2019; Huntington et al., 2019). Research that exists suggest that limits to mobility often stem from social and political factors, including governance over resources and access to services (Nawrotzki & DeWaard, 2018; Zickgraf, 2019).

Indigenous Peoples have been excluded from many debates and narratives about mobilities, but are increasingly bringing awareness to Indigenous perspectives on mobility, place and belonging, as well as demanding considerations of justice within research on mobilities (Sheller, 2018; Suliman et al., 2019; Whyte et al., 2019). They have pointed to the fact that climate and environmental change are embedded in social and historical contexts (Callison, 2014; Cameron, 2012; Coggins et al., 2021; Hastrup, 2016; ITK, 2019; Mattar et al., 2020; Watt-Cloutier, 2015; Whyte, 2020) and that, for Indigenous Peoples worldwide, relationships to land (which we acknowledge is a reductive term(Tuck & McKenzie, 2014)) have been disrupted by colonisation and colonial policy (Smith, 1999). Importantly, they have highlighted that colonialism can act as a containment strategy that limits mobility (Whyte et al., 2019).

For Inuit in Arctic North America, the land is the heart of cultural and community life (Cunsolo Willox et al., 2012; Ljubicic et al., 2022; Sakakibara, 2011, 2017; Todd, 2016; Watt-Cloutier, 2020). Spending time on the land is key for livelihoods, food, culture and transport between communities (AMAP, 2017, 2018). These activities have deep cultural and social importance to Inuit identity and spirituality (Cunsolo Willox et al., 2012, 2013; Lancet Comission on Arctic Health, n.d.; Sawatzky et al., 2021). Land-based activities and relationships to the land are also considered to be a key protective factor for physical, mental, emotional and spiritual health (Cueva et al., 2021; Petrasek MacDonald et al., 2015; Redvers, 2016; Sawatzky et al., 2019). As Sheila Watt-Cloutier writes (Watt-Cloutier, 2020), the land is a place for “learning and absorbing all the essential skills, aptitudes and attitudes required to survive and thrive on the land when their own time to be autonomous comes. In so many ways, the land never fails to invigorate and teach. Family and communal bonds are restored, and our spirits uplifted. We become healthier in mind and body, nourished by the country food the land and sea provides”.

Given the importance of being out on the land for Inuit, disruption to time spent on the land has been reported to impact the mental and emotional health of individuals and communities (Cunsolo Willox et al., 2012; Hackett et al., 2016; Hirsch et al., 2016). Additionally, challenging travel conditions may be associated with increased stress, anxiety, and risk of accidental injury (Dowsley et al., 2010; Ford et al., 2019; Harper et al., 2015). Understanding what environmental conditions are

safe to travel in and how to act in unexpected conditions is a key aspect of Inuit Knowledge (also called Inuit Qaujimajatuqangit or IQ in Nunavut) (Cunsolo Willox et al., 2013; ITK, 2018; Pedersen et al., 2020; Sawatzky et al., 2021). Inuit relationships to land require flexibility in the face of constant change and dynamic uncertainty in the Arctic, and Inuit Knowledge provides this (Berkes, 1999; ICC, 2021; Karetak et al., 2017; Pedersen et al., 2020). Inuit Knowledge is experiential and evolving, and in part comprises intergenerational land-based skills and a deep familiarity with the land and methods of safe travel and hunting (Bates, 2007; Gram-Hanssen, 2019; Kaplan, 2012; Laidler et al., 2010; Pedersen et al., 2020). For Inuit, residential schooling, forced sedentarization, relocations and intergenerational trauma impact mobilities on the land in ongoing ways (Cunsolo Willox et al., 2013; Qikiqtani Truth Commission, 2010; Sawatzky et al., 2019; Snook et al., 2020; Whyte et al., 2019). Inuit have also experienced rapid social and economic change (Kaplan, 2012) and face large disparities in health outcomes compared to non-Indigenous Canadians, rooted in colonialism (Cueva et al., 2021; Kirmayer & Valaskakis, 2009; Richmond & Ross, 2009). The reality of decision-making about travel on the land is, therefore, much more complex than simply being about the weather or ice conditions (Fox et al., 2020; Ready & Collings, 2020). Disruption to this mobility could be considered to constitute a slow-onset disaster, involving creeping processes of loss, with impacts on physical, mental and spiritual health that sometimes go “under the radar” of governmental monitoring and disaster risk reduction processes (Fortun et al., 2017; Willis, 2020).

Mobilities research in Arctic North America has focused both on communities undergoing processes of planned relocation (Albert et al., 2018; Marino, 2012; Wilson, 2014; Wolsko & Marino, 2016), and the daily, weekly and seasonal patterns of Inuit travel on the land (Aporta, 2009). These have both been addressed, in part, by literature that focuses on the social impacts of climate change (Ford et al., 2019; Hall & Sanders, 2015). A number of studies have critiqued this body of literature for centring climate change at the expense of attending to colonial legacies (Cameron, 2012; Prentice, 2017). Others suggest that there are many more important concerns to Inuit than climate change (Ready & Collings, 2020). Through these critiques, more nuanced understandings of mobilities are emerging, though none of this critical and essential research has used empirical approaches to identify the direct and root causes of limits to mobility, and all have focused on only one country or location. Additionally, as many critiques have focused specifically on what is referred to as “the human dimensions of climate change” literature, none have systematically reviewed all literature that discusses barriers to travel (whether through the lens of climate change or not), synthesising findings across both Arctic Canada and Alaska.

Here, therefore, we set out to identify the direct and root causes of limits to mobility for Inuit in Arctic North America. To do this, we systematically review and evaluate literature discussing barriers

to travel for Inuit across Arctic North America and, drawing from disaster studies, use a root cause analysis framework and causation coding to create a causal flow diagram and identify key themes of relevance across the region. In our research, we do not assume an increase in accidents or disaster, or a statistical decrease in mobility per se, as this data is likely to be complex and heterogenous across Arctic North America. However, we are responsive to reports of perceived change and concern among Inuit (Hirsch et al., 2016; Parlee & Furgal, 2012) and set out to ask what the barriers to mobility and travel are in this context of uncertainty. Given this, when we refer to disaster in this context, we are referring to the phenomenon of constrained travel on the land, including barriers to travel on the land, perceived decreased safety on the land and the physical and emotional impacts of both of these on emotional, spiritual and social health.

2.2 Materials and methods

2.2.1 Research approach: Disasters and root cause analysis

For some time, disaster scholars have argued that disasters are the result of societal processes that create and perpetuate risk, and are therefore never "natural" phenomena (Bankoff, 2001; Hewitt, 1983; Kelman, 2010; Kelman et al., 2016; O'Keefe et al., 1976; Oliver-Smith, 1986). Disaster risk reduction, therefore, requires an understanding of the ways in which disaster risk is socially produced (Sun & Faas, 2018). Globally, legacies and ongoing processes of colonization, globalisation, racialization, capitalism, industrialisation and destructive land management practices have created increasing inequities on multiple scales (Tuck & McKenzie, 2014). These processes produce risk, unevenly, along lines of race, gender, disability, Indigeneity, age and many other social categories (Cannon & Varley, 1994; O'Keefe et al., 1976; Watts & Bohle, 1993). This makes it clear that people are put at risk by the political and social structures of the societies in which they live, as opposed to by physical hazards (Bankoff, 2019; Wisner & Luce, 1993). It therefore follows that disaster risk reduction that fully attends to the social construction of disaster risk is essentially an issue of sustainable development (Hore et al., 2018; Kelman et al., 2017; Mercer, 2010).

For the same reasons, climate change can be framed as a crisis of development (Boyd et al., 2021; Parry, 2009; Whyte, 2020). Climate change will likely have diverse impacts on hazards, depending on the type of hazard and scale, including an increase in frequency and intensity of certain hazards (AghaKouchak et al., 2020; Costello et al., 2009; Hore et al., 2018). This includes both rapid onset hazards (such as floods and hurricanes), as well as creeping, slow hazards, which may be characterised by the slow shifting of ecological baselines such as sea level rise, erosion, ice melt and ecological change (Fiske & Marino, 2019; Nixon, 2011; Oliver-Smith, 1986). Given this, adaptation in

the context of climate change should arguably be seen as a form of disaster risk reduction, nested within a sustainable development agenda (Kelman et al., 2015, 2017; Roy et al., 2018).

Regardless of this push for more nuanced language that reveals the social construction of risk, the use of the term "natural disaster" (including in the context of climate change), along with technocratic approaches to disaster risk reduction and climate adaptation, still abound (Chmutina et al., 2019; Chmutina & von Meding, 2019). This can create discourses that depoliticise and externalise the threat of climate change and ignore how society constructs (and therefore has the power to reduce) risk (Faas et al., 2019; Roberts & Pelling, 2020). This discourse implies that disaster is purely situated in the environment or climate (Liverman, 2009). As a result, it overlooks the need to fix aspects of society to reduce disaster risk, and instead implies technocratic solutions which do not tackle the societal status quo that puts people at risk (Hore et al., 2018). In this way, climate change can act as a scapegoat for powerful actors to avoid responsibility for acting on the structural roots of risk (Gaillard, 2010; Hore et al., 2018; Kelman & Gaillard, 2010), potentially recreating, perpetuating and worsening risk and inequality (Eriksen et al., 2021; Marino & Ribot, 2012). What's more, these structural processes are oppressive in themselves as a form of structural violence, and there is an imperative to attend to these as social and environmental injustices even in the absence of a climate-influenced hazard (Nixon, 2011; Schlosberg & Collins, 2014).

A "root cause analysis" approach (Oliver-Smith, 2019; Oliver-Smith et al., 2016) seeks to identify underlying processes that produce disaster risk in people's lives, based upon the understanding that socially constructed root causes (deeper processes such as colonial legacies, marginalisation and national policy) can create more direct risk drivers, which in turn create the unsafe conditions that lead to disaster risk (Burton, 2010). The Forensic Investigations of Disasters (FORIN) conceptual framework (Oliver-Smith et al., 2016) lays out an agenda for disaster research that focuses on root causes, approaches research with an understanding of the historical construction of disaster and brings in considerations of political ecology to the study of disasters (Hoffman & Oliver-Smith, 2019; Oliver-Smith, 2019). Research objectives include the application of diverse, transdisciplinary and participatory approaches to the identification of principle causes of disaster risk and ways in which they can be reduced (Oliver-Smith et al., 2016). These will then inform the policy objectives, which include the broadening of the scope of disaster risk reduction measures and the institutions involved, and increased awareness that disasters are not "natural" and have diverse local manifestations. Additionally, FORIN's equity objectives seek to highlight how conventional 'development' can create disaster risk and that disaster risk reduction can be incorporated into all economic and social development planning in all countries (Oliver-Smith et al., 2016).

Suggested methodological approaches for such work include: (i) retrospective longitudinal analysis of the temporal development of disaster processes, (ii) future disaster scenario building, (iii) comparative analysis of disaster cases across different social contexts and (iv) meta-analysis of available literature to identify consistent findings across diverse studies in disaster contexts. It is this last approach which we apply in the current study, taking the first step in the use of disaster root cause analysis in an Indigenous Arctic context where it has not been significantly drawn upon previously.

Inuit in Arctic North America have experienced long histories of colonisation, including forced sedentarization, residential schooling, engagement in capitalist economies and cultural assimilation (Huntington et al., 2019; Whyte, 2018, 2016). As these are well understood to be root causes of risk in broader contexts (Kelman & Næss, 2019; McNamara et al., 2017; Oliver-Smith, 2019; Whyte et al., 2019), these warrant examination as potential root causes of risk in the specific context of travel on the land in Arctic North America. Of particular pertinence here are the ways in which colonisation constrains mobility, movement and flexibility associated with ways of life and with peoples' ability to flexibly adapt to dynamic environments (Faas et al., 2019; Ford et al., 2020; Gram-Hanssen, 2019; Kelman & Næss, 2019; Kyle Powys Whyte, 2020, 2020; Marino et al., 2016; Sayles & Mulrennan, 2010).

Furthermore, it has been increasingly argued that disasters should be studied through an intersectional lens (Andharia, 2020; Meissner & Whyte, 2017; Ryder, 2017; Vinyeta et al., 2015; Walker et al., 2019, 2021), which highlights the multiple, intersecting and interconnected oppressions and power relations within society and how they result in unique individual experiences day to day (Collins, 1990; Collins & Bilge, 2020; Crenshaw, 1991). As human societies and their environments can be considered "fundamentally inseparable" (Hoffman & Oliver-Smith, 2019, p19), the impacts of these intersecting oppressions manifest in impacts to human relationships with the environment. As Sultana (2015, p633) explains: "Gender related subjectivities are negotiated and embodied through social processes and ecological practices while intersecting with other subject positions, such as class, race, age or caste". The experiences of colonization, for Indigenous Peoples in North America, are therefore characterised by intersecting layers of oppression, including Indigeneity and gender (Meissner & Whyte, 2017). Research has often portrayed Indigenous Peoples as homogenous entities (Walker et al., 2019), but there is evidence that experiences in the context of disasters and environmental change are diverse and require attention (Reed et al., 2014; Vinyeta et al., 2015). For Inuit, power differences along lines of age, gender and other social categories create multiple experiences and situated knowledges (Collins, 1986; Hitomi & Loring, 2018). Equally, the complexities and power relations within communities are unlikely to be clear to outsider

researchers, nor will they necessarily mirror Western literature surrounding “community” (Mosurska & Ford, 2020; Titz et al., 2018).

2.2.2 Objectives: Untangling the root causes of disaster on the land and sea ice in Arctic North America

This context of shifting safeties on the land, decreased access to land and the subsequent loss of life and ways of life is characteristic of a slow-onset disaster (Cunsolo Willox et al., 2013; Fortun et al., 2017; Nixon, 2011; Tschakert et al., 2017, 2019). As root causes of disaster are embedded in the histories of human actions, all disasters evolve over large temporal time frames (Fortun et al., 2017; Knowles, 2014; Oliver-Smith, 2019). However, slow-onset disasters are those which cannot be artificially reduced (by media reports, for example) to discrete events, and which manifest in more gradual and creeping ways (Williamson & Courtney, 2018). Examples of these include drought, famine and environmental pollution and degradation. Due to the political nature of the ways in which disasters are defined (Bond, 2013; Liboiron & Wachsmuth, 2013; Oliver-Smith, 2019), and the relative lack of research in slow-onset disaster contexts (Staupe-Delgado, 2019), slow-onset disasters and intangible losses can go unaccounted for and unattended to by states, meaning that communities are unsupported (Anderson et al., 2020; Fiske & Marino, 2019; Fortun et al., 2017; Murphy, 2004).

We employ a root cause analysis, and to do so we systematically and comprehensively review the published and grey literature for discussion of: (i) direct causes of increased risk of accidental injury and death while on the land, (ii) direct barriers to spending time on the land, given that this has been identified as a threat to mental and spiritual well-being and (iii) the root causes of these direct drivers. We systematically identified and reviewed the peer-reviewed and grey literature that discussed Inuit travel on land, factors that affect mobility and risk during land-based activities and drivers of risk on the land. This comprised searches using Scopus, Web of Science and Google Scholar using the search terms in Table 2.1, and screening results for factors affecting opportunities for Inuit to travel, and to travel safely, on the land in Arctic North America. We included grey literature so that important perspectives from beyond academia (including those of Indigenous organisations) were incorporated. Additionally, we carried out a manual search of articles by authors working in social research in Arctic North America and the snowballing of references from included articles. Included studies underwent extraction of descriptions of factors affecting the ability to travel safely, including both direct factors and more distal broader processes that were described to impact land travel (root causes), as well as descriptions of specific events of risk or accidents on the land, or periods of time when travel was prevented. This research began by taking an approach that looked

for research relating to all Arctic North American Peoples, but heterogeneity of history and experience between Peoples led us to focus specifically on an Inuit context later in the research process.

Table 2.1: Databases and search terms used to search for peer-reviewed and grey literature

Database	Search Terms	Date
Scopus	TITLE-ABS-KEY (Arctic AND (Canada OR Alaska OR Nunatsiavut OR Nunavut OR Nunavik OR Inuvialuit) AND (Inuit OR Inuk OR Indigenous OR Aleut OR Yupik OR Iñupiat OR "Gwich'in" OR Innu OR Dene OR Tlingit) AND (travel OR trail OR land))	January 2021
Web of Science	TS = (Arctic AND (Canada OR Alaska OR Nunatsiavut OR Nunavut OR Nunavik OR Inuvialuit) AND (Inuit OR Inuk OR Indigenous OR Aleut OR Yupik OR Iñupiat OR "Gwich'in" OR Innu OR Dene OR Tlingit) AND (travel OR trail OR land))	January 2021

Extracted information was analysed in two ways. The causal analysis (Oliver-Smith et al., 2016) included the use of causation coding (Saldaña, 2016) to create a detailed causal chain diagram (Sohns et al., 2021) and, throughout this process, a mix of inductive and deductive thematic analysis was used to identify narrative themes that were common across regions and then arose in a significant number of documents that we analysed.

This process was supported by snowballing from the reviewed literature to identify further detail on the "root causes" identified. Such root causes often develop over significant periods of time(Oliver-Smith, 2019), and it is therefore important to understand pre-disaster conditions and the "normal" order of things to uncover the "policies, prejudices and actions that comprise the disaster conundrum" (Bankoff, 2001; Oliver-Smith et al., 2016, p. 18). Thus, this requires some degree of focus on the political ecology of the history of the context of interest, which highlights the function of ongoing social orders in the creation of risk (Hoffman & Oliver-Smith, 2019; Tschakert, 2012). It is important, however, to also study the ways in which these processes occur in the present, in order to avoid relegating these risk-shaping processes to history, and to be prepared to "study up" the present-day institutions through analyses of power (Marino & Faas, 2020; Nader, 1972).

2.3 Results

145 documents were included in the analysis (Table 2.2 and Table 6.1). We undertook an iterative process of qualitative causal analysis, which involved first coding for any mention of direct barriers or facilitators of travel or causes of unsafe travel, then re-coding for descriptions of the causes of these direct barriers and so on, iteratively building a causal pathway in reverse. Each causal step was documented with an arrow in the process of building an initial causal loop diagram (Figure 2.1). The

number of documents mentioning each causal step (and the geographic location of the research) was recorded, and once complete, this diagram was distilled down to the major causal mechanism displayed in Figure 2.2 through selecting causal processes that were present in more than 10 documents and across multiple locations. This causal loop diagram has been qualitatively summarized into four main themes (Table 2.3), designed to offer a narrative summary of the causal loop diagram, while acknowledging that these themes are deeply interlinked: (i) the high cost of living in Arctic communities and precarity to external market forces makes costs of travel insurmountable; (ii) historic and ongoing processes disrupt intergenerational land-based knowledge sharing and undermine the safety of travel; (iii) externally imposed timescales and schedules constrain time available for travel; (iv) historical and contemporary environmental policy and governance and resource development constrain the geographical spaces in which it is possible to travel. We use direct quotes from reviewed papers to illustrate these themes, attributing the quote to specific interviewees where possible.

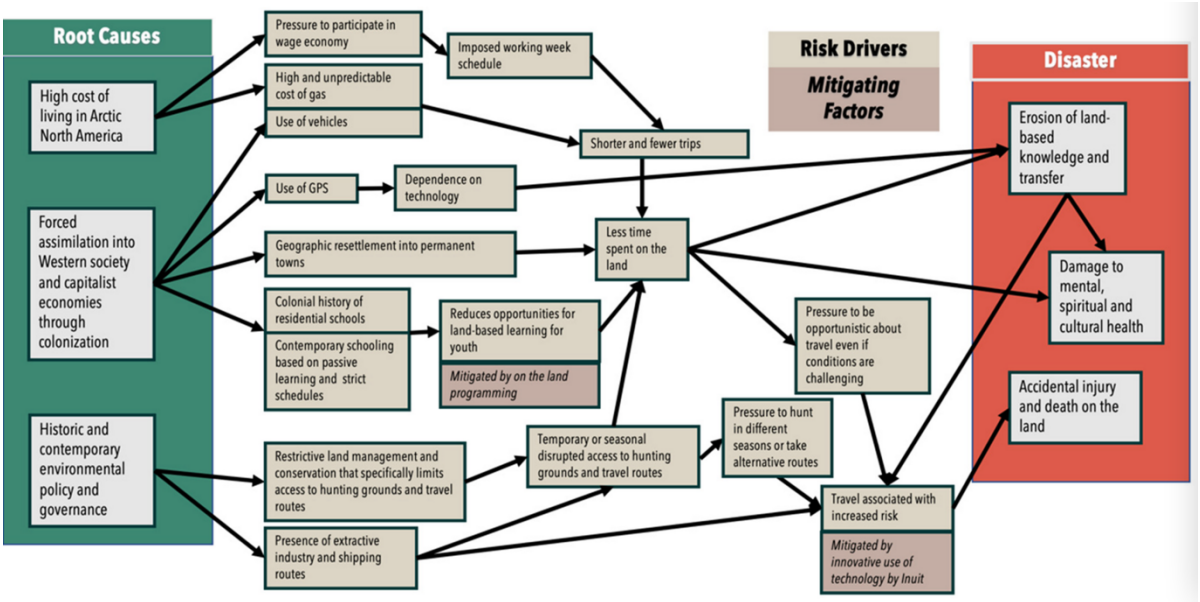

Figure 2.1: Causal flow diagram identifying root causes, risk drivers, disaster and mitigating factors

Table 2.2: Results of literature searches and screening

Source		Number of Documents Included in Review	Geographical Focus of Documents		
			Canada	Alaska	Both
Peer-reviewed literature	Database search	49	100	36	5
	Google Scholar	11			
	Snowballing and author hand search	53			
Grey literature	Conference abstracts	19			
	Reports	9			
Total		141			

2.3.1 High cost of living in Arctic communities and precarity to external market forces frequently makes costs of travel insurmountable

Disproportionately high living costs in relation to salaries result in direct financial barriers to travel in Arctic North America. Travel costs reflect the high price of navigation technology and means of transport that are increasingly relied upon: "Harvesting costs for the procurement of traditional foods are high and most often covered by hunters and their families and reflect the initial investment in hunting equipment such as snowmobiles and boats, as well as the ongoing costs related to equipment maintenance, fuel for hunting trips, and necessary ammunition" (Beaumier et al., 2015, p. 552). The unpredictability of ongoing costs such as gasoline produces a level of precarity in access to food and travel that is influenced by external market forces: "'The high cost of gas has really affected the people of Igloolik. Some people go without food for days... it really takes its toll when you cannot buy gas to get the [traditional] food which to us is cheaper than [the] store [food].' Abraham Ulayuruluk" (Ford, 2009, p. 95). This results in fewer and shorter trips on the land for many: 'A teacher of the Inuvialuktun language in Tuktoyaktuk recalled, ''When my dad was alive, we just stayed in a camp, never worried about what's built. Now, groceries are so expensive, rent—you can't even enjoy being out on the land. We used to go out for months, whaling camps, fishing camps. A jerry can [of gas] was five dollars, now it's 60 dollars" (field notes, 10 July 2016)' (Bennett, 2018, p. 139).

Other economic processes implicated in the reduction of time spent on the land included those which reduce the income that can be made from animal products (discussed further below),

hindering people's ability to make a living from the land: '"People were able to make money trapping and sealing. And that can't be an economic activity anymore, and it costs a lot more nowadays just to go out on the land. I mean, I'd probably go to England just as cheaply for a week as it would cost me to go up to the cabin for a week. But going up to the cabin is far more important." (William Andersen)' (Durkalec et al., 2015, p. 22).

2.3.2 Historic and ongoing processes disrupt intergenerational land-based knowledge sharing and reduce safe travel

The disruption and undermining of dynamic, intergenerational transfer and the exchange of cultural and environmental knowledge (sometimes also referred to in the literature reviewed as the erosion of Indigenous Knowledge) was described to be a result of historical colonial policies including residential schooling and associated intergenerational trauma (Battiste, 1998; Hirsch et al., 2016): "Over the years, the Inuit bond with land and wildlife was weakened due to colonial encroachment, policing, restrictive land management, forced assimilation, and residential school education. These new systems of settler colonialism systematically and deliberately disrupted the generational transfer of traditional knowledge" (Panikkar & Lemmond, 2020, p. 5). This was expressed as being an ongoing process inherent to the Western influence over local education today: "Parents in the study identified the experience of forced relocation and/or attendance at residential school as traumatic events for families. These events broke the chain of Inuit knowledge transmission, which participants blamed for health inequalities observed in northern communities today" (Healey, 2016).

A major theme was the role of Western schools in promoting more passive ways of learning at the expense of land-based, experiential learning and concern around youth and younger generations' well-being and futures: "As an elder noted: 'There should be more [training] when [young people] are not in school. They don't know how to hunt or what to do … it's better if we just go ahead and tell them to follow when their father or whoever's going out on the land when they're taught they learn' (elders' focus groups)" (Beaumier et al., 2015, p. 553). This fed directly into concern expressed by Inuit about safe travel for the youth: "Participants in both towns described youth as increasingly likely to take risks without adequate preparation. Lenny from Kugluktuk, Nunavut, shares: 'My main concern is that none of them will go out hunting anymore. And they don't know the sea ice conditions. They don't know how to travel on the ice or on the ocean. They don't know how to read the weather... kids these days are gearing more to staying in town and going out just for day trips. But those day trips could be dangerous for them'" (Panikkar & Lemmond, 2020, p. 10).

As land-based knowledge is known to be experiential and adaptive, these processes were discussed as both a fundamental barrier to safe travel and a consequence of less time spent on the land. The

literature describes how residential schooling forcibly and directly separated generations of people, reducing opportunities for knowledge transfer. The intergenerational trauma cultivated through residential schooling was also thought to have undermined close relationships and is compounded by current schooling policies: "Even if the schools, along with community elders, organise trips to bring students out on the land and teach them traditional skills, hunters consulted believe that traditional training should be done by parents, and if the schools are to be involved, they should work with the parents: 'The school is taking over [the] parent's role to teach hunting and survival to their children. Parents and school should work together' (hunters' focus groups)" (Beaumier et al., 2015, p. 554).

2.3.3 Externally imposed timescales and schedules constraining time available for travel

Constraints associated with time were present in diverse ways in much of the literature reviewed. Employment schedules are reported to significantly constrain people's ability to spend time on the land, due to the inflexible weekly structure that they impose: "'I travel quite a bit but since I am working most of the time now I don't get too much time to be out on the land. That's what I really miss is the life on the land.' Ricky Wolki, Tuktoyaktuk resident" (Andrachuk & Smit, 2012, p. 875). This is also true of school schedules, which means that whole families experience barriers associated with weekly schedules: "Many families have increasing difficulty in finding the time to go bakeapple picking together. It is difficult to cope with variability in weather and harvest timing with rigid work schedules and increasingly, single men will go to the bakeapple grounds for a couple of hours." (Anderson et al., 2018, p. 857).

This results in travel opportunities being restricted to the weekend for many: "'It is hard today. If you have machines only you need the gas and equipment to go on the land, but you need the money to take it. It is hard to get all the gas and equipment without working. So you have to work and hunt at the same time. Weekends are very short...so you have to rush. I used to have a permanent job and it was a stress for me. My mind wanted to go out when it was good weather, calm weather, and I was having to work.' Arviat Harvester" (Clark et al., 2016, p. 23). This has also had the effect of incentivising opportunistic travel at weekends, regardless of the travel conditions: "Many community members now go out in conditions previously considered unsuitable: 'I think some people will now go out when they wouldn't normally go out.' James Ungalak" (Ford et al., 2006, p. 131).

Where time off must be booked ahead, there is pressure to go ahead with trips, and this is accentuated by the high cost of travel and by the likelihood that money may have already been invested in a trip, including gas or borrowed vehicles: "Time off from work, which is used for hunting

trips, has to be booked weeks, if not months, in advance. Weather or safety concerns may, therefore, be superseded by consideration of time availability when harvesting decisions are made" (Ford et al., 2006, p. 131).

Regardless of this pressure to go ahead with trips, time constraints mean that many travel plans have to be cancelled, and some people are simply making fewer plans to spend time on the land: "Some hunters are unable to adapt to the longer time requirements needed to travel further and cope with changing trail conditions due to employment commitments, and others are unable to afford the costs of extra gas and supplies. Still others are forgoing travel altogether because they do not feel confident travelling in uncertain conditions, particularly during shoulder seasons and on the sea ice." (Fawcett et al., 2018, p. 129).

This leads to a paradox whereby individuals may need to engage in waged labour to support the costs of time spent on the land, but this in turn is a time barrier to doing so: "Individuals described the mixed wage and subsistence economy as having introduced an additional dichotomy, whereby money earners who can most afford to hunt have the least amount of flexibility due to work schedules. The mixed economy is seen as displacing land-use to the weekend, particularly among those with full- or part-time jobs. Some participants described that even if the weather was better (e.g., less chance of a storm) during the work week, inflexible schedules would push them to go out on the weekend instead. Based on time restrictions, land-users can be more likely to go out right before a predicted storm, trying to beat it, or be in a rush to return before work or school commitments" (Clark et al., 2016, p. 22).

Constraints also play out on longer timescales. Seasonal or annual restrictions to harvesting in conservation areas may restrict travel in ways that prevent flexibility in the face of unpredictable ecological and environmental conditions. Policies that were seen to restrict travel in these ways included the Nunatsiavut polar bear, goose and duck quotas and caribou ban (Natcher et al., 2016), the United States ban on the import of polar bear skin in 2009 (Ford et al., 2013; Wenzel, 2009), the European Union sealskin ban in 2010 (Ford et al., 2013) and seasonal regulations that impact the walrus hunt in the Bering Straits, Alaska (Fidel et al., 2014). Here, spatial and temporal constraints meet in the context of policies that constrain harvesting in specific geographic regions over specific timescales (McNeeley & Shulski, 2011).

This was reported to result in people being pushed to travel farther and longer to access hunting grounds: "With disruptions in seasonality and availability, tribal communities need flexibility in management systems in order to access traditionally harvested resources. However, the "calendar-driven" agency rules about harvest present a challenge. Namely, the defined "season" for harvesting

salmon, deer, and shellfish is in some cases in conflict with the actual season of availability... Tribal communities need flexibility in determining when is the most appropriate time to harvest species because seasons of "onset" are in flux" (Chisholm Hatfield et al., 2018, p. 8).

2.3.4 Historical and contemporary environmental policy and governance and resource development constrain the geographical spaces in which it is possible to travel

Shipping, industrial development and resource extraction are projected to increase in the context of a warming climate, which increases the period of time that the sea is navigable by ships. Dawson et al., (2020) find that shipping is something that communities across Arctic Canada are highly concerned about. Shipping, which includes purpose-built icebreakers, as well as other ships which create breaks in the ice, is associated with both direct and indirect threats to safety. The creation of unstable ice conditions is a primary direct driver of risk: "ice breaking also causes the ice to fracture and re-freeze in a way that can make it dangerous and sometimes impossible to cross with a snowmobile. This not only affects the ability of community members to hunt but also can be very dangerous if a hunter were to fall through the ice that has not yet refrozen to previous strength or if a snowmobile breaks down because of challenging ice formations" (Dawson et al., 2020, p. 30). The risk of wakes created by large ships were also seen to be a risk to safety while travelling on the water: "Hunters from Bering Strait communities [Alaska] travel by small, open boat as far as 100 miles (160 km) or more from land. These boats could be struck by a large vessel or swamped by a large vessel's wake" (Huntington et al., 2015, p. 122).

Secondary threats to safety were caused by disruption to wildlife, which is an impact of both shipping and industrial development more broadly: "An increase in shipping and icebreaking was mentioned in connection with both wildlife disruption and hunting grounds access. One participant in Cambridge Bay, Nunavut, recounted a story of a hunter being stranded for several days after an icebreaker cut off his ice route back to town" (Panikkar & Lemmond, 2020, p. 9).

Ice breaking by ships reduces people's ability to be flexible about when they travel. As a participant in Davies (2007, p. 78) describes: "People don't really have it logged on their calendar, because we don't know on the calendar when we're going to go off. You know. If we've heard that there's a caribou in certain areas, we'll get ready for them the next day. That's the only thing we think about. Now we have to think about, oh, ship's coming in today. You know, we don't think about that". Additionally, it regularly created a need for detours: "A couple of times we couldn't get to our cabin because the track wasn't froze… Some Inuit are not used to checking on the safety of the ice in the ship's track and often forget to do this before they go out on the land. If they reach the track and it is unsafe to cross, they either have to turn back, or to make detours in order to go around it. This

also happens when people are coming back from being out on the land, and some people have commented that it makes them feel 'trapped'. But I think that since there's been several incidents this year with one or two people." (Davies, 2007 p.78).

2.3.5 Social and structural factors interact with weather conditions and climate

Socially constructed root causes addressed above interact with weather and environmental conditions in complex ways. Time spent on the land requires flexibility: "A traditional subsistence harvest strategy requires the adaptive capacity to adjust to changes in resource availability, through location change, species switching or altering the timing of a hunt. Before colonization the timing of this hunt was not restricted by seasonal regulations so there was more flexibility within the system" (Fidel et al., 2014, p. 62). The identified root causes of risk constrain peoples' ability to live in and interact with their environment in a dynamic and flexible way: "While climate change is no doubt a challenge, northern peoples have historically been able to respond effectively to changes in the land and seascapes and to the distribution of fish and game through flexible and adaptive subsistence strategies. The research reviewed here highlights how governance and management structures can limit people's options and flexibility in this regard—restrictive land tenure regimes, and hunting and fishing seasons that are increasingly out of sync with changing seasonality and phenology of fish and game are two examples" (Loring & Gerlach, 2015, p. 386). Specifically, it is people's opportunities for adaptive change that are curtailed: "Some respondents have adapted to changing ice conditions by adjusting the timing and modes of travel on the land. The ability to adapt is dependent on the ability of the respondent to be flexible in the timing of harvesting, access to alternative modes of transportation (e.g., boat, ATV, snowmobile) and having the knowledge and skills necessary to change harvesting locations and techniques" (Prno et al., 2011, p. 14). Environmental hazards thus pose a risk because of the social and historical context.

There are differences in the ways that individuals can manage environmental hazards and change, and these differences are based on complex intersections of identity and experience: "Participants reported that although the weather is changing, prepared land-users are not affected because they are ready to make a shelter and spend the night, or if necessary call for help" (Clark et al., 2016, p. 24). Intersecting identities of gender, age and other differing identities are described in the literature as shaping experiences of risk on the land and barriers to travel. In particular, there was mention of the unique challenges faced by women and by families with single parents (of all genders), particularly in relation to lower incomes and the increased burden of responsibilities that act as a barrier to time spent on the land. There was also discussion around the differing experiences of different age groups and generations, particularly around the increased influence of Western

lifestyles for youth and perceptions of increased risk among youth in the North. Some studies report higher rates of unintentional injury and death and search and rescue among men and youth. Few studies employed detailed intersectional approaches.

One study reported weather condition thresholds for safe travel (Ford et al., 2019), but these tend to be place-specific or dependent on individual circumstances and interacting social drivers. Others suggest that the creation of general thresholds is not possible: "Weather is only one of many factors in Inuit decisions… The visiting researchers on the team had initially assumed the existence of weather thresholds for travelling and other activities; for instance, that people would not leave home or camp if wind speeds were above a certain level. In conversation and travel with Inuit on the team, it became apparent that many social and other factors come into play, making it impossible to identify clear thresholds of this kind" (Fox et al., 2020, p. 273).

The role of climate change was discussed in some studies within this review, though often in a non-direct way, or as one of a number of factors. For example, climate change was discussed broadly as having an impact on the walrus hunt in Alaska (Lynch et al., 2004), mainly in combination with other cumulative effects of regulatory frameworks and industry (Fidel et al., 2014), and climate change was also mentioned as a factor leading to a longer shipping season (Dawson et al., 2020). Climate change's role in increased weather variability was discussed: "One of the observed impacts of climate change is increased seasonal variability, which forces hunters to adjust their seasonal calendar continuously" (Berkes & Armitage, 2010, p. 117). However, weather variability was not necessarily described as a barrier to travel on the land. For example, Archer et al., (2017, p. 25) found that "hunters are generally making additional preparations given the experience with climate impacts. Many participants, for example, cited checking weather conditions online or seeking additional guidance from elders before leaving". Desjardins et al., (2020, p. 244) suggest that "The use of new technologies and innovation represents one point of continuity between past and present adaptation to changing climates". However, the theme of climate change was not discussed to a significant extent as a barrier to travel on the land, and the ways in which it arose in discussions were heterogeneous across Arctic North America.

2.3.6 Root causes versus direct drivers of risk

Mostly, the literature discussed relatively direct or immediate risk factors or barriers to travel on the land. The literature does also mention—and attribute cause to—underlying and broader root causes that create and shape risk. Sometimes the mechanism through which these cause risk are explicitly and directly described, such as the impact of Western schooling (Beaumier et al., 2015; Panikkar & Lemmond, 2020). Other times, they are referred to as a broader set of policies that impact and

shape Inuit lives in direct ways. For example, many papers reference “colonial encroachment,” as characterised by a broader set of processes including, but not limited to, restrictive land management, forced assimilation into western society and capitalist economies, geographic resettlement in permanent towns, residential schooling and associated systemic and deliberate disruption of intergenerational transfer of knowledge, and policing, including the systemic attack of the RCMP on sled dogs and their relationships with Inuit (Bennett, 2018; Dinero, 2013; Panikkar & Lemmond, 2020; Rodon & Schott, 2014). These are described as undermining land-based activities in a more general sense and act as the root causes of more direct risk factors. Root causes grounded in present day processes and actions were apparent in the literature as, for example, low government employment and low tourism and economic inflow, the domineering influence of western lifestyles among the younger generation of Inuit, and the economic dependence on external factors beyond community control (Collings et al., 2016; Dowsley, 2015; Ford et al., 2013). In particular, colonial policies of forced sedentarization, a time when many Inuit came in off the land, are considered to have fundamentally altered opportunities for travel and access to spaces outside of urbanised communities: “the move off the land in the 1950s and 1960s changed Inuit lives dramatically. Sedentarization in the villages increased the Inuit feeling of alienation from their land and their traditional way of life” (Légaré, 2008, p. 101). Aporta (2009, p. 135) explains how colonial policies of relocation intersected with imposed timescales: “Before Inuit moved to permanent settlements in the late 1950s and early 1960s… the journey took precedence over the route, and the trail was, in a sense, lived rather than travelled… This approach started to change with the arrival of European and American whalers and particularly with the arrival of trading posts, and the emergence of regular trading journeys to the posts. The most dramatic change was linked to sedentarization, and the appearance of such concepts as weekend trips”.

2.3.7 Positive drivers of safe travel and factors mitigating disaster

Some of the literature reviewed discussed positive social factors that enable people to get out on the land, including community-level resilience and adaptation, and may mitigate disaster. For example, while dependence on technology was suggested to be a driver of risk-taking behaviour, technology also provides opportunities for flexibility, creativity and learning: “Young Inuit are inspired by technology and readily utilize it. The elders say, ‘Now we need young people to teach us.’ Internet and school education are the means by which Inuit learn. When the researcher asked one Inuk fisher about Inuit turbot fish recipes, he replied, ‘Google it,’ with a smile” (Galappaththi et al., 2019, p. 8).

Additionally, communities are initiating numerous programmes to tackle many of the drivers of risk discussed so far: “Arviat has numerous programs to increase safety on the land. The Young Hunters Program, for example, exposes youth to harvesting activities. Youth are taught about land navigation, firearm safety, land safety practices, and local hazards by elders and active hunters in the community. The program addresses key vulnerabilities, reducing the susceptibility of participants, and encouraging them to recognize hazards. Study participants were supportive of the programs as they were seen as an avenue to maintain IQ [Inuit Qaujimajatuqangit], cultural identity, and protect youth. Arviat has also taken an active role with the SAR committee to ensure the necessary resources are provided for them to operate effectively. Similarly, Pangnirtung has taken steps to train SAR [search and rescue] members and has a Coast Guard Auxiliary Unit” (Clark et al., 2016, p. 24).

Table 2.3: Number of studies reporting each theme and location of studies with examples

Theme	Number of Studies	Locations/Examples
High cost of living in Arctic communities and precarity to external market forces makes costs of travel insurmountable	27	Alaska, e.g., (Brinkman et al., 2016) Nunavut, e.g., (Archer et al., 2017; Clark et al., 2016; Panikkar & Lemmond, 2020) Nunatsiavut e.g., (Boulanger-Lapointe et al., 2019) Inuvialuit Settlement Region e.g., (Bennett, 2018; Fawcett et al., 2018) Yukon e.g., (Chiu et al., 2016) Nunavik e.g., (Natcher et al., 2016)
Historic and ongoing processes disrupt intergenerational land-based knowledge sharing and reduce safe travel	24	Nunavut e.g., (Clark et al., 2016; Johansson & Manseau, 2012; Laidler et al., 2009) Nunatsiavut e.g., (Durkalec, 2012) Alaska e.g., (Eisner et al., 2013; George et al., 2004) Inuvialuit Settlement Region e.g., (Andrachuk & Smit, 2012; Fawcett et al., 2018)
Externally imposed timescales and schedules constraining time available for travel	19	Nunavut e.g., (Aporta, 2010; Prno et al., 2011) Alaska e.g., (Blair & Lovecraft, 2020) Labrador e.g., (Anderson et al., 2018; Davies, 2007; Petrasek MacDonald et al., 2015) Yukon e.g., (Chiu et al., 2016) Inuvialuit Settlement Region e.g., (Collings, 2011; Pearce et al., 2010)
historical and contemporary environmental policy and governance and resource development constrain the geographical spaces in which it is possible to travel	16	Nunavut e.g., (Bowman, 2011; Panikkar & Lemmond, 2020) Alaska e.g., (Dinero, 2013; Fidel et al., 2014; Gladden, 2001) Labrador e.g., (Davies, 2007; Natcher et al., 2016) Inuvialuit Settlement Region e.g., (Dawson et al., 2020) Nunavik e.g., (Rodon & Schott, 2014)

2.4 Discussion

Reports among Inuit of increasing risk of accidental injury and death on the land, increased barriers to land travel and associated mental, social and cultural health impacts suggest an unfolding, slow-onset disaster in Arctic North America. This slow-onset disaster can be understood through Nixon's (Nixon, 2011) concept of "slow violence", a delayed destruction occurring gradually, out of sight and across a range of temporal scales.

This paper presents the first attempt (as far as we are aware) to systematically review the barriers to travel for Inuit in Arctic North America, drawing insights from both Canada and Alaska and using a framework from disaster studies to identify causal mechanisms through which barriers to travel, and to safe travel, are created. We have identified barriers to travel for Inuit across Arctic North America, that include cost, time constraints, prevention of knowledge sharing, and the complex interplay between them. Additionally, we have identified how these processes can create risk of accidental

injury and death on the land. These emerge through pathways of causation that have, at their root, historic and contemporary colonial policy and inequality, as opposed to environmental hazards per se. Previous research has suggested that social, economic and political factors play a significant role in shaping the challenges faced by Inuit communities. Our research confirms that, rather than climate hazards being primary drivers of risk in Arctic North America, root causes embedded in colonialism, in the context of changing weather and climatic conditions, are responsible for creating barriers to safe travel on the land. Additionally, we have confirmed that this trend is common (with nuance) across Arctic North America. These impact peoples' mobilities in profound and complex ways. As Loring & Gerlach, (2015, p.386) explain: "While climate change is no doubt a challenge, northern peoples have historically been able to respond effectively to changes in the land and seascapes and to the distribution of fish and game through flexible and adaptive subsistence strategies". Thus, the unpredictability of weather conditions becomes a greater problem in the context of these root causes and drivers of risk, and these risk drivers act as a barrier to the exercising of the flexibility and life-long learning that Inuit are able to employ (Fidel et al., 2014; Ford & Smit, 2004; Loring & Gerlach, 2015).

The way that time constraints shape risk at different scales has emerged as an important paradigm. Sheila Watt-Cloutier (Watt-Cloutier, 2020) writes of the imposition of western timeframes on Inuit: "Suddenly there was a unit of time called a 'week'; how very strange the idea must have seemed to my ancestors that one in every seven days was a special day when hunting and all other 'work' had to stop". At weekly and annual time scales, policies constrain the temporal flexibility of Inuit with respect to travel on the land. Weekly schedules are controlled and constrained by school and work times and act to either prevent travel or to incentivise travel at times when conditions are challenging. On an annual level, seasonal conservation policies restrict access to harvesting sites. These processes act to significantly constrict and reshape people's mobilities on the land, over time and space, and build upon histories of colonial policy that have continually undermined the mobilities and flexibility of Indigenous Peoples in Arctic North America (Chisholm Hatfield et al., 2018; Faas et al., 2019; Snook et al., 2020). Nanni (2013) discusses how "the colonization of time" has been a major instrument of Imperialist colonial agendas throughout history, enforcing control and conformity over colonial subjects' lives. In an Arctic context, Christie and Halpern (Christie & Halpern, 1990) suggest that the imposition of Euro–Canadian temporal constructs has impacted dissociation from the land and its seasonal patterns, with significant mental health impacts for youth in particular. It is apparent here that privileging linear, Western and Eurocentric notions of time (Gingrich et al., 2002; Hodges, 2008; Nanni, 2013) through externally imposed work and school schedules can have tangible impacts on people's ability to travel safely on the land. The ways that

people are able to flexibly cope with uncertainty are bound up with personal and community interactions with time (Marino et al., 2016). Analyses of time therefore provide a useful lens for identifying immediate risk drivers, but also provide a unifying analytic to link broader themes of colonisation and constraint in the way people can interact with the land (Chisholm Hatfield et al., 2018).

Processes and impacts of colonisation are inherently spatial; Tuck & McKenzie, (2014, p. 4) point out that "legacies of the spatial practices of European colonisation over the past 500 years in many parts of the globe continue to be supported by governments, but also social practices more generally, which establish and reify hierarchies of settler over Indigenous". This research speaks to a broader literature that focuses on the way that people's mobilities, in the context of a changing climate, have been constrained by structural processes (Faas et al., 2019; Maldonado et al., 2013; Marino, 2012; Nawrotzki & DeWaard, 2018). Flexible processes used for managing risk through mobility have been replaced with administrative borders, the privatisation of land and externally imposed policies (Ford et al., 2020; Liao et al., 2016; Marino & Faas, 2020). External forces of relocation constrain peoples' mobility options and disrupt and transform the space and place of peoples' ecological relationships (Faas et al., 2019). Healey, (2016, p. 47) interviewed Inuit parents, who identified: "forced relocation and/or attendance at residential school as traumatic events for families. These events broke the chain of Inuit knowledge transmission, which participants blamed for health inequalities observed in northern communities today". As Durkalec et al., (2015, p. 24) describe, "mobility heightens the freedom of decision-making associated with going off on the land… health-enhancing aspects of this freedom are contingent on knowledge of how to stay safe on the ice, encompassed by the Inuit concept of ippigusutsianik, which combines knowledge, skills, preparation, and mindset". Undermining mobility and flexibility undermine not just safety on the land, but the health-enhancing aspects of this mobility.

Positive drivers of access to land mentioned in the literature reflect community-driven processes of creativity and innovation. The literature reviewed highlighted that learning and adaptation are occurring within Indigenous Knowledge systems, reporting the pragmatic integration and adaptation of new practices (Ford et al., 2020). While this review has focused on the root causes and direct drivers of risk, it does not intend to silence or make invisible these community level processes which continue to resist injustice and push back against colonial oppression and marginalization (Abele & Southcott, 2016; Callison, 2014; Jodoin et al., 2020; Redvers, 2020; Watt-Cloutier, 2015). We also recognise the problematic nature of discourses that emphasise experiences of trauma and hardship above the positivity of the day-to-day lives of those at home in the Arctic (Akearok et al., 2019).

Due to the long history of advocacy by Indigenous Peoples, Indigenous Knowledge is now recognized in global forums as valuable and relevant for the current challenges facing the world, including climate change (Fernández-Llamazares & Cabeza, 2018). However, Indigenous participation in these global forums is still limited (Ford & Smit, 2004; Gilbert & Lennox, 2019; Hohmann, 2019; Shea & Thornton, 2019; United Nations, 2021) and global processes are continuing to undermine Indigenous institutions (Lindroth & Sinevaara-Niskanen, 2017). Critiques of "resilience" point to its potential to "neoliberalise" climate action and place responsibility on communities to act and adapt (Fournier et al., 2019; Labbé et al., 2017; Mikulewicz, 2019; Mikulewicz & Taylor, 2020; Snook et al., 2020). Local agency for communities is, therefore, often in tension with broader power structures and institutions (Ford et al., 2020). Doing justice to local agency, while attending to the external structures that create risk is thus an ongoing challenge. While it is important to platform localised, Indigenous-led action that counters risk and promotes safe travel, the institutions that create structural violence and the root causes of risk must also be held to account (Bankoff, 2019; Béné et al., 2014, 2016; Kelman et al., 2016; Lindroth & Sinevaara-Niskanen, 2017), and this research has intended to contribute to this agenda. However, it is important for such work to learn from concepts of environmental justice (EJ) (Chisholm Hatfield et al., 2018; Walker et al., 2019), which stems from the activism and advocacy of communities in the face of environmental racism, including communities of colour and Indigenous Peoples across the globe (Bullard, 1993; Gilio-Whitaker, 2020; Whyte, 2018). EJ can be a powerful lens for recognising the agency of Indigenous Peoples while also placing focus on the structures and institutions that create risk, precarity, loss and damage (Mattar et al., 2020). Justice considerations also highlight how these root causes and risk drivers for unsafe travel on the land are not just problems in the context of climate change, but are processes of structural violence in and of themselves (Whyte, 2018). These processes are at risk of being hidden or consumed into one broader narrative of climate change, but they require focus and action in and of themselves, and for this an EJ lens may be productive. This would also suggest that there is a danger in taking an approach to researching these things that assumes "climate impacts" without investigating the root causes. As Hall & Sanders (2015, p. 443) suggest, research that centres on climate change as a threat to Arctic Indigenous Peoples fails to "consider the political and legal institutions and structures that constrain Arctic residents' ability to adapt to climate change … to see resource extraction and shipping as human dimensions of climate change … and to recognize that hunting policies set in Washington, London, and Brussels may pose a greater threat to Arctic citizens than the changing biophysical climate".

Thus, to minimise loss and disaster, particularly in the context of climate change, we will need to address the root causes of risk, which may involve reform of political systems and institutions

(Whyte, 2020), and likely should be embedded in sustainable development processes more broadly (Ford et al., 2014; Kelman et al., 2017). “Adapting” just to climate change as an “externalised” threat is problematic because it distracts from making the changes to social structures that are required to reduce risk and harm more broadly, as well as in the context of a changing climate. While changing weather conditions are certainly a concern to some in Arctic North America, and continue to play a key role in the narratives surrounding the Arctic and other locations, research and discourse should not ignore the role of structural factors in creating risk in the context of climate change (Nyantakyi-Frimpong & Bezner-Kerr, 2015; Ready & Collings, 2020; Tschakert, 2012) and should be careful about using resilience-focused approaches that place responsibility on communities to adapt. There is, however, value and opportunity in using a climate change lens in a nuanced way to reveal the socio-political structures and inequalities that underly climate change experience (Griffin, 2020; Marino & Schweitzer, 2016) and to leverage action and seize a “window of opportunity,” providing it does not distract from the underlying, socially located root causes of risk (Roberts & Pelling, 2020). The important factor is maintaining a plurality of discourses, perspectives and solutions (Callison, 2014).

This review has demonstrated the value of using a root cause analysis to understand unfolding disaster processes in the Arctic, in particular those unfolding gradually. It has demonstrated that disaster research can provide a framework through which to examine these processes in an Arctic context. This root cause analysis has opened several possibilities for further research on root causes in this context, including more detailed analysis of the specific institutional and governance processes which are presently replicating and recreating structural violence and processes of risk. Processes which engage, or are led by, Inuit and Inuit organisations must be prioritised in such work (Oliver-Smith et al., 2016). There is significant opportunity in these approaches for producing understandings of disaster creation that are of use for policy and practice (Fraser et al., 2016), both in disaster risk reduction and in processes of equitable policy in the Arctic more generally.

2.5 Conclusions

Systematically reviewing barriers to safe travel for Inuit across Arctic North America has revealed a complex web of socially constructed drivers of risk that impact the safety of people’s mobility and travel on the land in Arctic North America. In doing so, we have demonstrated the value of root cause analysis for research in Indigenous Arctic contexts. While the way that environmental hazards and climatic change contextualise loss and disaster in this context is complex, and there can never be a complete absence of risk, the risk and loss associated with constrained mobility in this context is to a great degree explained by the impacts of historic and contemporary colonial policy. There needs to be a shift from a focus on “vulnerable peoples” to the underlying processes and institutions

that put people at risk, including rethinking the "location" of disaster to include spaces of power and decision-making (Marino & Faas, 2020) and rethinking the temporality of disasters as not just "one-off" events (Oliver-Smith, 2019). This may mean "studying up" the institutions and power relations that create risk (Nader, 1972) and employing participatory and Indigenous-led approaches to doing so. It is important that the voices of community-based and non-governmental organisations, Inuit governments and individuals are centred in these conversations, not just in research but in ongoing collective action and fights for environmental justice that Indigenous Peoples have been at the forefront of. There is much evidence here already to suggest that increased social protection, and movements toward greater Indigenous autonomy over mobility, time, education and land use are ways to tackle the root causes of risk.

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2.7 Author contributions

Conceptualization, K.D., J.D.F., C.H.Q., A.M., M.F., S.L.H. and IHACC; formal analysis, K.D.; writing—original draft preparation, K.D.; writing—review and editing, K.D., J.D.F., C.H.Q., A.M., M.F. and S.L.H.; supervision, J.D.F., C.H.Q. and S.L.H. All authors have read and agreed to the published version of the manuscript.

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3 Stories of climate change and health: A narrative analysis of health in Canadian government climate change policy affecting Inuit Nunangat

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Abstract

Narratives are used to make sense of the world and are profoundly important for our understanding of complex challenges and for imagining possibilities for change. While it is understood that inequity and unequal power relations are the root causes of disasters, dominant narratives frame climate change as an 'externalised' threat to human health and propose technocratic approaches to defending the status quo. Such narratives draw focus away from solutions that address the root causes of disaster and ill-health in the context of climate change. In Inuit Nunangat, the social determinants of health include histories of colonialism and contemporary policy, and these shape Inuit experiences of climate change. However, these root causes of harm have historically been neglected in governmental policy in Canada. This paper reports the results of a narrative analysis of Canadian governmental policy documents pertaining to climate change and human health. Narratives are deconstructed and common and dominant narratives are identified, drawing from Burke's dramatistic pentad. We identify three common narratives. The dominant narrative externalises the threat of climate change and proposes solutions that leverage knowledge and innovation to adapt. This narrative does not engage with inequality or power relations. A second narrative identifies inequality as a driver of harm but does not engage with power relations when detailing the solution. A third narrative emerges from a small number of documents and identifies inequities and colonial policy as drivers of Inuit experiences of climate change, proposing specific solutions that address these root causes and that further Indigenous sovereignty and changes to policy and governance. How we tell the 'story' of climate change determines how we act and adapt in the face of it. As long as dominant policy narratives distract from addressing the root causes of harm, inequities and violence will be perpetuated through inappropriate actions and missed opportunities. Less dominant narratives identified in this analysis offer ways of telling this story that can push us to act on the root causes of harm in the context of climate change.

Key Words

Narrative, policy, disaster, climate change, Indigenous, Inuit

3.1 Introduction

Disasters are the outcome of social, political, and economic conditions and processes (Hewitt, 1983; O'Brien et al., 2007; Oliver-Smith, 2019), and research increasingly points to the relevance of this understanding of disasters for action to protect human, and more-than-human, health in the context of climate change (Kelman et al., 2016, 2017; Mercer, 2010; Todd, 2017). As Zoe Todd (2017) points out, it is not a hazard that is violent, but the "machinations of human political-ideological entanglements". The structural nature of disasters and climate change (meaning the ways that they are associated with the political, social and economic structures of society) are highlighted in frameworks including the 'root causes of disaster' (Oliver-Smith et al., 2016) and the 'social determinants of health' (Marmot et al., 2008). Indigenous Scholarship has further emphasised the need to centre the relational in understanding the root causes of disaster (Howitt, 2020; Todd, 2017). These understandings not only provide conceptual guidance for research into these processes, but they also provide narratives that highlight how inequity, oppression and colonialism shape the health and ill-health of people, whether in the context of crises or not. They illustrate how disasters reveal failures in governance, and in particular, colonial governance (Howitt, 2020).

Narratives are accounts of series of actions and events that unfold over time (Bruner, 2004; Mroz et al., 2021). They are "world-making" (Bruner, 2004), and a tool through which social actors "interpret, navigate, and (re)constitute the social world" (Edgell et al., 2016; Foucault, 1972). They can powerfully draw together diverse events, processes and experiences of human life into unified, goal-directed processes (Polkinghorne, 1995) and are thus particularly important for our understanding of the ongoing challenges facing humanity, including disasters and climate change (Mroz et al., 2021). Policy-making is a particularly powerful discursive space responsible for creating shared meaning around these challenges through the framing of problems that need responding to and relevant solutions (Feindt & Oels, 2005; Hajer & Versteeg, 2005; Iannantuono & Eyles, 1999). Policy-making is thus a fundamentally narrative process (Fischer & Forester, 1993; Mroz et al., 2021). The narrative(s) contained within any one policy document do not necessarily equate directly to the specific actions and outcomes of the policy, as the document is only the visible part of a policy-making process that is complex, negotiated, changing and often occurring behind closed doors (Naess et al., 2011). However, the policy document is the aspect of policy-making that is most visible to most people, and the narratives contained within it will have a powerful role in shaping collective understanding of the issue (Roe, 1994). Therefore, the narrative(s) within policy documents can have deep influence over the policy action and the way that it is received.

Despite a need to centre the root causes and social determinants of harm in responses to climate change (Pörtner et al., 2022) many narratives of disaster, climate change, and health in policy,

media, academia and elsewhere, frame climate change as an 'externalised' threat to human health and propose technocratic approaches to defending the status quo (Cheek & Chmutina, 2021; Harcourt et al., 2020; Mikulewicz, 2019). This risks depoliticising the problem and missing opportunities to propose solutions that address the root causes of disaster and ill-health in the context of climate change, thus perpetuating inequities and structural violence through pursued actions and missed opportunities (Lahsen & Ribot, 2021; Nixon, 2011). They risk disconnecting narratives from the scales of human experience (Howitt, 2020) and erasing Indigenous Peoples' understandings of the deep connections between colonial violence and climate change (Whyte, 2018), while simultaneously proposing 'unprecedented' solutions such as 'climate-induced resettlement' (Whyte et al., 2019).

In Arctic North America, rapid climatic change has been met with a surge in policy approaches to identify and address the impacts that climate change will have on human health, and particularly the health of Indigenous Peoples (Austin et al., 2019). This is taking place within a context of increased understanding of the role of the environment as a determinant of health (Iannantuono & Eyles, 1999). At the same time, Canada is reckoning with colonial legacies and reconciliation is also being increasingly incorporated into policy agendas (Qikiqtani Truth Commission, 2010; Truth and Reconciliation Commission of Canada, 2015). The two issues are deeply interlinked, with anthropogenic climate change being labelled as another manifestation of colonialism (Whyte, 2020), and colonialism identified as a key ongoing determinant of Indigenous health and root cause of disaster (Faas et al., 2020; Inuit Tapiriit Kanatami, 2014). Therefore, failing to tackle colonialism in policy that seeks to address the links between climate change and health directly conflicts with goals of Indigenous self-determination (ITK, 2019). Nevertheless, across countries, dominant narratives surrounding climate change and health regularly fail to do so. Given current goals of reconciliation in Canada, it is particularly important that Canadian policy narratives reflect these connections but, to our knowledge, few have attempted to deconstruct government policy narratives in Canada that pertain to climate change and health. In this paper, we identify and characterise policy narratives of climate change and health in governmental policy in Canada. We focus specifically on policy (federal, provincial, and territorial) that pertains to the health of Inuit in Inuit Nunangat (the Inuit homeland in Canada) alongside issues of climate change and ask how these narratives engage with the social determinants of health and the root causes of disaster for Inuit. We begin with a background to this context, before describing the narrative policy analysis research approach.

3.1.1 Background: Indigenous social determinants of health and the root causes of disaster

The 'social determinants of health' framework highlights how health inequities and uneven distribution of harms to health are broadly caused by the "unequal distribution of power, income, goods, and services, globally and nationally" (Marmot et al., 2008, p1). Societal structures cause different people and populations to have different health outcomes based on intersecting identities and oppressions, including gender, age, disability, race and others (Hankivsky & Christoffersen, 2008; López & Gadsden, 2017; McGibbon & McPherson, 2011). Such health outcomes can be tangible harms such as physical injury, death, ill-health, and mental ill-health. However, they can also include intangible forms of loss and harm, such as personal and collective sense of identity and culture (Johnson et al., 2021; Lavallee & Poole, 2010; Tschakert et al., 2019). Marmot et al (2008) point to the role of policies, programmes and politics in creating these conditions.

Importantly, frameworks of the 'Indigenous Social Determinants of Health' highlight the profound role of oppressive colonial structures (including contemporary ideological and political structures) in creating these conditions (Reading, 2015). Indigenous Social Determinants identified by Indigenous Peoples and organisations, include not only root causes such as income, education, health services, gender, age, and disability, but also colonization and associated historical and ongoing trauma (Bambra et al., 2010; Chatwood et al., 2012; Driscoll et al., 2013; Inuit Tapiriit Kanatami, 2014). Most importantly, Indigenous Social Determinants of Health centre self-determination, Indigenous Knowledges and languages, spirituality, and connection to land (Cueva et al., 2021a; Greenwood & de Leeuw, 2012; Healey, 2018; Redvers, 2020; Tagalik et al., 2018). Individual, family, social, cultural, historical, linguistic, and environmental contexts are all factors that support communities in the Circumpolar North to thrive (Cueva et al., 2021b). Inuit health requires that "Inuit are empowered to be at the forefront of studying their homeland, and to be decision makers in the solutions put forward" (Pfeifer 2020, p266). There is also a push to reframe Arctic health determinants, moving away from deficit framings of Inuit health (Aldred et al., 2021; Walter & Andersen, 2013) and moving towards understanding and supporting what makes communities thrive (Healey Akearok et al., 2019). Meaningful policy action to address these social determinants of health will need to acknowledge and integrate Indigenous rights and knowledges, using strength-based framings to support community-led critical research approaches, monitoring and assessment (Cueva et al., 2021a).

Disaster scholars have studied the determinants of health and well-being through different frameworks, investigating the ways that these same processes that cause harm to health manifest as disasters, historically focusing on rapid-onset crises, but increasingly expanding definitions of disaster to include creeping processes of loss and harm to health (Oliver-Smith, 2019). In disaster

research, the 'social determinants' that create these disasters are referred to as the 'root causes' of disaster (Bankoff, 2019; Hewitt, 1983; Kelman et al., 2016; Oliver-Smith et al., 2017). Feminist contributions to disaster research have further pushed for disasters to be conceptualised as the determinants and inequities that exist in societies in advance of the 'events' that trigger emergencies and crises – in other words, the disaster is the inequity in society, and is thus linked to social justice and development (Ahmad, 2018). In this way, the social determinants of health and the root causes of disaster are deeply linked in a number of intersecting ways. It is clear that the societal processes of inequity and oppression that determine health outcomes in and between populations in an ongoing way are the same processes that shape risk of disaster and determine harm in the context of disaster. Additionally, the harm and inequitable burden of ill-health that is caused by the social determinants of health, can themselves be considered a disaster that unfolds in an ongoing or creeping way (Ahmad, 2018). Finally, it is also important to remember that both the social determinants of health and the root causes of disaster represent processes that are forms of structural violence and thus both are social justice issues (Ahmad, 2018; Marmot et al., 2008; Nader, 1972).

Both the social determinants of health and the root causes of disaster have been discussed in the context of climate change adaptation, as being key to deconstructing how and why different people and populations will have different experiences of climate change and will be subject to differing harms (Clark et al., 2021; Kelman, 2017). Action to protect human health in the context of climate change must, therefore, address root causes and social determinants, and adaptation approaches that seek to protect the status quo from the 'external' threat of climate change will miss the point that the greatest source of risk (and that which we have most control over) lies within the structures of our societies (Lahsen & Ribot, 2021). Here, given the cross-over between the two, we use "root causes" to refer to both the "social determinants of health" and the "root causes of disaster", unless we are referring specifically to one framework. We argue that it is useful to bear both the social determinants of health and the root causes of disaster in mind when considering adaptation to climate change, as this can bring together communities of scholars and policymakers from different disciplines. While the two concepts are sometimes discussed alongside each other (Faas et al., 2020) we are not aware of a significant literature that brings them into conversation.

3.1.2 Inuit Nunangat

In Inuit Nunangat (the Inuit 'homeland' in Canada) there is a diverse policy landscape dealing with the human health dimensions of climate change (Vogel & Bullock, 2021). Across Canada, there is also a lack of clarity about which institutions, nationally and regionally have accountability for

tackling the health dimensions of climate change (Austin et al., 2015; Clark et al., 2021; Raikes et al., 2022). The Arctic is experiencing rapid climate and environmental change and there is rapidly accelerating research on the human dimensions of climate change (AMAP, 2017, 2018). However, it is increasingly apparent that the social determinants of health include histories of colonialism and contemporary policy (Cueva et al., 2021a; Greenwood & de Leeuw, 2012; Healey, 2018; Redvers, 2020; Tagalik et al., 2018). The root causes that need to be tackled in adapting to climate change have historically been neglected in governmental policy in Canada (Clark et al., 2021; Ford et al., 2014). Critically analysing the discourses around root causes present in the diversity of Arctic Canada's policy landscape can shed light on the degree to which policy is currently attending to these root causes in proposed solutions and adaptation options.

3.2 Research approach

3.2.1 Narrative policy analysis

Narratives are accounts of series of actions and events that unfold over time (Bruner, 2004; Mroz et al., 2021). Narratives are therefore a specific type of discourse, and while discourses can be broadly defined as a way of construing aspects of the world, narratives do so through telling stories, (Burke, 1945; Foucault, 1972; Gee & Handford, 2012). They are "world-making" (Bruner, 2004), in that they are a tool through which social actors "interpret, navigate, and (re)constitute the social world" (Edgell et al., 2016). Discourses of all types are powerful, agenda-setting phenomena (Chmutina et al., 2019; Elizabeth Marino & Peter Schweitzer, 2016; Hajer & Versteeg, 2005; Leipold et al., 2019), but the power of a narrative is in its ability to draw together diverse events, processes and experiences of human life into unified, goal-directed processes (Polkinghorne, 1995). Narratives can be divided up into various components. For example, Burke's Dramatistic Pentad frames narrative as "concerned above all else with purposeful action towards a goal" and proposes five key narrative elements that include the act (what is done), the scene (the context in which it is done), the agent (who does it), the agency (how it is done) and the purpose or motive (why it is done) (Burke, 1945, 1955).

There is understanding that narratives can be used strategically to engender action on climate change (Bushell et al., 2015, 2017). Many common narratives have thus far focused on leveraging action on mitigation, attempting to frame the problem in such a way that it drives this action (Bevan et al., 2020; Bushell et al., 2017). Some have focused on reframing the narrative around adaptation from one proposing reactive, incremental adjustments to narratives that focus on addressing root causes from 'transformative' (Ajulo et al., 2020; Gillard et al., 2016), 'justice' (Mattar et al., 2020) and 'intersectional' (Amorim-Maia et al., 2022) framings. In Arctic North America, however,

dominant narratives in research, policy and media continue to frame the region as being on the 'front-line' of climate change, being at heightened risk, as a resource frontier (Bravo, 2009; Stoddart & Smith, 2016), some giving little attention to Indigenous concerns other than labelling them as 'vulnerable' or 'resilient' (Callison, 2017; Cameron, 2012; Hall & Sanders, 2015). In contrast, Inuit narratives of climate change are deeply intertwined with community, culture, land rights, food sovereignty and histories of colonialism, and call for Inuit leadership at the heart of any action (Caughey et al., 2022; Harper et al., 2012; ITK, 2019).

We use narrative analysis to deconstruct the narratives present in governmental policy in Canada surrounding climate change and health. There is a diversity of approaches to narrative analysis, and these have been used in a variety of contexts (Polkinghorne, 1995; Thornborrow, 2012). We are interested in "analysis of narratives", or "paradigmatic analysis", which involves the collection of narratives, their deconstruction into common elements, and creation of taxonomies or categories (Polkinghorne, 1995). Deconstruction of narratives in climate change discourse can encourage consideration of the `framing' process involved in policy (Iannantuono & Eyles, 1999; Roe, 1994), situating it within the social and cultural context in which it comes to have meaning (Yanow, 1993). Narrative analysis seeks to make visible the values and underlying assumptions involved in the production of policy, and thus the power over the authorship of the narrative (Culler, 2014). The 'metanarrative', or overall story that a policy document tells, can reveal the powers that shape and determine the process of narrative creation in policy (Iannantuono & Eyles, 1999). We apply Burke's dramatistic pentad to analyse narratives of climate change and health within Canadian government policy documents, to identify dominant narratives and themes. Few analyses of policy narratives have drawn explicitly from literary theory in this way (Mroz et al., 2021).

3.2.2 Research questions

In this paper we ask: what narratives about climate change and health in Inuit Nunangat are being told in governmental policy in Canada? Specifically, we analyse the narrative discourses surrounding the relationship between climate change and health, challenges or problems that are identified, and the ways forward that are present in this body of policy. To do so, we review policy documents produced by the Canadian federal and regional governments, and which address or discuss human health and climate change side by side. We follow Polkinghorne's (1995) paradigmatic analysis of narrative data, to identify narrative elements (the framing of each of the scene, act, actor for example), narratives (the common ways in which these narrative elements appear together within policy documents), and overarching narratives (common metanarratives across policy documents) surrounding the framing of problems and solutions (Burke, 1945, 1955) (Figure 3.1). We then reflect

on the ways in which these narratives engage with framings of the social determinants of health and the root causes of disaster.

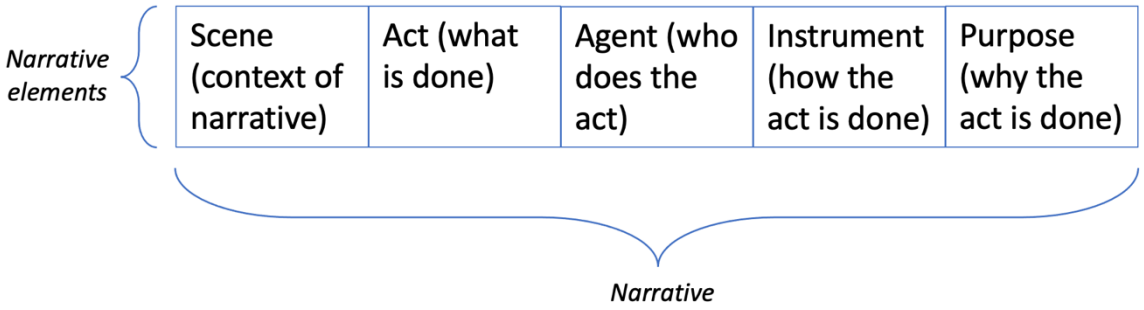

Figure 3.1: Illustration of narrative structure based upon Burke's 'Dramatistic Pentad'

3.2.3 Search strategy

We carried out a manual search of the websites of the federal government and agencies, and territorial and provincial governments encompassed within Inuit Nunangat (Newfoundland and Labrador, Northwest Territories, Nunavut, Quebec and Yukon), for policy documents of interest (Table 6.2, Appendix B). In particular, we searched webpages of environmental and health departments, agencies and ministries within these institutions. This was followed by a Google Search using a search strategy adapted from Labbé et al., (2017) and Panic & Ford, (2013) (Table 3.1) on 01.12.2021. Any duplicates from the manual search were removed, and results were screened using the inclusion criteria in Table 3.2.

Table 3.1: Google search strategy)

("climate change" OR "global warming" OR "climatic change") health (Canada OR Canadian OR "gc.ca" OR Nunavut OR "Northwest Territories" OR "Inuvialuit Settlement Region" OR ISR OR Nunavik OR Nunatsiavut OR Labrador OR Yukon OR Inuit)

Table 3.2: Inclusion Criteria

Inclusion Criteria	Exclusion Criteria
English or French language	Non-English or French language
Documents or websites produced by federal or regional governmental agencies, government-established research organizations or networks or consultants hired by the government (Austin et al., 2015) and officially agreed upon by the Canadian Federal, Provincial or Territorial Government	Documents by non-governmental organizations, unaffiliated institutions, private companies or professional associations (Austin et al., 2015)
Policy, defined as "a set of ideas or a plan of what to do in particular situations," (Cambridge University Press, N.d.) including plans, reports or strategy documents	Peer-reviewed academic research, media reports, editorials, meeting or conference reports, presentations, abstracts, cost-benefit analyses
Documents that are likely to directly discuss the intersection of health (broadly conceptualised) and climate change	Documents that do not discuss the intersection of health and climate change
With relevance to Inuit (not Arctic Canada) (including Northwest Territories, Yukon, Nunavut, Quebec (or Nunavik), Newfoundland and Labrador (or Nunatsiavut)	Focuses on non-Arctic region of Canada
Documents produced since 2015	Documents produced prior to 2015

3.2.4 Analysis

We analysed narratives within the included policy documents using the framework in Table 3.3, which was developed iteratively and based upon the most common and representative narrative elements that emerged in the policy documents analysed. Drawing from Burke's 'dramatistic pentad', narratives within each document were broken down into the following narrative elements: 'scene', 'act' and 'agent'. The 'scene' narrative element, which encompassed the framing of the problem or challenge, was broken down further into the framing of the relationship between climate change and human health, and the framing of who or what is particularly vulnerable or at risk. The latter is important as it has been shown that the way that vulnerability is framed and understood can give rise to very different approaches towards adaptation (O'Brien et al., 2007). This framework emerged iteratively based upon the key narrative elements within the policy documents. Each document was coded qualitatively for the narrative elements in the coding frame, and then

common sub-themes within each narrative element were identified. Finally, summary 'overarching narratives' were reconstructed to illustrate the ways that these different narrative elements were commonly woven together to create narratives within the policy documents. Any one policy documents may not contain one single, coherent narrative. That is, the different narrative elements within the document may not necessarily build directly upon each other and, in some cases, they may seem to be in conflict. For example, a document may frame the 'scene' with a description of how inequality dictates experience of climate change but propose an 'act' that focuses on the use of technology rather than addressing inequality. The purpose of this analysis is to deconstruct these narrative elements contained within each and all of the policy documents and then to reconstruct these into overarching coherent narratives. This then enables us to establish which of these are the most dominant narratives, both in terms of frequency of occurrence in the policy documents, as well as the power balance between the narratives within the policy documents, such as where one narrative silences another. It is important to note that the overarching narratives that are identified through this analysis are not necessarily arising in their complete form (that is, including all narrative elements) within any of the documents.

Table 3.3: Initial coding frame

Scene		Act		Agent
Climate Change	Vulnerability / Risk	Goal	Strategy	Responsibility for action
How is climate changed framed in the context of human health?	What discourses around who is at risk, and why, are present?	What goals are outlined in the document?	What solutions or strategies are proposed?	Who is mentioned in relation to actions and responsibilities for acting?

3.3 Results

Our search identified 40 policy documents. This included 29 from federal government and its agencies and 11 From territorial and provincial governments. This also included 22 plans and strategies and 18 reports (Table 6.3, Appendix B). Below, we present qualitative summaries of three key overarching narratives that emerge from the policy documents. These have different levels of dominance in policy and wider discourse.

3.3.1 Overarching narratives

Figure 3.2 summarises the overarching narratives, which are key narratives that emerge from the documents. These are based on analysis that identified common narrative elements and how they commonly are woven together in policy documents to create coherent narratives. Below, we

provide qualitative descriptions of each overarching narrative, followed by a discussion of how these overarching narratives exist alongside one another in the policy documents. Narratives are powerful in and of themselves, and where we refer to a 'dominant' narrative it is primarily referencing the frequency with which it arises in and across the policy documents. However, we will also consider the dominance of the narratives over one another.

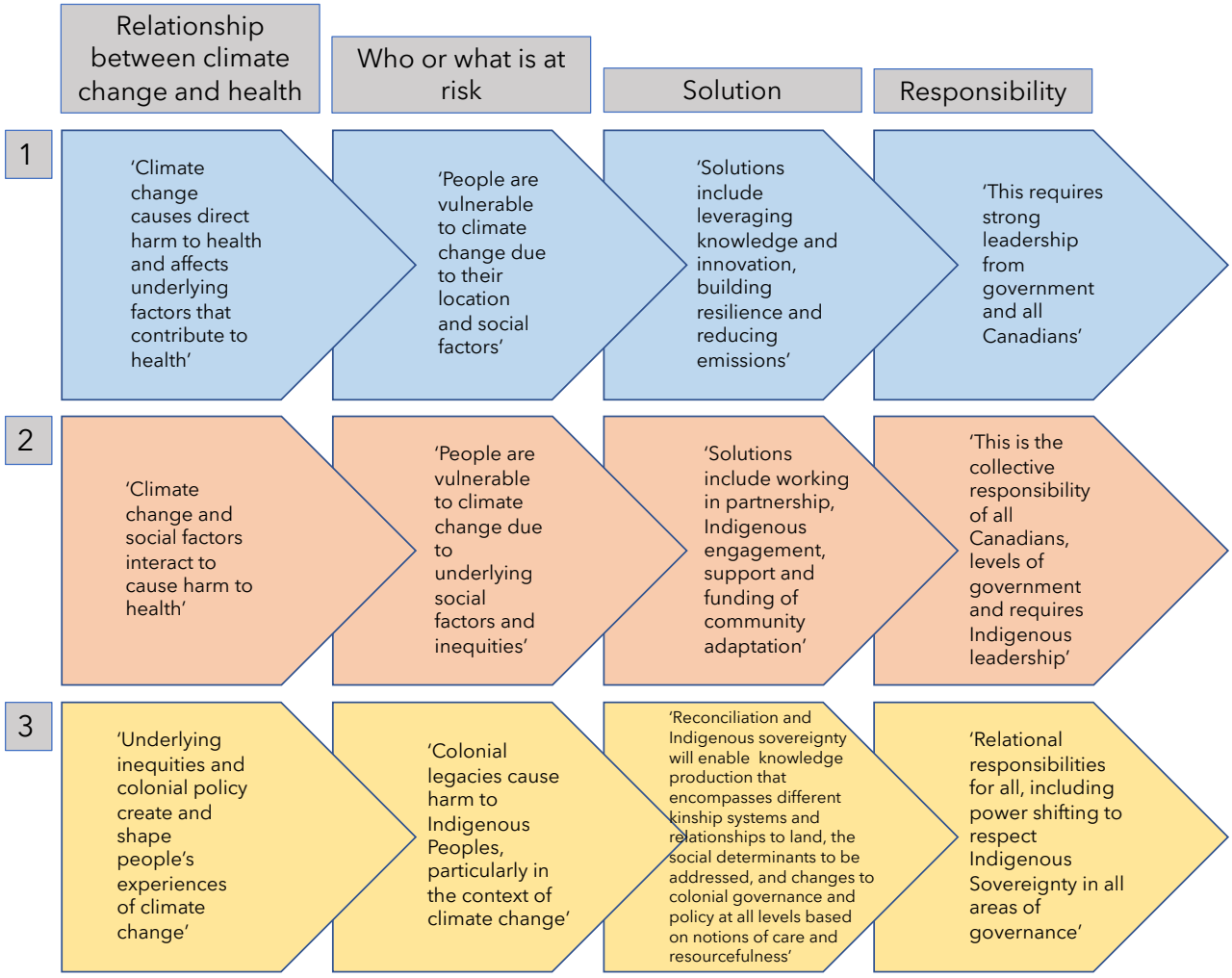

Figure 3.2: Three overarching narratives identified in the policy documents

3.3.1.1 *Overarching narrative one*

Narrative one is the most frequent narrative to emerge from the policy documents. It is present across federal, provincial and territorial policy documents, and in all but one of the 40 documents. In 41 percent of federal documents and 27 percent of provincial or territorial documents, it is present in all four of the narrative elements (Figure 3.3). It tends to dominate (in that it is not accompanied by any other narratives) in the 'scene' narrative element concerned with the relationship between climate change and health (Figure 3.3). This narrative positions climate change as a significant, and often direct, driver of harm to human health and to communities' wellbeing. Little detail is given on

how climate change is directly impacting health, but it is taken as a given that it does and will continue to do so. Links between climate change and health include impacts of extreme weather events and secondary impacts on social and economic systems, including worsening inequities. This narrative places primary responsibility on climate change for these impacts.

Narrative one describes vulnerability to climate change as a feature or characteristic of specific people or groups, primarily linked to social characteristics such as gender, age and pre-existing health conditions, or based on geographic location: "Certain populations in Canada, such as expectant mothers, children, the elderly, and Indigenous communities, are more vulnerable to harmful substances" (ECCC, 2021, p. 19). The most common focus of this framing is on Indigenous Peoples: "Indigenous people and other residents of the NWT are particularly vulnerable to climate related changes since, for generations, they have depended on the land, water and wildlife for their livelihood and sustenance" (GNWT, 2019, p. 7) . At times, this narrative also frames locations as vulnerable in and of themselves, for example referring to the 'climate-sensitive' North (ECCC, 2017), and coastal regions. 'Characteristics' of the location are emphasised as affecting people who live there, including disproportionate climate change and social factors. This narrative ultimately frames this vulnerability as a problem 'of' the specific location, rather than seeing these circumstances as embedded in broader national and historic processes.

Solutions proposed in this narrative build from this framing of risk and vulnerability and propose that what is required is greater knowledge about climate risks in combination with technological innovation. It focuses on 'knowledge production' and 'translation' as key to adaptation to the health impacts of climate change (ECCC, 2020). This may lead to the development and application of "innovative adaptation technologies" (ECCC, 2021, p. 6) which includes suggestions such as home retrofits, clean transport, climate-smart agriculture, and nature-based solutions. Hand in hand with this innovation, reduction in emissions and improved air quality are proposed as a direct solution to health impacts of pollution and climate change. There is an overall implication that more or better knowledge will lead to adaptation.

In particular, this narrative suggests that leveraging Indigenous Knowledge, or bridging or integrating knowledge types offers solutions: "As the climate continues to change, it is important to improve our understanding of how the natural environment is responding, using a combination of Indigenous, local and scientific knowledge and ways of knowing, doing and being" (Government of Yukon, 2020, p. 50). This narrative suggests that these solutions will build resilience, frequently described as a desirable outcome, though often not accompanied by a clear definition. This framing can tend to imply individual responsibility, suggesting that the problem is 'within' the community in

question as opposed to rooted in governmental policies, political economies, and processes of marginalisation.

When describing responsibility for this commitment, this narrative highlights the need for 'strong' leadership from the federal government and its agencies, with its role being framed as to 'protect and empower' (PHAC, 2017), but responsibility is generally framed as being spread across all levels of government: "The Government will also continue to encourage all levels of Government to step up and enhance their ambition on climate action" (ECCC, 2020, p. 10) and a need for cooperation across multiple levels of government (NRC, 2021).

3.3.1.2 *Overarching narrative two*

Narrative two is present in 36 of the 40 documents (90 percent), including 86 percent of federal policy documents and 100 percent of provincial or territorial documents. It is present in three or more narrative elements in 24 percent of federal documents and 27 percent of provincial or territorial documents. It is most frequently present in the 'act' (solutions) and the 'agent' (responsibility) narrative elements, though most often accompanied by narrative one in these narrative elements. Narrative two suggests that the interaction of climate change and social factors results in harm to health, so that climate change is in part responsible for the harm in "the interplay between climate change and important determinants of health, which can affect adaptive capacity and health equity to influence vulnerability to health impacts" (Berry & Schnitter, 2022, p. 9). To address this, narrative two suggests a need to work in partnership and collaboration. Proposed partnerships often involve the federal government, territorial governments with a range of other partners, and are broad and high-level: "We will foster partnerships, collaboration, information-sharing and capacity-building to empower all governments, organizations, businesses and individuals to take action" (Government of Yukon, 2020, p. 9). Partnership is often described such that it seems to become a goal in and of itself, as opposed to a means, and it is often not clear what the partnership sought to achieve beyond the relationship-building process, and in relation to climate change and health, or how differing agendas might be reconciled.

Frequently, this proposed partnership involves Indigenous Peoples, aligned with a general reference in this narrative to the need for Indigenous engagement. This involves participatory approaches to knowledge production, as well as policy and planning for adaptation. Again, there is little detail around specific roles and power over the process: "Adaptation planning should involve communities and those most affected by climate change. Participation of marginalized individuals and communities that already experience a disproportionate burden of illness and health inequities,

such as Indigenous Peoples and racialized populations, is particularly important" (Berry & Schnitter, 2022, p. 31).

Alongside this, narrative two suggests a need to 'help' and 'support' communities: "to support First Nations and Inuit as they manage the health impacts of climate change, such as access to country food, impacts of extreme weather events, and mental health impacts of climate change on youth" (ECCC, 2021, p. 4). Much of this 'help' is proposed in the form of funding, particularly through funding from federal government agencies: "to help communities across Canada better manage the risks of natural disasters, the Disaster Mitigation and Adaptation Fund continued to support a number of large-scale infrastructure projects in multiple jurisdictions, investing $1.5 billion in 2019" (ECCC, 2020, p. ii). The importance of providing 'protection' is also present in this narrative: "protection of people and culture is of paramount importance" (GNWT, 2021, p. 20). The role of government and its agencies is emphasised: "ECCC will continue to play a leadership role in work with partners to improve air quality and protect Canadians from harmful substances in air, water and on land" (ECCC, 2017, p. 2).

Many of these actions are described as being at the 'community-level', 'community-based' or 'place-based': "Canada provided $5.95 million in 2018-2019 to support First Nations and Inuit to undertake community-led adaptation projects. These projects address a wide range of health and climate change concerns including food security, vulnerability assessments, access to land and medicines, and mental wellness" (ECCC, 2020, p. 33). Thus, action is contained to this scale, targeting issues directly at this level, as opposed to addressing issues at a national or policy level.

Action, in this narrative, is seen to be a 'collective commitment' (ECCC, 2020) and 'shared responsibility', with involvement required by all levels of government, Indigenous Peoples, non-governmental organizations, the private sector, and individuals (ECCC, 2018). Many responsible institutions were listed, but specific roles are not identified or proposed and, as such, no specific responsibilities are proposed. Linking particularly with the 'behaviour change' and 'raise awareness' narratives of the 'act' narrative element, this narrative also suggests that individuals must act: "Canadians need to adapt to the changing climate by taking action to reduce negative consequences and to take advantage of new opportunities that the changes may bring" (ENRC, 2016, p. 1). Again, these narratives offer little detail of what these responsibilities are, including no information on how broader actions by governments will facilitate individual actions, beyond providing information to individuals.

One distinct responsibility emerging in this narrative is that of Indigenous Leadership, with documents describing the position of Indigenous Peoples as 'at the forefront of climate change'

(ECCC, 2020) and having already led “crucial contributions to climate change science and knowledge” (ECCC, 2020, p. 9). The role of Indigenous youth is particularly emphasised, and the role of Indigenous women in ongoing action is also highlighted. While the need for funding to support these adaptation efforts is mentioned, this narrative does not engage with the structural barriers to youth participation and engagement, and thus does not make explicit the power relations involved in this process.

3.3.1.3 *Overarching narrative three*

Narrative three was present to some degree (in one or more narrative elements) in 34 percent of federal policy documents and 55 percent of provincial or territorial documents. It arises most frequently in the ‘act’ (solution) narrative element, though most often accompanied by narratives one and two in this narrative element. Only one document contains narrative three in all narrative elements, and this was produced by an Indigenous government (IRC, 2016) (Figure 3.3). Narrative three suggests that experiences of climate change are negative because of underlying social factors and inequities. This may be due to limited access to services and resources that enable flexibility or adaptability to changing environmental conditions, including, in a more acute sense, access to health services as well as broader structural factors. Only four documents contain this narrative, but those that do often refer to ‘colonial legacies’ as being responsible for negative experiences of climate change: “colonial legacies and persistent inequalities make Indigenous people living in Yukon especially vulnerable to the impacts of the changing environment” (Government of Yukon, 2020, p. 3).

This narrative places emphasis on the process of risk creation, highlighting the role of social determinants and “Structural systems of oppression that result in health inequities … underlying drivers of vulnerability to climate change” (Berry & Schnitter, 2022, p. 27). This narrative reflects the social determinants, power and privilege that affect experience of climate change: “Vulnerability to health-related climate change impacts is often socially determined… it is important to acknowledge issues of privilege associated with the capacity and agency to act on climate change. There are systemic barriers that must be addressed to enable equal opportunities to act" (ECCC, 2018, p. 52). This narrative shifts the focus to “Structural systems of oppression that result in health inequities… Such systems of oppression include racism, heteronormativity, and colonialism. The health and well-being of Canada’s Indigenous Peoples continues to be affected by Canada’s history of systemic racism, colonization, and discrimination. This has included forced displacement from traditional territories, residential school experiences of abuse and neglect, and the disruption of traditional culture, language, and practices” (Berry & Schnitter, 2022, p. 46). This narrative focuses on

inequalities and structural barriers, demonstrating that narratives can place emphasis on processes and root causes without necessitating the labelling of people or peoples as 'vulnerable'.

Specific issues, such as food insecurity in the context of climate change, were discussed in relation to these colonial legacies: "The legacies of colonial policies in northern and Indigenous communities in Canada have contributed to a reliance on market foods from the south" (ECCC, 2021, p. 32). Colonial processes are also described as root causes of other social determinants of ill-health: "Historic and ongoing colonial processes imposed new social norms and legal rights… creating significant gender inequalities as well as discrimination against gender fluidity and homosexuality. In the context of climate change, gender intersects with other determinants of health — such as education, race, income, and social status — to create unique climate change vulnerabilities, resiliencies, and lived experiences" (Berry & Schnitter, 2022, p. 68)

In this narrative, solutions are framed within the broader goal of Indigenous sovereignty and reconciliation, in which power shifts need to take place and Indigenous priorities need to be advanced: "the Government must continue to support co-development, collaboration, and Indigenous self-determination… improving food security, community health, clean energy, resilient infrastructure, and the protection of biodiversity" (ECCC, 2020, p. 68). Equitably addressing the impacts of climate change and achieving reconciliation are framed as interdependent goals: "Supporting self-determined climate action is critical to advancing Canada's reconciliation with Indigenous Peoples, as is the leadership of Indigenous Peoples to achieve the foundational transformations required to address and mitigate the consequences of climate change" (Government of Canada, 2021, p. 7). The importance of Indigenous sovereignty over land, waters and food is particularly central in this narrative: "The ability of Indigenous Peoples to exercise autonomy over their lands and traditional foods is crucial for redressing the colonial narrative of socio-economic marginalization and health disparities... This autonomy is embodied in the concept of "food sovereignty" (Berry & Schnitter, 2022, p. 80).

This process is seen to enable the production of knowledge that encompasses different kinship systems and relationships to land, and which will be produced in more relational ways. Approaches to knowledge production are encouraged that "Embrace interdisciplinarity to produce science and knowledge that reflect the complexity and interconnections inherent in climate change and that encompass different kinship systems and relationships with the land" (ECCC, 2020, p. 7). This does not necessarily mean combining knowledge types: "recognizing that Indigenous Knowledge is a distinct network of knowledge systems that cannot be integrated into western science but that there are spaces where the two can co-exist and co-create knowledge" (ECCC, 2020, p. 7). The importance of respect in this process is highlighted in this narrative.

This narrative also outlines solutions that address the social determinants of health, but with a focus not only on direct material conditions, but also on regulation and policy instruments, including industry, development and colonial environmental governance, that create inequities for Indigenous Peoples. This includes suggestions to “Review and amend regulations related to harvesting to make them consistent with current environmental realities… improve coordination between various regulatory entities, such as the GNWT Department of Environmental and Natural Resources and community Hunters’ & Trappers’ Associations, so eliminate regulatory inconsistency and miscommunication with harvesters… Reduce industrial and cumulative impacts that exacerbate harm to threatened species… Secure compensation from developers in the event of … damage” (IRC, 2016, p. 18). This is suggested to go hand in hand with specific cultural programming, providing a clear narrative of what this could look like, including language resources, cultural committees, on the land learning, elders’ centres, counselling and payment schemes for hunters. This narrative reflects the entanglement of physical, mental and cultural wellbeing in the context of climate change in more nuanced and specific ways than many other narratives.

Throughout narrative three, a couple of themes arise. One is the need to engender care in all actions designed to address the health dimensions of climate change. This includes the importance of "respect and care for the people, land, animals and environment,” (IRC, 2016, p. 7). The second is a theme of ‘innovation and resourcefulness’, distinct from the narratives of technocratic innovation in narrative one, and which describes “Wisely using human, natural and financial resources through innovative partnerships and collaboration. This will maximize our climate change knowledge and our potential to successfully adapt" (IRC, 2016, p. 7). This narrative differs in that it centres the sustainable use of resources, as opposed to centring the human need, and thus extends respect into ways of relating to such resources.

These themes stretch into the responsibilities in narrative three, in which Indigenous leadership is accompanied with power-shifting that advances tangible rights over land and resources. In this narrative there is space to move beyond the idea that only adaptation actions within Indigenous communities should be led by Indigenous Peoples, as implied in narrative two, for example. Instead, this narrative raises the idea that Indigenous leadership should be extended to encompass any adaptation that affects Indigenous communities, which could include any adaptations by federal, provincial or territorial governments that have national or regional impacts.

3.3.2 Balance of narratives in policy documents

These narratives are qualitative summaries of key narrative threads running through the policy documents and have been constructed as part of the analysis, so they often do not exist in their

complete forms within the documents. Often, elements of one overarching narrative exist alongside others within one narrative element of a document (Figure 3.3). Narrative one is present more frequently than all other narratives and is thus dominant in terms of how common it is. It is also important to look at the power balance of the different narratives within individual policy documents. Where an overarching narrative is present throughout the narrative elements of a policy document, it presents a more consistent and coherent narrative within that document, which has more power than narratives that are only present within one narrative element (Mroz et al., 2021). For example, within most individual documents, narrative one and two occur more regularly and consistently across the different narrative elements than narrative three, and this consistency gives them power within the overall narrative of any one document. Where narrative three is present in individual documents, it is rare for it to be present in all narrative elements (Figure 3.3). In this way, we can observe narratives one and two exerting power over narrative three, which acts to drown it out and prevent narrative three from presenting a consistent and coherent narrative throughout any one policy document that could challenge narratives one and two. An impact of this is that where narrative three exists alongside elements of narratives one and two, solutions and proposed responsibility tend to be more in line with narrative one.

Document	Scale	Narrative Element			
		Relationship between climate change and health	Who or what is at risk	Solution	Responsibility
Pan-Canadian Framework on Clean Growth and Climate Change (Environment and Climate Change Canada, 2016)	Federal				
A Healthy Environment and a Healthy Economy (Environment and Climate Change Canada, 2020)					
Canada's Climate Actions for a Healthy Environment and a Healthy Economy (Environment and Climate Change Canada, 2021)					
Health Canada 2021-22 Departmental Sustainable Development Strategy (Health Canada, 2021)					
Science Narrative - Climate Change Impacts on the Health of Canadians (Public Health Agency of Canada, 2017)					
Environment and Climate Change Canada 2016–17 Report on Plans and Priorities (Environment and Climate Change Canada, 2016)					
Environment and Climate Change Canada 2021–22 Departmental Plan (Environment and Climate Change Canada, 2021)					
Environment and Climate Change Canada 2017–2020 Departmental Sustainable Development Strategy (Environment and Climate Change Canada, 2017)					
Environment and Climate Change Canada 2019–20 Departmental Results Report (Environment and Climate Change Canada, 2020)					
Pan-Canadian Framework on Clean Growth and Climate Change: Third Annual Synthesis Report on the Status of Implementation (ECCC 2020)					
Canada's Adaptation Communication to the United Nations Framework Convention on Climate Change (ECCC 2021)					
Canada's 7th National Communication and 3rd Biennial Report (Environment and Climate Change Canada, 2017)					
Achieving a sustainable future winter 2021 update, a federal sustainable development strategy (Environment and Climate Change Canada, 2021)					
Federal Actions for a Clean Growth Economy - Delivering on the Pan-Canadian Framework on Clean Growth and Climate Change (Environment and Climate Change Canada, 2016)					
Strategy on Short-Lived Climate Pollutants (Environment and Climate Change Canada, 2017)					
Measuring progress on adaptation and climate resilience: recommendations to the government of canada (Environment and Climate Change Canada, 2018)					
Climate Science 2050: Advancing Science and Knowledge on Climate Change (Environment and Climate Change Canada, 2020)					
Strategic Assessment of Climate Change (Government of Canada, 2020)					
Canada in a Changing Climate: National Issues Report (Natural Resources Canada, 2021)					
Adapting to the Impacts of Climate Change in Canada: an update on the National Adaptation Strategy (Environment and Climate Change Canada, 2021)					
Crown-Indigenous Relations and Northern Affairs Canada Departmental Plan 2021–22 (CIRNAC 2020)					
Working within the Territorial Health Context: A Framework to Understanding and Applying a Northern Lens (Indigenous Services Canada, 2019)					
Canada's Adaptation Communication to the United Nations Framework Convention on Climate Change (Environment and Climate Change Canada, 2021)					
Canada's 2021 Nationally Determined Contribution Under the Paris Agreement (2021)					
Clean Canada: Protecting the Environment and Growing Our Economy (Environment and Climate Change Canada, 2019)					
Achieving a sustainable future: Draft federal sustainable development strategy 2022 to 2026 (Environment and Climate Change Canada, 2021)					
Canada's Arctic and Northern Policy Framework (Crown Indigenous Relations and Norther Affairs Canada, 2019)					
Federal Adaptation Policy Framework for climate change (Environment and Natural Resources, 2016)					
Health of Canadians in a Changing Climate: Advancing our knowledge for action (Helath Canada, 2022)					
2030 NWT Climate Change Strategic Framework 2019-2023 Action Plan (Government of Northwest Territories, 2019)	Provincial/ Territorial				
Annual report 2019/20 (Government of Newfoundland and Labrador, Environment, Climate Change and Municipalities, 2020)					
Health Effects of Extreme Weather Events and Wildland Fires: A Yukon Perspective (Government of Yukon Health, 2020)					
Our Clean Future 2020 annual report (Government of Yukon, 2021)					
Our Clean Future, A Yukon strategy for climate change, energy and a green economy (Government of Yukon, 2020)					
Pan-Territorial Adaptation Strategy (Pan-territorial Adaptation Partnership, n.d.)					
Framework Policy on Electrification and the Fight Against Climate Change (Government of Québec, 2020)					
The way forward on climate change in Newfoundland and Labrador (Government of Newfoundland and Labrador, n.d.)					
2030 NWT Climate Change Strategic Framework (Government of Northwest Territories, 2019)					
NWT Climate Change Action Plan: Annual report 2019/20 (Government of Northwest Territories, 2021)					
Inuvialuit on the front line of climate change (Inuvialuit Regional Corporation, 2016)					

Figure 3.3: Summary of which narratives are contained in each narrative element of each policy document. Blue represents Narrative one, orange represents Narrative two, and yellow represents Narrative three.

3.4 Discussion

Social determinants and root causes are profoundly important in shaping peoples' experience of climate change and health outcomes, and policy narratives that do not reflect this in the problem framing risk moving the focus of action away from addressing the underlying causes (Lahsen & Ribot, 2021). We have carried out narrative analysis of policy documents, produced by the Canadian federal, provincial and territorial governments and focusing on climate change and health. We find that the dominant overarching narrative contained within these documents (narrative one) does not engage with the social determinants of health and root causes of disaster, and instead centres climate change as a driver of health outcomes in the framing of the problem (the 'scene' narrative element). In particular, it does not engage with the role of colonialism in shaping health outcomes in the context of climate change. Another common narrative (narrative two) acknowledges the role of inequity in unequal experiences of climate change, but also does not address the role of colonial legacies or power relations. These dominant narratives (narratives one and two) thus tend to focus explicitly on human vulnerability to climate change, using language that centres people as vulnerable, as opposed to centring the processes of inequality and colonialism.

It follows, therefore, that these two narratives also do not address these issues in the proposed solutions (the 'act' narrative element). These focus on knowledge, innovation and resilience (narrative one) and partnership, engagement and funding for community action (narrative two). In both of these narratives, there is a lack of clear discussion around if and how proposed solutions will address the structural drivers of ill-health in the context of climate change and the power shifts that this will require. Narrative one focuses on solutions that do not challenge the power relations of the status quo. The language used in narrative two, however, is more ambiguous and leaves open the possibility that power shifts may occur, but also the possibility that actions will instead seek to reinforce the status quo. In this sense, this language has the potential to conceal a lack of tangible change.

Each of the solutions put forward are described in broad terms, which is common in policy due to the ongoing nature of policy negotiations and deliberations, and the complex nature of jurisdictional responsibility and autonomy for climate adaptation in Canada, where there is still some lack of clarity around how the federal government will work with other levels of government (Austin et al., 2015, 2018). In narrative two, however, the specific goals that the proposed solutions are designed to achieve are not made clear. For example, working in partnership is a frequently proposed solution in narrative two. However, this narrative does not make clear what the goal of the proposed partnership is and, therefore, whether the partnership is a goal in and of itself or has a further goal. Therefore, such a partnership may or may not lead to shifts in power relations between state

government and Indigenous Peoples. Without clarifying whether this *is* a goal of the partnership, it is unclear if the policy intends to address power relations and thus the root causes of harm in the context of climate change.

These narratives therefore include some specific areas of vagueness. Vagueness is not necessarily a negative thing in and of itself, and can represent openness to possibility, and may reflect the ongoing negotiations and deliberations involved in the policy-making process, of which the 'policy document' only provides a limited snapshot. However, vagueness has power, in its leaving open many possibilities and options for action, and where accountability in governance is important, vagueness around responsibility for action can fail to provide structures of accountability and can conceal a lack of attention to power relations (Katz et al., 2020). For example, language around partnership, could be suggesting partnerships in which power relations are truly interrogated, but partnership does not necessarily address power relations in and of itself. In the end, therefore, vagueness can end up hiding the fact that no change is happening at all.

Jurisdictionally, it is important that responsibilities and mandates around policy-making are clear (Austin et al., 2015). The federal government, for example, should not be dictating the specifics of what Indigenous governments or communities should be doing at a local level to address health in the context of climate change. However, given that calls for Indigenous land rights and food sovereignty are well documented, there should be space in federal policy narratives for discussions of the power shifts that need to take place to facilitate this. Dominant narratives emerging in this review suggest that 'all sectors' or 'all levels of government' are responsible for action, which does not provide clarity around roles and responsibilities of governance in addressing the root causes.

Proposals for Indigenous Leadership in narrative two do appear to more closely echo what ITK have called for in the National Inuit Climate Change Strategy (ITK, 2019). However, Indigenous leadership around climate change has been demonstrated for decades (Huntington, 1998; ITK, 2017; Watt-Cloutier, 2015). Such leadership has pointed to the need for expanded Indigenous land rights and food sovereignty to address the risk of harm in the context of climate change, which will require power shifting from federal, provincial and territorial governments to Indigenous Peoples (Health Canada, 2022; Whyte, 2016). So, it is not clear what narrative two is proposing here, and whether it is calling for change that involves shifts in power relations. In fact, by not addressing such shifts in power, the narratives conceal the power relations involved in policy making and the lack of power shifting in the policy actions themselves.

Ultimately, dominant narratives still frame climate change as the main, externalised threat to which people are 'vulnerable'. This risks externalising and depoliticising the impacts of climate change

instead of highlighting their roots in social inequities and institutions. This means that we fail to identify the social and structural processes that put people at risk of harm and disaster in the context of climate change, and therefore miss the opportunity to tackle the root causes in proposed solutions, while risking perpetuating the true source of harm. 'Solutions', therefore, fail to challenge broader power structures and drivers such as colonisation, and can lead to the adoption of superficial solutions that are likely to perpetuate inequalities and structural violence because they do not directly target structural inequalities (Lahsen & Ribot, 2021). One of the greatest risks with the general climate change discourse that is present in much of these policy documents is that it can detach the discourse around the experience of climate change from histories of colonialism, social justice issues and others, and present 'climate impacts' in isolation (Howitt, 2020). Many narratives portray climate change as an unprecedented, post-apocalyptic crisis, erasing the dystopic experiences of colonialism that Indigenous Peoples have already experienced (Callison, 2014; Whyte, 2018).

A theme across narratives one and two is the focus on Indigenous communities as the ones who need to adapt. This conceals the role for governments in making changes to policy that can remove the barriers to Indigenous action at the community level. These barriers prevent Indigenous Peoples from taking control of their lands and communities and from genuine power in leadership (Cueva et al 2021). For example, community based work may be taking place in broader policy settings that are hostile and inhibitory (Howitt et al., 2012). This 'responsibilising' is also represented in the 'agent' part of dominant narratives. Responsibility is diluted between many governments, with federal government needing to display 'strong leadership' and placing a large emphasis on Indigenous Leadership. The latter echoes calls from Indigenous climate strategies, but does not describe what must be done at federal level to achieve this. Community-led research is key, but if communities are to have the power and capacity to lead this, cost of living, food sovereignty and education needs must be addressed. As Howitt (2020) argues, a more nuanced approach to scale in these governance narratives is required to develop policy that can respond appropriately.

The question remains "how do we challenge the power of the dominant and dangerous policy narratives surrounding climate change and health?" This paper has been one attempt to do this through deconstructing this narrative and holding it alongside others, in particular narrative three, to show how more dominant narratives can actively conceal those that offer other ways of framing and imagining the relationship between climate change and health. Narratives such as narrative three have their own power, however, as they exist independently of, and despite, harmful dominant narratives that conceal colonial legacies. Narrative three in particular, reflects the entanglement of physical, mental and cultural wellbeing in the context of climate change in more

nuanced and specific ways than many other narratives around solutions. It proposes a narrative around 'care', 'resilience', 'innovation' and 'resourcefulness', for example, that can challenge the vague and often neoliberal use of these terms in the more dominant narrative. The fact that this narrative is present in some policy documents around climate change and health is a start. Holding space for these notions can also mean holding space for hope in the narratives that we tell about climate change and health. Kyle Whyte (2018) (referring to the work of Grace Dillon (2016)) highlights how Indigenous stories of persistence and flourishing can challenge depoliticised narratives of mere survival.

There is a need to refocus the relational in narratives of climate change and health, in the understanding of root causes, solutions and responsibilities (Howitt, 2020). Howitt (2020) describes how Indigenous self-determination and self-governance are moderated by relationships internal and external to a particular Indigenous group, the latter of which can constrain the exercise of governance. As Zoe Todd writes, the violation of disaster can be an opportunity to "take stock of socio-political, economic and legal-governance responsibilities we hold to the lands, waters, fish, beavers, herons and other more-than-human beings" (Todd, 2017). This puts partnership at the centre of such narratives but, importantly, this partnership is based on "recognition, respect, and explicit commitment to justice" (Howitt et al., 2012). There is also a need for narratives that connect past, present and future. Scholars including Stewart-Hariwara, Grace Dillon (Grace Dillon, 2016) and Kyle Whyte (2018) have written of the inseparable nature of past, present and future in Indigenous thought, as well as more fluid and non-linear ideas of time and narratives. The analysis in this paper has drawn primarily from Western literary theory based on linear concepts of time and narrative, and thus it is important to privilege the work of these scholars, and others, to make space for new narrative structures.

Narrative three can provide some insights into the narratives we need to platform, both for their own value and to challenge dominant, harmful narratives. It is clear that narratives must reflect "sustained resilience, survival, adaptation and responsiveness", the fact that Indigenous Peoples have already been through destruction, and that climate change is a colonial legacy (Howitt 2020). This challenges both neoliberal, responsibilising 'resilience' narratives, as well as dominant narratives of impending human destruction and calamity. In doing so, plural narratives need to be respected and may offer powerful and ambitious visions of the future, where tensions are seen as opportunities for change (Gillard et al., 2016). However, ultimately what is needed is greater 'narrative agency': "the capacity to make choices about the telling of one's story and impose them on, relate with, and ultimately be in the world" (Bieger, 2018, p9), and this narrative agency is

therefore inextricably entwined with Indigenous self-determination. Thus, communities also need to be given a central role in policy-making (Bravo, 2009).

This review has focused on governmental policy at federal, territorial and provincial scales, but policy is conceptualised, negotiated and implemented by many different groups at a range of scales (Tanner & Allouche, 2011). We have not analysed the narratives produced by other policymaking or policy-influencing groups and institutions that may be in conversation with, and responding to, the policy narratives that we have identified. Our intention has been to deconstruct the policy narratives produced by some of the institutional spaces that hold the most power, but future research should look to these other policy actors and influencers to broaden understanding of the diverse policy landscape and how policy narratives exist within hierarchies of power. This should include analysis of the ways that the dominant narratives identified here interact with and are aligned to broader, international policy narratives that address these issues, including international governance organisations.

3.5 Conclusion

Dominant overarching policy narratives in Canada that describe health challenges in the context of climate change fail to identify the root causes of these problems or suggest solutions to address them. In order to centre the processes that create unequal harm in the context of climate change, and to act on them, we need to be able to creatively tell and retell the story of climate change, so that we can understand and address the harmful structures and processes that shape harm. Where powerful and dominant narratives prevail in discourse-setting processes such as policy, concealing more nuanced and plural narratives that engage with issues of power, the dominant narratives define solutions and constrain our ability to imagine other possibilities. This paper has attempted to challenge these harmful dominant narratives through deconstructing them and holding them alongside narratives that do engage with processes of power. This has highlighted problems with these dominant overarching narratives and revealed how they can actively conceal those that offer other ways of framing and imagining the relationship between climate change and health. Narratives surrounding climate change and health need to shift to represent Indigenous-defined notions of survival and resourcefulness, which highlight the roles of relationality at multiple scales, government accountability and reconciliation in pathways forward. This requires power shifting towards increased narrative agency for Indigenous Peoples.

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3.7 Author contributions

Conceptualization, K.D., J.D.F., C.H.Q., A.M., M.F. and S.L.H.; formal analysis, K.D.; writing—original draft preparation, K.D.; writing—review and editing, K.D., J.D.F., C.H.Q., A.M., M.F. and S.L.H.; supervision, J.D.F., C.H.Q. and S.L.H. All authors have read and agreed to the published version of the manuscript.

4 From participatory engagement to co-production: Modelling climate-sensitive processes in the Arctic

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Abstract

Participation is increasingly being used in the modelling of climate-sensitive systems to improve usability. Bottom-up, place-based approaches to modelling can challenge the dominantly positivist approaches used until recently. We examined how participation is reported within modelling research that uses participatory approaches, focusing on the Arctic. Our systematic scoping review identified 26 articles that used participatory approaches in modelling research to explore a climate-sensitive process in an Arctic setting and analysed the degree of participation at each stage of the process for each article. A diversity of topics, modelling approaches, and participant groups were identified. Most studies (71%) occurred in Arctic North America, and all studies engaged with non-Western knowledge types to some degree. Participation was most commonly reported at the model generation and participant identification stages, and least commonly reported in the choice of modelling type. Participatory scores — based on the number and degree of participatory stages of a study — were higher where authors gave instrumental or transformative rationales for the use of participation, and among studies that described prioritising non-Western knowledge types. Detailed reporting of participatory processes was frequently absent, suggesting a need for clearer discussions of these issues in the descriptions of the process.

Keywords

Arctic, climate change, participatory modelling, participation, community-based participatory research, non-Western knowledge systems

4.1 Introduction

The interaction of climate-related hazards with multiple socioeconomic inequities poses a profound challenge to society at multiple scales (Gaillard 2010; Tschakert 2012; Watts et al. 2019). The experience of climate change will differ among groups in diverse and unequal ways, the root causes of which are embedded in development issues (Hewitt 1983; Kelman et al. 2016). Attempts at understanding and adapting to climate change in the context of these multiple hazard drivers will need to be sensitive to complexity and context, integrate diverse local perspectives, and involve

deliberate and transformative change to existing power structures underlying these inequities (O'Brien 2012; Tschakert et al. 2013; van Bruggen et al. 2019; Ford et al. 2020).

It is increasingly understood that the knowledge required for this must include diverse perspectives and modes of production (Dilling and Lemos 2011). In climate research, positivist forms of knowledge have previously been prioritised at the expense of experiential knowledge, which can result in the creation of knowledge both detached from its local context and embedded in Western scientific epistemologies that are shaped by histories of colonisation (Conway et al. 2019). Engaging citizens and rightsholders in research and decision-making is one way to challenge these in-grained hierarchies of knowledge and their problematic manifestations in the creation of knowledge relevant to climate change (Sawatzky et al. 2018; Kipp et al. 2019; van Bavel et al. 2020). Participatory processes, including collaborative, co-productive, and cross-cultural methods for knowledge production, can provide more place-based and contextual nuance to previously positivist climate and environmental modelling processes (Lynam et al. 2007; Nakashima et al. 2012; Alshaikh 2013; Crate et al. 2019; Gotts et al. 2019; Mach et al. 2020).

The term "model" refers to any abstract representation of reality (van den Belt 2004). For the purposes of this paper, however, in which we are examining participation in the modelling of climate-sensitive processes, we are focusing on models used or created as part of a participatory research process, including conceptual models, fuzzy cognitive maps, Bayesian belief networks, and statistical modelling (Voinov and Bousquet 2010). Within this field, various structured approaches have evolved to guide those seeking to engage participants in natural resource management, often brought together under the name of "Participatory Modelling" (Voinov et al. 2016). These tend to refer to a number of flexible tools or approaches including Group Model Building and Mediated Modelling (Andersen and Richardson 1997; van den Belt 2004) that involve a number of iterative and adaptive stages including scoping, planning, model choice, model building, simulation, evaluation, and monitoring (Videira et al. 2010; Dreyer and Renn 2011; Duboz et al. 2018). The fundamental goals of these approaches are to foster social learning, shared commitment and buy-in, successful policy implementation, and conflict resolution for decision-making (Voinov and Bousquet 2010), and frameworks have been developed for evaluation of these processes (Jones et al. 2009).

Although we recognise the value of these structured processes, particularly for problems that require collaborative decision-making, we see these "Participatory Modelling" approaches as a subset of a wider body of literature that engages participants and stakeholders in some form of modelling process as part of a participatory analysis (Figure 4.1). This more diverse body of research has its roots in participatory action research, and although it may not use the specific language of "Participatory Modelling" it encompasses research that uses modelling processes for knowledge co-

production more broadly and is not limited to decision-making (Cooke and Kothari 2001; Leal 2007; Cornwall et al. 2011). We refer descriptively to this as "participation in modelling research." An example would be modelling as a research collaboration between academic researchers and an Indigenous organisation, in which the meeting of two knowledge types (scientific and Indigenous) is key to the process (Ford et al. 2019). We therefore distinguish between this broader conceptualisation of "participation in modelling research," and the more formal approaches referred to by some as "Participatory Modelling" (capitalised to demonstrate the difference), which is a sub-group of the former, as illustrated in Figure 4.1 (Voinov et al. 2016).

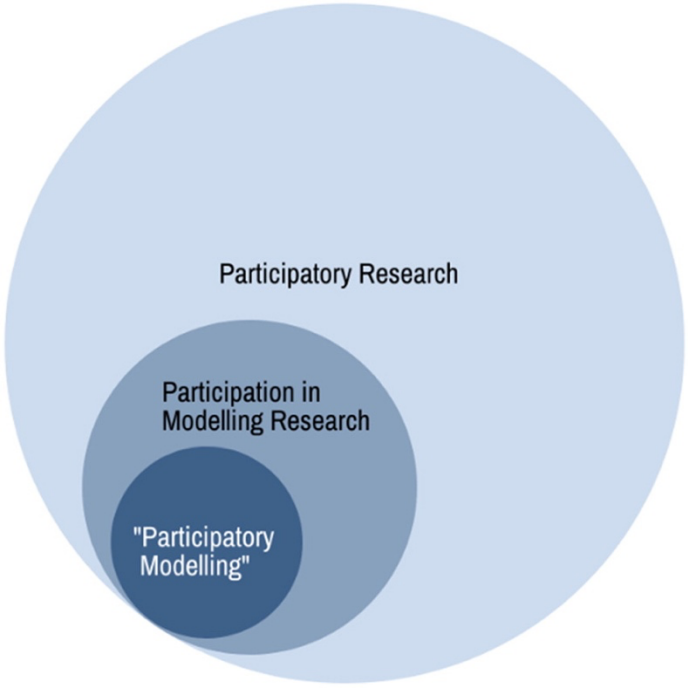

Figure 4.1: Illustration of the scope of this review

4.1.1 Participation in modelling research in the Arctic

The Arctic is undergoing rapid environmental changes, including significant reductions in sea ice extent and thickness, permafrost thawing, changes to species distributions, and air temperature increases three times the global average over the past 30 years (Nickels et al. 2005; Hoegh-Guldberg et al. 2018; Meredith et al. 2019). This is taking place in the context of ongoing social, economic, and political processes including colonisation, marginalisation, histories of forced relocations, sedentarisation, residential schooling, and cultural assimilation (Furgal and Seguin 2006; AMAP 2017, 2018). The Arctic is, thus, understandably the site of a significant amount of climate modelling research (Hua et al. 2012; Ford et al. 2014).

There is a diversity of Arctic stakeholders, rightsholders, and knowledge types that can and must contribute to the building of knowledge and understanding around climate-sensitive processes

(Duyck 2011; Ernst and van Riemsdijk 2013; Flynn et al. 2018). Arctic residents possess a multiplicity of experiential and place-based knowledge types that are not grounded in Western scientific paradigms, including Indigenous Knowledge (IK), locally-held or community-based knowledge (LK), land-based knowledge, and practitioner knowledge (Cunsolo Willox et al. 2012; Tengö et al. 2014; Crate et al. 2019). We refer broadly to these as non-Western knowledge types. IK, for example, is grounded in long histories of a people's interaction with their surroundings, and flexibility to drivers such as climate change is present in relationships with the land (Wenzel 2009; Ford et al. 2015; Abram et al. 2019). Participatory approaches to modelling complex, climate-sensitive processes are, thus, highly applicable to an Arctic context.

Increased calls for engagement of IK and LK in climate research cites both the value of non-Western knowledge types for broadening and enriching perspectives on complex climate-related problems, and the importance of ethically engaging Indigenous Peoples and community groups as rightsholders in decision-making (Nakashima et al. 2012; Maynard 2014; Meredith et al. 2019). This may include research in which only academic researchers and Indigenous communities or researchers are engaged, and although there may not be more than these two stakeholder groups, there are still conflicts of interest in many of these studies, that exist as conflicts of perspectives between scientific/Western knowledge and Indigenous Knowledge, such that the academic researchers are a stakeholder group also participating in the knowledge creation (Barber and Jackson 2015).

However, shifts towards participatory methodologies in the Arctic have been limited, fragmented, and at times tokenistic (Ford et al. 2016; Jones et al. 2018; Carter et al. 2019), and although Indigenous Peoples are increasingly involved in research, the degree to which they are involved varies hugely (Brunet et al. 2014; Flynn and Ford 2020; Mosurska and Ford 2020). There are concerns that "participation" has become a buzzword in research and policy discourse more broadly, that lacks true attempts to engage with transformative processes (Leal 2007; Castleden et al. 2012), and can in fact lead to further marginalisation and reinforcement of existing power relations (Cornwall and Jewkes 1995; Guta et al. 2013; Janes 2016; Berrang-Ford et al. 2018). It is, therefore, essential that attempts at participation do not end up taking a superficial or "extractive" approach to engaging non-Western knowledge types, in which IK is compartmentalised, distorted, and decontextualised (McDowell et al. 2016; David-Chavez and Gavin 2018; Dentzau 2019).

It is important to take a critical approach to any effort at participatory research, to understand the goals and achievements, and this includes participatory research involving modelling processes (Arnstein 1969; Cooke and Kothari 2001; David-Chavez and Gavin 2018). Examining the nature and structure of participation power dynamics can reveal the degree to which participants had autonomy over the process (White 1996) or the "depth" of participation (Király and Miskolczi 2019).

What's more, some have argued that we need to move away from taking a "tool-kit" approach, which focuses on appropriate tools for the job, and towards approaches that re-centre the process of participation itself, and the associated empowerment, equity, trust, and learning (Reed 2008; Ford et al. 2016). Attempts to characterise differing degrees of participatory research include Arnstein's (1969) "Ladder of Participation", Pretty's (1995) classification based on the purpose of the process, and Lynam et al.'s (2007) summary of "extractive use, co-learning, and co-management". Some further suggest breaking studies down into stages to look at the role of participation in each (Jonsson et al. 2007; David-Chavez and Gavin 2018).

4.1.2 Objectives

Given the importance of participation in climate change modelling and research for achieving transformative change, we set out to review how it is being implemented in the Arctic. We are not just interested in studies that carry out the idealised, participatory-intensive process encouraged in "Participatory Modelling" studies, but also in the broader body of studies that are seeking to use participation in research, regardless of the extent to which they are achieving the higher degrees of participation or the ideals of a structured "Participatory Modelling" process. In doing so we aim to capture a wider diversity of approaches to participation in modelling research and their lessons for processes of participation in an Arctic context and related to modelling research. We look at the extent to which key elements of participation have been employed and reported within published research applying participation to a modelling process, drawing from existing frameworks for analysing the degree of participation in research. We specifically focus on the Arctic, as a region undergoing significant climatic change (Nickels et al. 2005; Hoegh-Guldberg et al. 2018; Meredith et al. 2019), and due to the current drive among researchers and funding bodies for enhanced participation in Arctic research (Nakashima et al. 2012; Maynard 2014; Meredith et al. 2019).

We set out to (1) to identify and characterise participatory climate modelling processes used in climate and environmental change research in the Arctic, and (2) assess the structure and degree of reported participation in these modelling processes. We do not examine the "success" of the project in terms of the outcome, due to the diversity of contexts and desired outcomes among modelling processes. Rather, we focus on the extent to which the conception, design, management, process, and use of outcomes are participatory in nature, using a set of criteria to assess the degree of participation. These criteria are described in the next section and were compiled through an iterative and emergent process, based on a number of frameworks and theories that identify the key components of effective, ethical, and sustainable participatory engagement.

4.2 Methods

4.2.1 Systematic review methodology

We employed a systematic scoping review of the published literature to identify and evaluate how participation in modelling of climate-sensitive processes is being reported in research in the Arctic, and to what extent these reported processes are participatory. Countries with Arctic boundaries include the United States (Alaska); northern Canada; Greenland; the Faroe Islands; Iceland; and the northern parts of Norway, Sweden, Finland, and Russia (Einarsson et al. 2004). The search is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses' reporting guidelines for scoping reviews (Tricco et al. 2018, Figure 4.2).

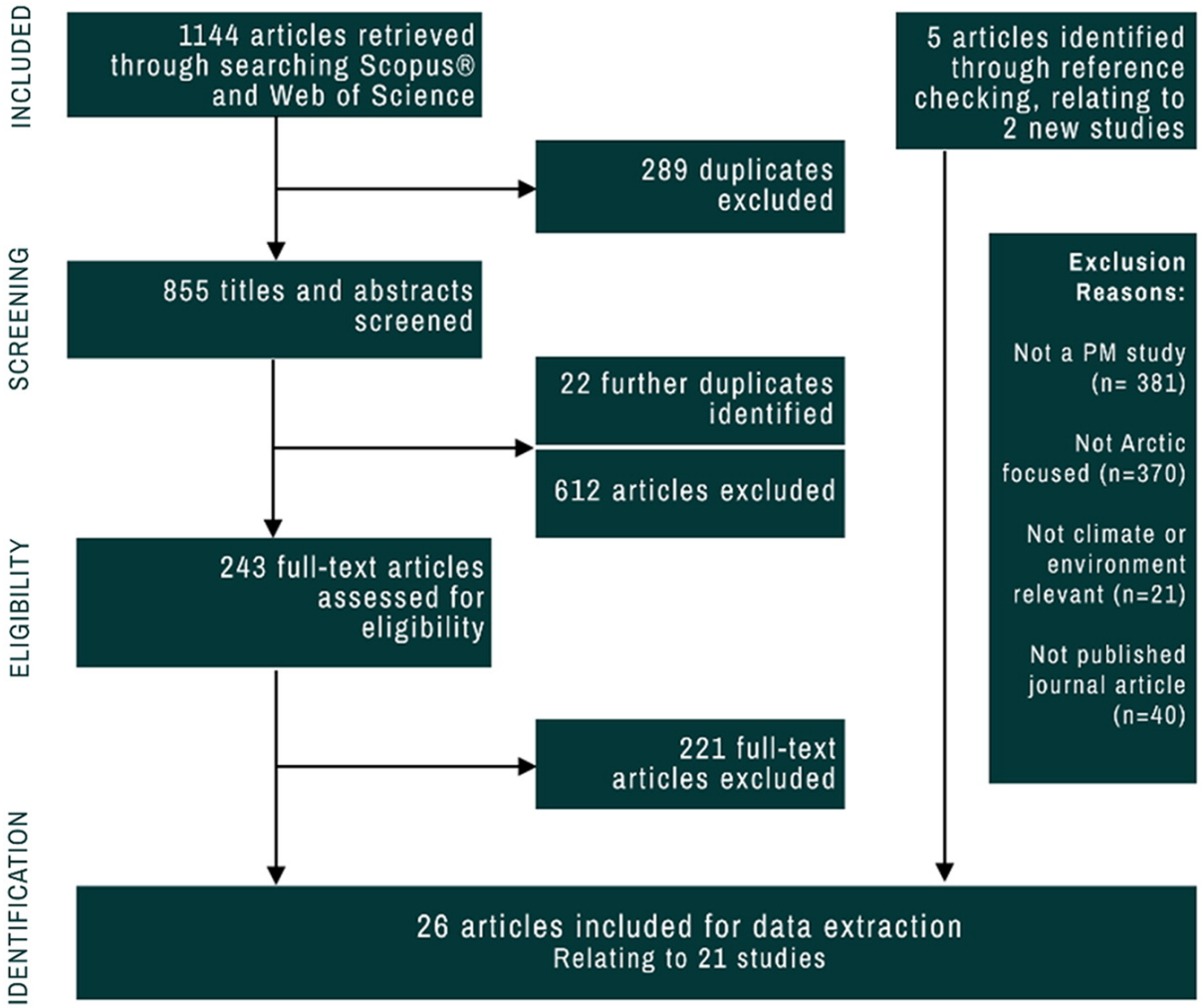

Figure 4.2: Flow chart illustrating the number of articles identified through initial searches, then screened for relevance and eligibility. PM, Participatory Modelling

4.2.2 Identifying modelling studies

We intentionally kept our definition of participation in modelling research broad to include the diversity of modelling approaches that we have described, including qualitative and conceptual models, and enabling us to capture studies that may use participation with a modelling process, but that do not necessarily explicitly refer to it as "Participatory Modelling". We also considered a range of methods and tools being applied to the process; we included studies using participatory mapping, for example, as the use of this tool can enable participants to visualise and model their problems spatially (Voinov et al. 2018). Nuance was, thus, required in identifying studies that met our criteria.

4.2.2.1 *Search procedures*

A search string was developed to locate published articles (Table 4.1) and was designed to be broad to capture all potentially relevant articles discussing modelling processes engaging with participants, which may or may not have explicitly specified "Participatory Modelling". Search terms consisted of

three conceptual parts: the climate or weather concept, the participation in modelling concept, and the Arctic concept, combined with the operator “AND”. Regarding climate and weather, terms referred directly to the climate or to climate-sensitive socio-environmental systems. These terms were identified based on the Intergovernmental Panel on Climate Change (Masson-Delmotte et al. 2018) and the 2015 Lancet Commission on Climate Change and Health (Watts et al. 2015). The literature was also searched for common ways the climate or environment was discussed in the context of modelling with stakeholders. Thus, the participation in modelling search terms included commonly used keywords, terms, and phrases that describe participation, involvement, and stakeholder knowledge in modelling processes.

Table 4.1: Search strings used in Scopus and Web of Science

Component	Search terms in Scopus	Search terms in Web of Science
Climate/environment context	TITLE-ABS-KEY (climat* OR weather OR "Natural resource" OR "Global warming" OR "Water management" OR "Land management" OR "Land-use" OR "Coastal management" OR "Forest management" OR "Trail use" OR "Sea ice" OR "Sustainability assessment" OR "Rural appraisal" OR watershed OR "Biodiversity management" OR "Ecological planning" OR dryland OR precipitation OR rainfall OR drought OR "temperature" OR flood OR "Sea level rise" OR "Ecological systems" OR "Coastal areas" OR "Delta management" OR "Ice sheet" OR "Saltwater intrusion" OR "Biodiversity loss" OR "species loss" OR extinction OR "Forest fires" OR "Invasive species" OR "ocean acidity" OR "ocean oxygen" OR "Marine Biodiversity" OR fisheries OR ecosystem OR "Coastal resources" OR aquaculture OR heatwave OR "Water resource" OR "water stress" OR "Air pollution" OR agricultur* OR storm* OR hurricane OR cyclone OR blizzard OR disaster OR wildfire OR "environmental model*" OR wetland OR monsoon)	TS = (climat* OR weather OR "Natural resource" OR "Global warming" OR "Water management" OR "Land management" OR "Land-use" OR "Coastal management" OR "Forest management" OR "Trail use" OR "Sea ice" OR "Sustainability assessment" OR "Rural appraisal" OR watershed OR "Biodiversity management" OR "Ecological planning" OR dryland OR precipitation OR rainfall OR drought OR "temperature" OR flood OR "Sea level rise" OR "Ecological systems" OR "Coastal areas" OR "Delta management" OR "Ice sheet" OR "Saltwater intrusion" OR "Biodiversity loss" OR "species loss" OR extinction OR "Forest fires" OR "Invasive species" OR "ocean acidity" OR "ocean oxygen" OR "Marine Biodiversity" OR fisheries OR ecosystem OR "Coastal resources" OR aquaculture OR heatwave OR "Water resource" OR "water stress" OR "Air pollution" OR agricultur* OR storm* OR hurricane OR cyclone OR blizzard OR disaster OR wildfire OR "environmental model*" OR wetland OR monsoon)
AND		
Participation in modelling research	TITLE-ABS-KEY ((participat* PRE/2 model*) OR "group model*" OR (companion PRE/2 model*) OR "participatory system dynamics" OR "community model*" OR (collaborative PRE/2 model*) OR (cooperative PRE/2 model*) OR "mediated model*" OR (model* AND ((indigenous W/1 knowledge) OR (traditional W/1 knowledge) OR (local W/1 knowledge) OR "community knowledge" OR "popular epidemiology" OR "participatory map*" OR "participatory GIS" OR "participatory workshop" OR "community workshop" OR agroecolog* OR ethnobotany OR ethnoecology OR ethnoclimat* OR "citizen science")))	TS = ((participat* NEAR/2 model*) OR "group model*" OR (companion NEAR/2 model*) OR "participatory system dynamics" OR "community model*" OR (collaborative NEAR/2 model*) OR (cooperative NEAR/2 model*) OR "mediated model*" OR (model* AND ((indigenous NEAR/1 knowledge) OR (traditional NEAR/1 knowledge) OR (local NEAR/1 knowledge) OR "community knowledge" OR "popular epidemiology" OR "participatory map*" OR "participatory GIS" OR "participatory workshop" OR "community workshop" OR agroecolog* OR ethnobotany OR ethnoecology OR ethnoclimat* OR "citizen science")))
AND		
Arctic focus	TITLE-ABS-KEY (circumpolar OR polar OR nunavut* OR nunavik* OR nunatsiavut* OR inuvialuit* OR yukon* OR "northwestterritories" OR norw* OR greenland* OR alaska* OR russia* OR swed* OR finland OR iceland* OR arctic OR indigenous* OR "first nation*" OR inuit* OR saami OR nenets OR Khanty OR evenk OR chukchi OR aleut OR yupik OR i ñupiat OR kalaallit OR "NorthernCanada" OR alberta OR "Newfoundland and Labrador" OR Ontario OR Quebec OR Svalbard OR "Nordic countr*")	TS = (circumpolar OR polar OR nunavut* OR nunavik* OR nunatsiavut* OR inuvialuit* OR yukon* OR "northwest territories" OR norw* OR greenland* OR alaska* OR russia* OR swed* OR finland OR iceland* OR arctic OR indigenous* OR "first nation*" OR inuit* OR saami OR nenets OR khanty OR evenk OR chukchi OR aleut OR yupik OR i ñupiat OR kalaallit OR "Northern Canada" OR alberta OR "Newfoundland and Labrador" OR ontario OR quebec OR svalbard OR "Nordic countr*")

The search string was used to perform a title, key word and abstract search in Scopus and Web of Science CORE Collection, providing a robust search of the literature. The search was limited to academic published literature, and we applied no language or date restrictions. The search was conducted in June 2019 and updated in April 2020. Search results were exported to Mendeley reference management software and duplicate articles were eliminated. Citations were then uploaded from Mendeley into Rayyan QCRI (Ouzzani et al. 2016) to facilitate relevance screening.

4.2.2.2 *Relevance screening*

Relevance screening took place in two stages, in which studies captured by the search terms, but not involving a modelling process, were screened out. All screening was carried out by KD. In stage 1, we screened the title and abstract of each citation using the inclusion and exclusion criteria outlined in Table 4.2. Potentially relevant articles proceeded to stage 2. In stage 2, we reviewed the full text of each article for relevance using the criteria outlined in Table 4.2. If an article did not meet all criteria at stage 2, it was excluded. To ensure that relevant articles had been captured, snowball sampling of references and citations of included articles was conducted. Where supplementary materials were available, these were also screened for information.

Table 4.2: Inclusion and exclusion criteria for first round of screening

Inclusion criteria	Exclusion criteria
Studies that have implemented or evaluated modelling research that includes participants or describes a method or framework for doing so.	Studies that do not discuss participatory modelling with stakeholders.
The modelled process is climate- or weather-sensitive or is likely to be influenced by climate in the future.	The modelled process is not climate sensitive.
Process takes place entirely or partially within the Arctic (as per the definition of the Arctic defined by the Arctic Human Development Report (2015)	Study takes place in a non-Arctic region.
Peer-reviewed journal articles Literature not subject to peer review	

4.2.3 Data extraction and analysis

4.2.3.1 *Descriptive analysis*

Google Forms was used to create an extraction sheet to facilitate the systematic extraction of qualitative data. Information was extracted for analysis based on four themes: (1) study information including title, authorship, location, and discipline of the lead author; (2) focus of study, including the phenomenon modelled and the scale of the focus; (3) reported participatory structure, including

participants, the reported reasons for use of participation and how participation was used in the research process; and (4) descriptive data on nature of engagement with non-Western knowledge types. These data were exported into Microsoft Excel for descriptive analysis.

4.2.3.2 *Evaluation framework*

We created an evaluation framework that enabled the analysis of participatory structure by appraising each study for the degree of participation reported at each stage of its modelling process. To do so, we adapted David-Chavez and Gavin's (2018) "Scale for assessing levels of Indigenous community participation based on who has authority over the research process". Their scale was selected due to their inclusion of the "Indigenous" degree of participation, in which community members have full control over the process. Although their review focused specifically on work with Indigenous Peoples, we were interested in research engaging participants who may not identify as Indigenous. Therefore, we added to their "Indigenous" degree of participation a "community" degree of participation, although we recognise that these are distinct categories. To examine participation reported at different study stages, we added to this framework a conceptualisation of the common stages of participation in modelling approaches, drawing in particular from literature on specific "Participatory Modelling" methods, such as Jonsson et al. (2007) and Voinov et al. (2016), as these have formalised some of the ideal structures of participation that can be used in modelling with participants more broadly. These stages are flexible, and any one process might use repetitive loops of these stages or might break one of more of these steps down. Specifically, we adapted Jonsson et al.'s (2007) "six key dimensions of participatory modelling", and added aspects of Voinov et al.'s (2016) "components of the participatory modelling process", including validation and evaluation (Figure 4.3) (Jakeman et al. 2006; Refsgaard et al. 2007; Voinov and Bousquet 2010; Voinov et al. 2016).

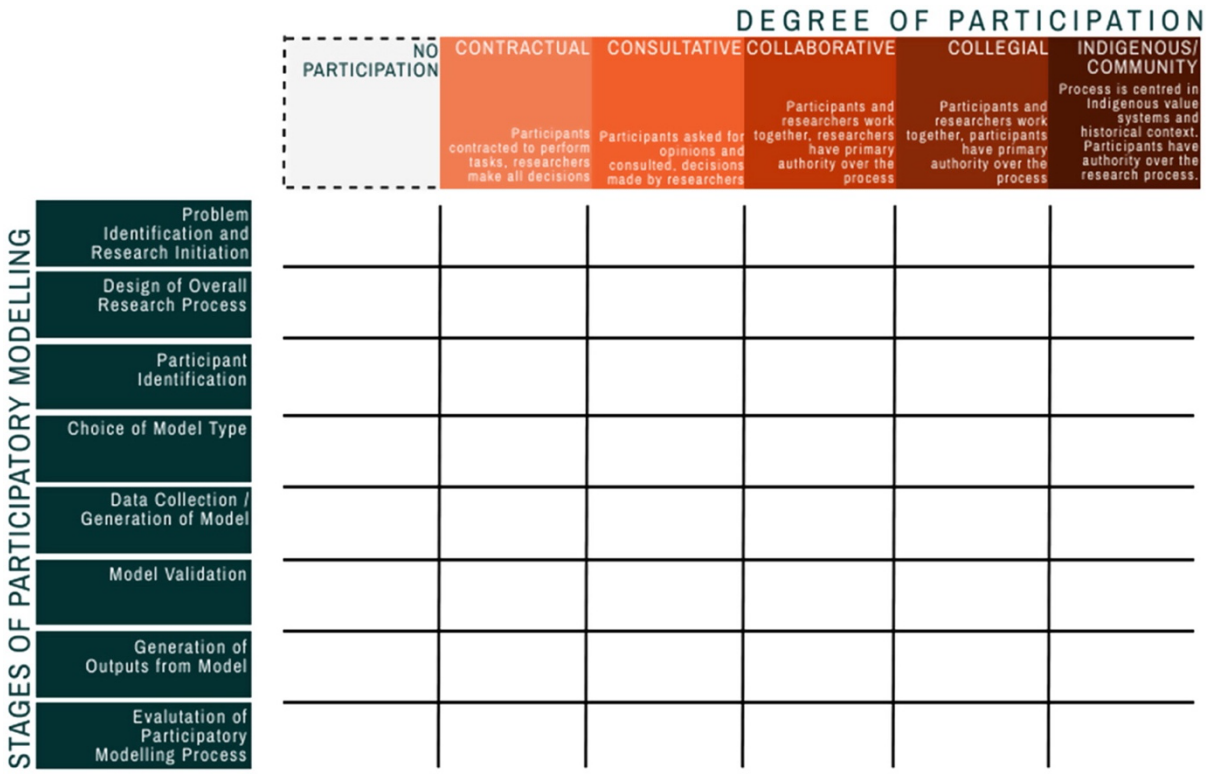

Figure 4.3: Matrix of degree of participation throughout the process of modelling with participants, adapted from David-Chavez and Gavin (2018), Jonsson et al. (2007) and Voinov et al. (2016)

To quantify the structure and degree of reported participation for analysis, each study was scored based on the number of stages of the process that were participatory and the degree of participation in these stages (Figure 4.3). For each stage that was consultative, a study was awarded one point, each that was "collaborative" was awarded two points, each that was "collegial" was awarded three points, and each that took an "Indigenous" or "community" approach to participation was awarded four points. As the "contractual" degree does not describe a process where participants had autonomy over the research process, this was awarded 0 points.

It is important when deciding how to employ a participatory process that researchers consider their reasons for and intentions in engaging participants, as these are key to deciding which tools or processes are chosen for use (Voinov et al. 2016, 2018). To understand these objectives, we sought to identify for each study: (1) stated reasons why participation was used as an approach to modelling, and (2) stated reasons for the specific use of participation throughout the study. We further analysed each study's use of participation in terms of whether normative, instrumental, substantive, and (or) transformative functions were stated (see Table 4.3 for examples). These represent different rationales for the use of participation in deliberative processes based on the value of the process (Fiorino 1990). Normative rationales for participation are based on the concept that inclusion of citizens in decision-making processes is democratic and a successful end in and of

itself, i.e., self-evidently positive, and, thus, increases the legitimacy of the process (Fiorino 1990; Cass 2006; The Nuffield Council on Bioethics 2012; Mere et al. 2019). Substantive rationales are based on the premise that this democratic participation will, through incorporating multiple and diverse perspectives, produce benefits of better quality and more useful policies, management plans or, in this case, models (Fiorino 1990; Cass 2006; Király and Miskolczi 2019). Instrumental rationales prioritise the relationship building between participants that gives the resulting decisions or policy more chance of success, particularly in terms of participant buy-in (Fiorino 1990; Cass 2006; Stave 2010; Mere et al. 2019). Others have proposed a fourth rationale, this being a transformative one, in which the participatory process can be educational and empowering, and, thus, a transformative experience, in terms of power relations, for all participants (Voinov and Bousquet 2010; Voinov et al. 2018; Király and Miskolczi 2019; Mere et al. 2019).

Table 4.3: Definitions and examples of rationales for participation

Function	Definition	Examples
Normative	Increases legitimacy through increased democracy	• Consistency with local priorities and norms • Good research practice • Democratically involve rightsholders • Increased transparency of process • Incorporation of non-Western knowledge types (if there is not a further reason for this)
Substantive	Increase value, quality and effectiveness of results and information produced, i.e., better knowledge	• Decision Support • More robust planning • Access knowledge base • More credible research • More sustainable outcomes • More effective outcomes • Add legitimacy to management decisions • Improves accuracy • To be more context-sensitive • More relevant • Better at identifying problems
Instrumental	Increases social learning, relationships and public buy-in and investment, i.e., more chance of success	• Conflict resolution • Overcome cross-cultural misunderstandings • Social/collaborative learning • Fosters trust between participants and researchers • Develop further/promote methodologies of collaboration in field of study
Transformative	Something is tangibly transformed, be it the participants or the power structure	• Capacity building • To address power relations • Better outcomes for the community/ participants • Leads to more equitable management/ control over resources • At request of population or to provide info direct to participants (shift in power in terms of who defines research priorities and what types of knowledge are prioritised)

Finally, we aimed to identify the nature of engagement with non-Western knowledge types for each study. We examined if and how the article described the overall process of engaging with non-Western Knowledge. We categorised the approaches as: no engagement with non-Western knowledge types (e.g., where only policy or governmental stakeholders were participating); an "add-

on" approach where non-Western knowledge types provide additional information to modelling approaches prioritising Western or scientific knowledge; "bridging" or connecting non-Western knowledge types and science with an even emphasis; and an approach in which non-Western knowledge types are prioritised in the modelling process, that is they are privileged over Western knowledge.

4.3 Results

Searches of the two databases identified 833 citations once duplicates had been removed (Figure 4.2); we screened articles written in English, Spanish, French, Russian, Italian, Portuguese, Arabic, Chinese, Croatian, Czech, Korean and German. After screening, 21 articles, relating to 19 studies that carried out modelling with participants, met the full inclusion criteria. Five articles were identified through reference checking, which related to two new studies. In total, 26 articles, relating to 21 studies, underwent data extraction and analysis. As some articles referred to the same study, the subject of analysis was individual studies. All included articles were written in English.

4.3.1 Publication trends over time and place

The greatest number of studies were identified in the North American Arctic, with fifteen studies in Arctic Canada and (or) Alaska. The European Arctic was the location of six studies, including three in Norway, one in Finland, one in Sweden, and one in Russia (Figure 4.4). Most studies focused on a regional scale (n = 14). Of all studies, five were locally focused and two were nationally focused. Only regionally focused studies were carried out in Europe, whereas studies in North America varied from local to regional to national (Figure 4.5A)

Figure 4.4: Geographic distribution of the location of identified studies. Map created using QGIS (https://qgis.org/en/site/) software and Natural Earth (https://www.naturalearthdata.com/) boundary basemap

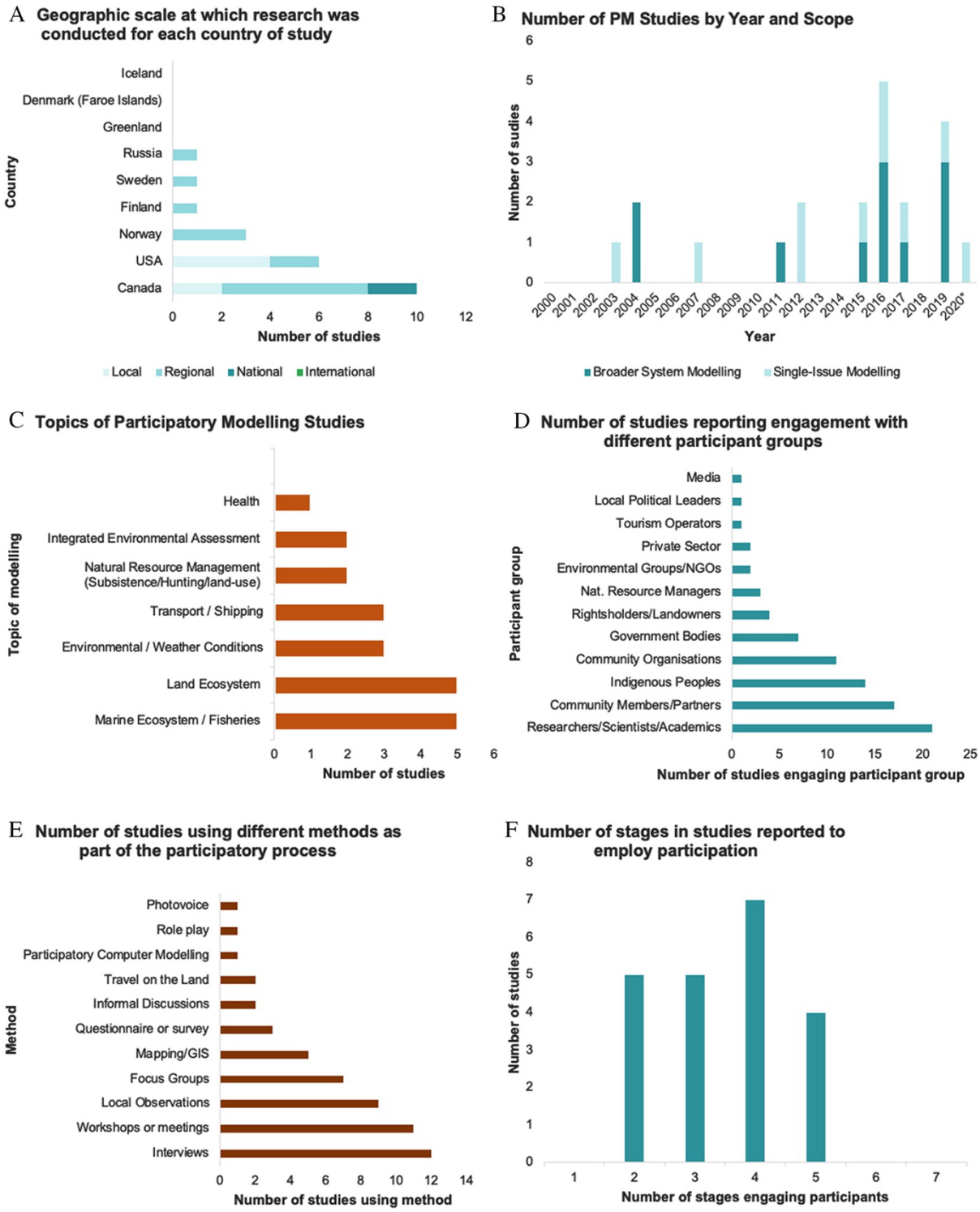

*Figure 4.5: Graphs displaying publication trends over time and place. (A) Geographic scale at which research was conducted for each country of study. (B) Number of participatory modelling (PM) studies by year and scope; *note that 2020 was not a full year as the literature search took place in April 2020. (C) Topics of participatory modelling studies. (D) Number of studies reporting engagement with different participant groups. (E) Number of studies using different methods as part of the participatory process. (F) Number of stages in studies reported to employ participation*

The number of studies that engage participants in modelling research in the Arctic has increased in the last decade. There was little difference between the number of studies taking an approach in

which the phenomenon of interest was modelling a broader socio-environmental system (n = 11) and those that focused on a single issue (n = 10) (Figure 4.5B). Topics modelled included marine and land ecosystems (n = 10), environmental and weather conditions (n = 3), transport (n = 3), natural resource management (including subsistence and land-use, n = 2), integrated sustainability assessments (n = 2), and health (n = 1) (Figure 4.5C). There were no clear geographic trends in the modelling topics.

We considered researchers, academics, and scientists to be participants in the research, particularly where the emphasis in a study was on collaboration between researchers and community members. Researchers were, therefore, understandably the most common participant group reported across studies (n = 21). This was followed by community members or partners (n = 17) and Indigenous Peoples (n = 14) (that were not mutually exclusive), community organisations (n = 11), and government bodies (n = 7). Some studies also engaged with non-governmental organisations (n = 2), natural resource managers (n = 3), and the private sector and tourism industry (n = 3) (Figure 4.5D). The number of different participant groups engaged with in each study ranged from 2 to 7, with an average of 4.

4.3.2 Participatory structure

4.3.2.1 *Modelling approaches*

The diversity of topics modelled was reflected in the diversity of modelling approaches reported (Table 4.4). These ranged from conceptual modelling (n = 6), modelling based on systems dynamics and fuzzy logic (n = 4), and participatory mapping processes (n = 2), to increasingly quantitative modelling approaches including species habitat models (n = 2), agent-based modelling (n = 1), computer-based climate modelling (n = 4), and threshold models (n = 2). Reported methods most commonly included participatory workshops and (or) interviews, and some studies incorporated one or more of mapping, photovoice, role-play, and local observations (Figure 4.5E).

Table 4.4: Examples of modelling approaches used

Modelling approach	Example	
Conceptual modelling (n = 6)	Laidler et al. 2008	Conceptual modelling of Inuit knowledge of sea ice processes, conditions, and features in Pangnirtung, Cape Dorset and Igloolik, Nunavut.
Systems dynamics and fuzzy logic (n = 4)	Tiller et al. 2016	Fuzzy cognitive mapping of Norwegian marine food system stakeholders' perspectives of the risk of climate change to marine environments
Quantitative climate modelling (n = 4)	Turunen et al. 2016	Combining Herder knowledge with future snow condition projections to simulate the impacts of changing snow conditions on herders in Finland, and to identify coping strategies.
Participatory Mapping (n = 2)	Sandström et al. 2003	The use of participatory geographic information systems, with reindeer herders in northern Sweden, to model land-use activities and patterns among multiple land users.
Agent-based modelling (n = 2)	Kruse et al. 2004	Creation of a computational discrete-choice travel-cost model of subsistence hunting in Old Crow, Yukon, Canada, relying on research and Indigenous Knowledge to provide rules and parameters for individual and collective decision making.
Species habitat models (n = 2)	Olsen et al. 2015	Indigenous-Knowledge-informed use of remotely sensed environmental data and geospatial training data to create habitat suitability maps for marine mammals in Alaska, USA.
Threshold models (n = 2)	Ford et al. 2019	Modelling, with Indigenous Knowledge holders, to create threshold models of access to informal ice, sea and land trails in Inuit Nunangat.

4.3.2.2 *Use of participation*

All studies reported engagement with participants in two or more research stages: problem identification; planning and design; participant identification; choice of model; data generation; model validation; model output generation; and (or) evaluation of the process, with an average of three participatory stages reported per study. Four studies reported to be participatory in five of their stages (Figure 4.5F). Across studies, the stages that were most frequently reported to be participatory were the data and model generation process and the participant identification process (Figure 4.6). Participation was least commonly reported at the research planning stage and in the process of choosing the modelling type. Reported participation was also low in model output generation and evaluation of the process, but a number of studies did not report including these stages as part of their research process. Lack of clarity in reporting across studies and stages meant that the degree of autonomy that participants had over a stage in the process could not always be determined.

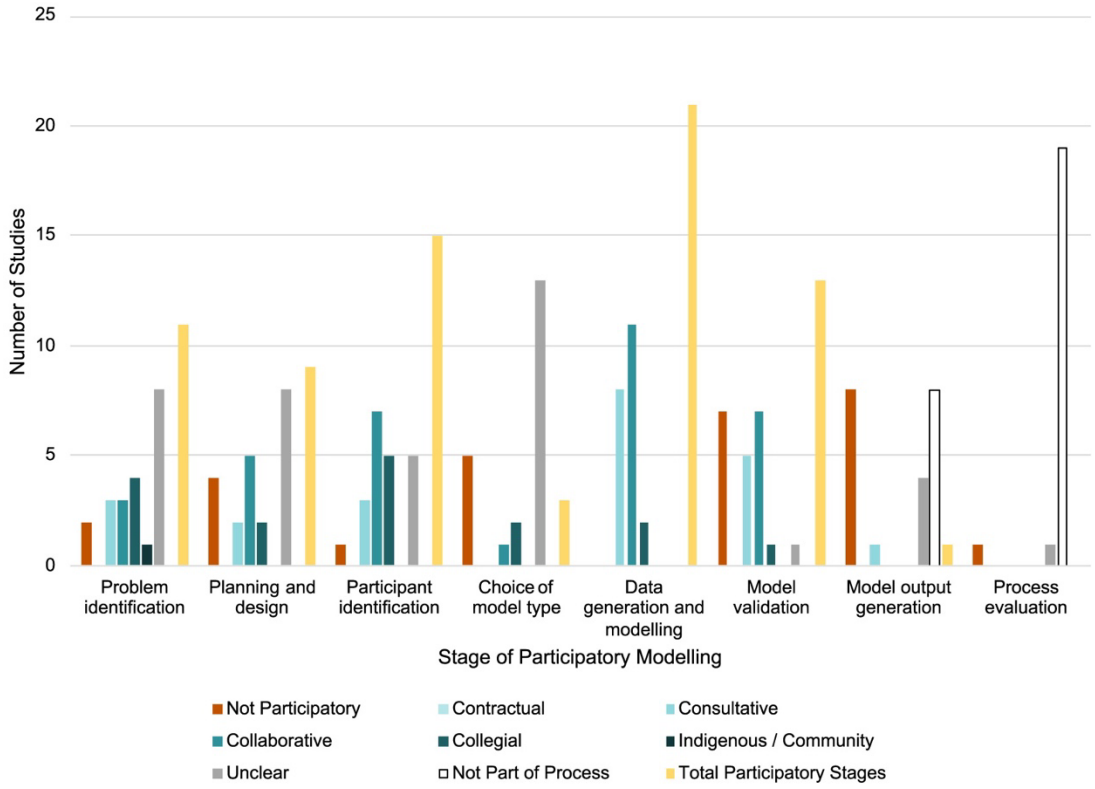

Figure 4.6: Number of studies reporting each degree of participation by stage

4.3.2.3 *Degree of participation*

Where participation was reported in the article, it was most frequently collaborative or consultative (Figure 4.7). Eight articles described a collegial degree of participation in one or more stages, with one article describing a collegial approach to participation through five of the research stages. Collegial approaches were most commonly described at the problem identification and participant identification stages of research. Collaborative approaches were most commonly described for the data or model generation stage, followed by the participant identification stage. Only one study described an Indigenous/Community degree of participation, and this was at the problem identification stage. No studies described the use of a contractual approach to participation at any stage, so where participation was reported, it was, at the very least, reported to be consultative. As mentioned, however, in many cases the degree of authority over the process afforded to participants was not clear.

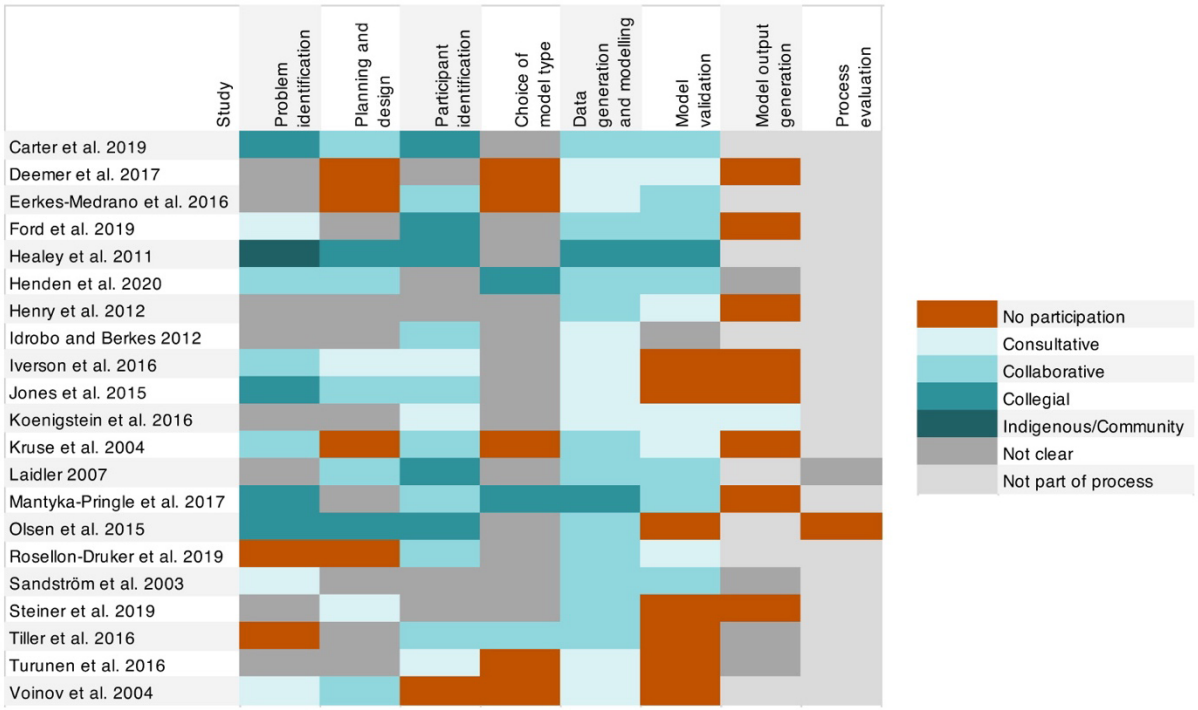

Figure 4.7: Structure and degree of participation for each study

Studies' participatory scores (based on the number of stages of the process that were reported to be participatory and the degree of participation described in these stages) ranged from 2 to 15, with an average score of 6.7. Lower scoring studies tended to describe a "consultative" approach in two or more stages. Higher scoring studies described engaging participants in five or more stages of the process, often with a "collegial" or "collaborative" approach. Most studies described a mix of "degrees" of participation throughout the process (Figure 4.7).

There was a small difference between the average score for Arctic North America (7.3; n = 15) and Arctic Europe (5.3; n = 6). There was little association between the affiliation of the authors of a study and its score, except for those that included authors that were community members or were affiliated with a community organisation, which had an average score of 9.4 (n = 6). There was no trend in participation score over time.

4.3.3 Reasons for use of participation

The stated reasons for the use of participation were not always explicit, so we included each paper's discussion of why participation in modelling research has value, as well as the reasons given that were specific to the research project in question. Substantive rationales for the use of participation were most commonly given (18 studies), such as the pursuit of more credible, sustainable, effective, and legitimate research outcomes. This was followed by instrumental rationales (13 studies), such as conflict resolution, trust-building and social learning, and normative rationales (nine studies) that

include the need to adhere to good research practice and local norms. Only two studies gave one or more transformative rationales for participation, which included local capacity-building and power shifting in resource management. Studies giving instrumental and (or) transformative rationales for participation, on average, achieved a higher participatory score (8.2) than those providing normative and (or) substantive rationales alone (4.2). There was little discussion of why participation was being used at certain stages of the research process and not others.

4.3.4 Nature of engagement with non-Western knowledge types

The majority of studies (62%; n = 13) described "integrating" or "bridging" knowledge types, placing an even emphasis on Western and non-Western knowledge. Five studies (24%) described a process that prioritised IK or community-based knowledge over Western knowledge, including those studies that were requested by a community or initiated by Indigenous scholars. Three studies (14%) described a superficial form of engagement with non-Western knowledge types. On average, studies that described prioritising non-Western knowledge types had a participation score of 11.2, whereas those that described bridging knowledge types and "adding on" non-Western knowledge types had scores of 5.9 and 2.6, respectively.

4.4 Discussion

This systematic scoping review has identified and characterised published reports of participation in modelling research taking place in the Arctic over the last 20 years. In doing so, it has highlighted and examined the diversity of approaches that can and are taken to engage participants in climate and environmental modelling processes. This scoping review reveals key characteristics of participation in modelling research in the Arctic and presents an approach to interrogating articles that report the use of participatory methods that is of value outside of the contexts in which it is used here. The approach creates a composite score for studies based on the temporal structure of participation throughout a participatory study and the degree of participation at each stage.

4.4.1 Participants and topics

Most studies reported engaging with Indigenous and non-Indigenous Peoples in their participatory processes, which involves engaging with both Western and non-Western knowledge. This is likely to be due to the presence of multiple autonomous Indigenous Peoples and community groups in the Arctic, who are increasingly carrying out or commissioning their own research and research agendas, alongside expectations of Western researchers to adhere to protocols such as the duty to consult (Haida Nation v. British Columbia (Minister of Forests) 2004), research agendas developed by Indigenous organisations (Inuit Tapiriit Kanatami 2018), and research funding that is specifically

allocated to communities (Peace and Myers 2012). This is not an unexpected finding, considering this context. However, this does not necessarily mean that these knowledge holders are being engaged in processes that are highly participatory, such as those that achieve an "Indigenous" or "Community" degree of engagement and may be the result of tokenistic solutions to these calls for inclusion. The breadth of topics of study identified in this review represent the diversity of issues that the Arctic is facing in the context of climate change, from impacts on species and habitat health, land use, subsistence, employment, and tourism, to the direct impacts of changing environmental and climatic conditions.

The participant identification stage involves both the process of defining the criteria for participation in the research process, and the process of selecting participants that met these criteria. Studies did not always distinguish between these two steps, but it was often clear that participants had been heavily involved in the selection, but not the definition, of participants. Similarly, there was rarely a discussion on the groups or individuals who may have been excluded from the process due to practicalities such as the time-consuming and intensive nature of a highly participatory modelling process. This is yet another part of the process in which clearer reporting on research design, in general, would be beneficial, as understanding who has defined the criteria for participation, as well as who may be actively or inadvertently excluded from the process, helps to identify the perspectives that are and are not represented in the resulting models (Hitomi and Loring 2018). Others have similarly called for greater clarity in how participatory research more generally is reported (Mosurska and Ford 2020).

4.4.2 Structure of studies

The research stages that were most regularly reported as participatory (regardless of the degree of participation) were the participant identification stage, and data or model generation. It is understandable that participants would be a valuable source of knowledge for identifying the scope of relevant stakeholders for a given issue. Utilising this participant expertise demonstrates a move away from more traditional approaches in which participants or stake/rightsholders are defined and identified by the subjective assessments of researchers, and places value on the social relationships and communication networks that exist among participant groups (Mitchell et al. 1997; Prell et al. 2007). However, it was not always clear whether the researchers had already imposed restrictions or criteria for participants, or whether these criteria were identified collaboratively.

It is also understandable that the data and model generation stage would tend to be reported as participatory, as this is the focal part of the study in which diverse knowledge types can be brought together in the process of collaborative learning. Reviews of participatory monitoring research have

similarly observed participation most commonly characterised as data collection (Thompson et al. 2020). However, although some studies reported using participatory workshops to combine data and knowledge generation with model building and synthesis (Healey et al. 2011; Mantyka-Pringle et al. 2017), others reported using two distinct stages of data elicitation, such as a round of interviews or focus groups with participants, followed by a subsequent modelling process in which participants may or may not have been involved (Iverson et al. 2016; Ford et al. 2019). In these cases, it was challenging to summarise the studies into the stages we had initially identified.

Excluding the model output generation and evaluation stages (as many studies did not include these stages as part of their modelling process), participation was least commonly reported at the choice of model stage. We found that unclear reporting was particularly high at this stage, preventing us from determining whether participatory processes were, in fact, used. Participants and communities have pointed to the benefits that early research engagement can bring to the levels of participation and autonomy throughout the rest of the research process, and for enabling their priorities to define this process (Harper et al. 2012; Carter et al. 2019; Flynn and Ford 2020). This highlights that breaking participation down into stages, although useful to evaluate, is somewhat artificial because it is also important to consider the threads of participation that run throughout the entire process of a study. It is, therefore, important for articles to clearly report participation at these early stages of research, as they can reveal nuances about the degree of participation afforded in subsequent stages, provide accountability to the interests of those involved as participants, and draw links to where participation was used in the study, to what degree, and why.

This review identified great diversity in the methods, tools and types of modelling used. Workshops were frequently used as part of the modelling process, which are known to be effective in bringing diverse knowledge holders together and promoting social learning, participatory analysis, and relationship building (Huntington et al. 2002; Knapp et al. 2011). Other participatory methods, such as photovoice, and traditionally non-participatory methods, such as interviews, were used, sometimes blended or integrated into one research stage. Although the choice of methods is important, as methods can empower some participants over others (Voinov et al. 2018), few studies discussed power dynamics within and between participant groups.

4.4.3 Degree of participation

Only one study reported an “Indigenous” or “community” degree of participation. This was a study where the problem identification and initiation of the research was driven by the community and centred on community priorities (Healey et al. 2011). Nevertheless, most studies reported incorporating one or more stages of collaborative or collegial participation into their process, and

this occurred most often at the data and model generation stage, suggesting that these model building stages are regularly being used to create space for social learning, genuine exchange and the meeting of different knowledge types. Again, unclear reporting meant that determining the degree of participation was challenging. As Carter et al. (2019, p. 390) point out, historically "a lack of research reporting has been a key factor in exploitative research relationships and lack of community trust in research" (Inuit Tapiriit Kanatami 2018); thus, reporting is important for accountability.

There is often a trade-off between breadth and depth of participation (McCall et al. 2015; Voinov et al. 2016). The degree of participation afforded to participants as a group, and the degree of participation that any one individual participant has are not necessarily the same, although it was most often the former that was reported in the included papers. The more participants and participant groups that are involved, the less power each individual will have. Here, we have assessed the degree of power that was possessed by the participant group in contrast with the power held by the researchers in any one study, but not enough information was provided to interpret power relations between participants.

4.4.4 Reasons for use of participation

The motivations, from those initiating the research, for using participation in the process are important for understanding specific choices of nature of participation and at what stage in a study. Again, we found lack of clarity in reporting in a number of studies around their specific reasons for using participation, which is consistent with other literature reviewing participation in modelling studies (Voinov et al. 2016). Where reasons were given, they were most frequently substantive (n = 18), often referring to the value of engaging non-Western knowledge types for the quality of the research outcomes. Instrumental functions were stated in 13 studies, highlighting the accepted value, and mutual benefit of, the social learning that can take place through the modelling process. Only two studies gave transformative rationales for the use of participation, which prioritises the benefits for the participants in terms of the power shift and tangible change that can come about through the research process itself. This included studies that sought to directly address and change power relations in research and natural resource management (Rosellon-Druker et al. 2019), and those that incorporated research capacity building into the process as a key objective (Healey et al. 2011). Studies stating instrumental and (or) transformative rationales demonstrate the importance that they are placing on the value of the process itself, particularly for participants. These studies' average participation score was 8.2. Studies giving only normative or substantive rationales for participation demonstrate a greater focus on the value of the outcomes of the process, and their

average participation score was 4.3. This suggests that studies are using more frequent and higher degrees of participation to achieve more instrumental objectives such as social learning, and potentially transformative change for participants.

4.4.5 Review limitations

Our approach relies on reporting in the published literature on processes that are often complex and nuanced. Understanding participatory processes involves understanding the social relations between participants, autonomy over decision-making, ability to communicate and exchange knowledge, and their skills, tools, and experience that allow them to do so (Voinov and Bousquet 2010). Although there are examples of how these descriptions of participation, autonomy, and power relations in research can be reported clearly and succinctly (Carter et al. 2019), we understand the constraints placed on authors when publishing with limited word counts. Nevertheless, the growth in the use of supplementary materials reduces such challenges in contemporary scientific publishing. We included supplementary materials in our review, but they were rarely used by their authors to add more detail to the description of the participatory process. As a result, our evaluation has been dependent on often incomplete descriptions of participatory processes, in which researchers and participants may have engaged in higher degrees of participation and collaboration that we were unable to credit. In journal articles these descriptions are usually from the perspective of the researchers and, thus, are sensitive to bias. Furthermore, we were unable to investigate outcomes of these research processes, including short- and long-term outcomes and whether there were direct benefits for the participants. Interviews with both researchers and participants could be one way to address both of these issues.

Jones et al. (2009) have put forward a framework for participatory modellers to self-evaluate their studies in reference to their original goals. Fundamentally, part of this evaluation is carried out by the participants engaged in the process. This provides insights on the value of the process from multiple perspectives and holds the research to account over its goals. Additionally, a further question remains around how this coproduced information is taken up and used in policy, management, and decision-making, particularly that which engages with non-Western knowledge types (Thompson et al. 2020).

4.5 Conclusion

This review has identified a diversity of approaches being used in the Arctic to engage participants in modelling climate-sensitive processes. These studies comprise a range of both degree of participation and ways of engaging with non-Western knowledge types. It is noteworthy that more

participation is not necessarily better participation, nor necessarily favoured by participants. It is challenging to comment on what is best or most effective in terms of stage and degree of participation, as this depends on the objectives of the process and there will likely be different participants or stakeholders with different ideas of what a successful outcome would be. However, we have identified examples of research in the Arctic that are successfully implementing highly participatory modelling processes, while working with and for non-Western knowledge holders in the region.

Considering how few studies in this review reported engaging participants in an evaluation process, this may be a priority area for improvement, and one that needs to be planned for at the project planning stage to ensure resources and time are allocated to this task. Equally, it is also important that readers are able to critically appraise the participatory processes in a study, and currently we find that the level of detail available is, in general, not enough for this. Reporting criteria may be useful to improve the quality and clarity of the communication of this important information. To move towards research on what types of participation work in what contexts and for whom, we need to understand in greater depth what is happening in these modelling processes in terms of power, participation, and autonomy, particularly in the context of diverse, non-Western knowledge types, and this requires clearer discussions of these issues in the descriptions of the process.

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5 Discussion and conclusion

5.1 Introduction and key contributions

This chapter contains a summary of the contributions of this thesis to scholarship, followed by a discussion of the findings organised around the two overarching research questions. This is followed by a discussion of the cross-cutting theme of power, including lack of attention to power imbalances, some potential limitations of the research approaches used and, finally, some concluding remarks.

Increasingly research across disciplines points to the structural roots of disaster and ill-health in the context of climate change, and frameworks such as the root causes of disaster and the social determinants of health have highlighted how these structural factors create harm to people and their health, both in the context of a hazard such as climate change and day to day (chapter one). Given the persistence of hazard-focused approaches in disaster risk reduction and climate adaptation, it is more important than ever to re-centre the root causes of this harm in research and policy. In Arctic North America, a great deal of research and policy focuses on the 'impacts' of climate change, taking a hazard-focused approach, and there is a need for research into the structural drivers that shape harm in the context of a changing climate. This thesis set out to critically examine power, participation and engagement with the root causes of disaster in the creation of policy narratives around climate change and health in Arctic Canada. It asked, 'how are dominant narratives of climate change and health in Arctic North America addressing the root causes of disaster for Inuit?' and 'how is Inuit Knowledge being engaged in these narratives of climate change and health?' In chapter two, it systematically reviewed published literature, and used qualitative causal coding to construct a causal loop diagram of the root causes of constrained mobility for Inuit in Arctic North America. Then, in chapter three it used narrative analysis to deconstruct narratives around climate change and health in Canadian governmental policy with relevance to Inuit Nunangat in Arctic North America, discussing how these narratives engage with the root causes identified in chapter two. Finally, in chapter four, it critically assessed the extent of participation, and engagement with diverse knowledge types, reported in research that uses participation in the modelling of climate-sensitive processes in the circumpolar Arctic. The goal was to understand the processes through which Indigenous Peoples in the Arctic participate in the creation of narratives such as those discussed in chapter three.

Drawing together theory from mobilities research, disaster scholarship, and social determinants of health research, in the context of Arctic North America, this thesis adds to the body of scholarship that is critical of hazard-centric approaches to disaster and climate change research. It highlights how colonisation and other intersecting inequities in society cause harm in the context of a changing

climate and points to a need to address these issues as part of action in the face of climate change. As far as the author is aware, this represents one of the first attempts to explicitly analyse the narratives in climate change policy in Arctic North America and highlights the power processes through which policies are created and exist alongside one another, revealing that dominant policy narratives do not attend to the root causes of disaster in the context of climate change. This raises the concern that policy action itself will not address the root causes and highlights the value of narrative approaches to policy. It also begins the work of challenging these dominant policy narratives, by holding them up against less-dominant narratives that emerge from the policy documents and that do engage with root causes. These offer ways to imagine other possibilities for the future.

Finally, this thesis has highlighted the lack of reporting of power over the process in participatory modelling research on climate change in Arctic North America, and generally low levels of participation where detailed reporting was available. This adds to other literature that has highlighted superficial engagement in participatory research and highlights the importance of deep consideration of power relations in individual research projects in this context.

5.2 Overarching research question one: How are dominant narratives of climate change and health in Arctic North America addressing the root causes of disaster for Inuit?

Constrained mobility for Inuit, and associated risk of accidental injury and death on the land, mental, social, and cultural health impacts, comprises an unfolding, slow-onset disaster in Arctic North America, and one which is often attributed to the impacts of climate change (Ford et al., 2019). Chapter one reports the results of a systematic literature review to identify the root causes of this constrained mobility. The review focused on mobility as an issue that is representative of physical, mental, spiritual and community health for Inuit. This review identified immediate barriers to travel that include cost, time constraints, prevention of knowledge sharing, and the complex interplay between them. These processes can create risk of accidental injury and death on the land through limiting time spent on the land, changing patterns of travel, and creating pressures on travel that does go ahead. The review identified the root cause of these barriers to be historic and contemporary colonial policy and associated inequity, which are ultimately responsible for creating the immediate barriers to travel, and thus limiting flexibility around travel in a changing climate. This review revealed that, across Arctic North America, these structural legacies and ongoing processes affect Inuit mobility in common but locally contextual ways.

Many of these complex processes have impacts that are mediated through the dimension of time. Specifically, the imposition of western timeframes on Inuit (Watt-Cloutier, 2020), the process of

creating financial barriers to going off on the land, and the impacts of seasonal environmental governance and conservation policy on annual patterns of travel and harvesting, constrain the temporal flexibility of Inuit with respect to travel on the land. These in turn limit knowledge sharing about safe travel, further limiting opportunities for safe travel. These interact with colonial legacies of spatial practices (Tuck & McKenzie, 2014) that constrain the spatial movement of Inuit, including where they must live (such as processes of forced sedentarization) (Chisholm Hatfield et al., 2018; Faas et al., 2019) as well as which areas of land they can harvest across (such as contemporary environmental policy and permit systems) (Snook et al., 2020). This speaks to broader trends in other colonial contexts where 'the colonization of time' has been used through history to control colonial subjects (through imposing Western timeframes on the working day) as well as to justify acts of violence and control through colonial subjects' apparent 'lack of timekeeping' (Nanni, 2013).

One of the key ways that these constraints on peoples' time and movement create harm is through constraining their flexibility more broadly. Whether through livelihood diversification or the flexibility to use the hours of the day in response to weather conditions, flexibility is understood to be key to dealing with rapid climatic change (Ford et al., 2020). For example, the resourcefulness and responsiveness of Indigenous Peoples to adapt to historic changes in climatic and weather conditions is regularly pointed to as an asset in the context of climate change (Eira et al., 2018). In an Inuit context, therefore, we can see how historic and contemporary governance creates harm in part through providing constraints (including on time and movement) on Inuit, that interfere with their ability to adapt and respond to change, including environmental and climate change (Whyte et al., 2019).

In this sense, governance (and particularly colonial forms of governance) can play a key role in the creation of the constraints imposed on Indigenous Peoples, including constraints on mobility. Within mobilities research, only a small body of research has studied the mobilities of those whose movement is seasonal or flexible, not one-directional, and not within urban centres (Boas et al., 2019; Suliman et al., 2019). Some of this research has demonstrated how governance can act to negatively constrain and interfere with people's mobility and flexibility, and the term (im)mobilities is used to reflect the constraints on peoples' movement as well as the processes that force people to migrate (Sheller, 2018). This includes environmental governance that has been found to reduce the flexibility of migration that is tied to pasture rotation of livestock (Eira et al., 2018; Johnsen et al., 2017; Turi, 2016), policies and programmes in Zambia that have been found to contribute to the 'trapping' of marginalised populations in place (Nawrotzki & DeWaard, 2018) and international bilateral agreements governing mobility in Senegal and Mauritania that can act to limit seasonal mobility (Zickgraf, 2019). Flexible processes that people have historically used for managing risk

through mobility have been replaced with administrative borders, externally imposed environmental policies and the privatisation of land and natural resources (Ford et al., 2020; Liao et al., 2016; Marino & Faas, 2020). This may also be in the form of forced relocation, which can constrain peoples' mobility options and disrupt and transform the space and place of their ecological relationships (Faas et al., 2019). In an Inuit context, very specific constraints on movement were seen during periods of forced relocation and sedentarization and residential schooling, for example (Bennett, 2018; Dinero, 2013; Panikkar & Lemmond, 2020; Rodon & Schott, 2014).

The findings of chapter two add further evidence to the suggestion that, in the context of climate change and other creeping or rapid-onset environmental hazards, governance plays a large part in constraining peoples' flexibility to adapt, and thus shaping the adverse health outcomes of disaster. This research illustrates that Inuit mobility is constrained not just by the legacies of historic colonial forms of governance, but also the impacts of contemporary governmental policy, and that action to mitigate negative health outcomes in the face of climate change should focus on these forms of policy and governance as a key area of change. This contrasts with the dominant discourse around climate change and mobility in research and policy discussions in general, which focuses primarily on one-way migration and forced relocation across, or within, international borders, and assumes a direct role of climate change in pushing or constraining peoples' movement) (Baldwin et al., 2019). Given the key role of governance in shaping peoples' mobilities that this thesis has identified, this externalisation of climate change as a direct driver of mobility is problematic. This highlights a need for closer attention in research to the ways that policy and governance interact with peoples' mobility in complex ways. Given the findings of this research, in conversation with other research that has looked critically at the role of governance in shaping mobilities, there needs to be a shift in the way that mobility and migration are considered in the context of climate change, so that climate is not centred as the sole driver or constrainer of mobility, and that mobilities are thought about not just as one-directional migration but as complex, sometimes cyclical processes that are not one-off events (Boas et al., 2019).

Migration and mobility are intimately tied to health outcomes (Abubakar et al., 2018). Given that being on the land is, for Inuit, at the heart of mental and physical health, constraints to mobility in an Inuit context are closely tied to adverse health outcomes. And, given that the flexibility required for Inuit to adapt to climate change is likely to be constrained by the historic and root causes identified in this thesis, these root causes of constrained mobility need to be centred in discussions around climate change 'impacts', particularly those around climate change and health. Given the role of governance and policy in constraining mobility, addressing these adverse health outcomes involves attending to the root causes, which may involve reform of political systems and institutions

(Whyte, 2020). This also highlights how 'adapting' just to climate change as an 'externalised' threat is problematic because it distracts from making the changes to social structures that are required to reduce risk and harm more broadly, as well as in the context of a changing climate. When we think about adapting to climate change, we need to be thinking about how to recreate equitable social structures that will enable flexibility and resourcefulness in the context of a changing climate.

Action on policy and governance can include two interrelated shifts. The first is to act to change the specific forms of policy and governance that actively or inadvertently create inequity and harm to Indigenous Peoples (Berry & Schnitter, 2022). In Arctic North America, for example, this may include current environmental policy examples that limit the areas over which Inuit are able to harvest food. The second is to ensure that policy actively addresses the root causes of the problems that humanity faces in the context of climate change, and to focus on governance that can achieve this. For policy to do this, it must identify the root causes of the problem (such as colonial inequities) and then propose solutions that directly address these root causes. In doing so, it must present a coherent narrative for change. The creation of a narrative is key to giving future direction to the change required, and as an ultimately narrative exercise, policymaking is powerful because of its ability to shape the way people think about a certain issue. Thus, policy narratives are profoundly important for framing issues such as climate change. In Arctic North America, based upon the findings in chapter two, policy action will need to address existing and harmful legacies of colonialism in contemporary policy and actively tackle issues of inequity and poverty that are at the root of adverse health outcomes in the context of climate change (chapter two). This will require policy narratives that identify the root causes of harm to health in the context of climate change and lay out a path forward that addresses these.

Despite the value and power of policy for creating narratives that identify the root causes of a problem and propose relevant solutions to address them, much research and policy on themes of mobility and health in the context of climate change focuses primarily on climate change as a direct driver of harm. These narratives risk suggesting solutions that focus on mitigating damage to the status quo from climatic change (Lahsen & Ribot, 2021). There must be space in narratives of climate change and its 'impacts' to incorporate understandings of how root causes of disaster are central in shaping the experiences and 'impacts' of hazards associated with climate change, and that harm (including in the context of disaster) exists in the status quo (Oliver-Smith, 2017). It is, therefore, valuable to critically analyse the narratives that are contained in policy, to see how they engage with the root causes we have identified.

Chapter three sought to deconstruct policy narratives in Canadian governmental policy documents using narrative analysis. Results showed that the dominant narrative (narrative one), emerging in

the policy documents reviewed, centres climate change as an external driver of harm to health, failing to identify the root causes of disaster identified in chapter two, or to engage with the social determinants of health. Solutions proposed, therefore, also fail to address these root causes or social determinants and focus primarily on technology and innovation. These echo broader narratives around climate change and health, in policy, research and media, that take a hazard-centred approach, fail to identify the structural root causes at the heart of the problem of climate change and health, and offer technocratic solutions to protect the status quo (Raju et al., 2022). This distracts from opportunities to act on the root causes of harm in the context of climate change, such as those identified in chapter two. Additionally, top-down, technology-driven approaches to climate policy are known to limit public engagement, deliberation, and inclusion of social priorities in policy-making, including through the non-recognition of Indigenous Knowledge as valid (Käkönen et al., 2014; Webb, 2011)

A result of this externalising of climate change, is that it detaches the discourse around the experience of climate change from histories of colonialism, social justice issues and inequity, therefore depoliticising the impacts and experience of climate change (Lahsen & Ribot, 2021; Pelling & Garschagen, 2019; Sultana, 2022). This dominant narrative labels people and places as 'vulnerable', failing to identify the root causes of this vulnerability in structural factors. This is also consistent with a 'deficit framing', which has been a historically persistent narrative used to frame Indigenous Peoples in terms of deficiency, absence, lack or failure (Fogarty et al., 2018), pathologizing the peoples themselves rather than the structural processes of inequity (Aldred et al., 2021). The discourse has the potential to contribute to stereotyping and further marginalisation of Indigenous Peoples (Hyett et al., 2019).

The second narrative that emerged (narrative two) moves beyond the hazard-centred focus, to frame harm as emerging from the interaction of climate and inequity. Solutions proposed include working in partnership, Indigenous leadership and community-based adaptation, and are described in broad terms common in policy documents due to the ongoing nature of policy negotiations and deliberations, and the complex nature of jurisdictional responsibility and autonomy (Austin et al., 2015). This results, however, in the specific goals of proposed solutions being unclear and open to interpretation (for example, 'working in partnership'). Therefore, there is lack of clarity around whether these solutions are intended to lead to shifts in power relations between governments and Indigenous Peoples, and thus to address the root causes of harm in the context of climate change. In this way, this narrative conceals the power relations at play in such processes of partnership and leadership and avoids committing to specific end goals or responsibilities.

Solutions also contain a strong theme of action at the 'local' level, locating the problem and the need for change in communities themselves. This is in line with an increased move to support community-based adaptation globally and reflects a growing preference in recent years to allocate funds for community-based actions (Ebi & Semenza, 2008; Ford et al., 2011; Forsyth, 2013). However, many point out that such approaches to adaptation require attention to simultaneously be placed on the institutions and governance approaches that ultimately facilitate adaptive capacity (Beckwith, 2022; Schipper et al., 2014). Where attention is not also focused on governance, narratives of community-based action problematically centre communities as the sole location of the problem and solution as well as being responsible for becoming 'resilient' to climate change (Mikulewicz, 2019). These dominant narratives also detach the discourse from a focus on policy and governance (Raju & da Costa, 2018), and focus instead on technological innovation designed to protect the status quo, including its imbalanced power relations (Cheek & Chmutina, 2021). Greater autonomy for Indigenous communities adapting to climate change is a positive thing and is included in the National Inuit Strategy on Climate Change (ITK, 2019), but narrative two focuses solely on community-level change in a way that distracts from the parallel need for changes in governance, power and policy such as addressing existing colonial policy and taking actions on the social determinants of health. This parallel change in power and governance is required to facilitate Indigenous action at the community level and remove constraints on Indigenous sovereignty that prevent them from taking control of their lands and communities (Cueva et al., 2021; Trainor et al., 2007) and speaks to a wider understanding of the need to connect local adaptation to changes in systems of governance (Lambert & Beilin, 2021).

While not nearly as common or dominant as narratives one and two, a third narrative was identified (narrative three) that does engage with the Indigenous social determinants of health and root causes of disaster identified in chapter two, by explicitly describing the ways that colonial policy and inequity create peoples' experiences of climate change (chapter three). This narrative proposes solutions that address these issues directly, covering specific changes to policy and governance approaches as well as examples of community-based programming and the relationship between action at both these scales. It is also more explicit about the important role of both Indigenous sovereignty and government responsibility and policy change, and how these go hand in hand. This narrative does not focus on the 'vulnerability' of people to climate change, but instead on the harm of colonisation. It conceptualises the strengths and capacities of Inuit in the context of climate change in more nuanced ways, reflecting complex entanglements of physical, mental and cultural wellbeing and bringing specificity to narratives of the ways forward. These include themes of care, Indigenous resilience, innovation and resourcefulness, for example. Importantly, this narrative

centres relationality in the path forward, including human to non-human and human to human relations, as well as centring the responsibility of government. This narrative is able to encompass ideas of justice and critical approaches to the root causes of disaster and colonisation, while centring Indigenous agency and priorities.

To answer our first overarching research question, we can conclude that dominant government policy narratives of climate change and health in Arctic Canada do not address the root causes of disaster for Inuit. However, emerging from these policy documents is another, less dominant, narrative that does identify the root causes of disaster and social determinants of health, and proposes ways forward that centre Indigenous priorities and sovereignty. While the power of the dominant narrative can act to drown out and conceal this narrative, this narrative offers an insight into ways that policy narratives of climate change and health in Arctic Canada could be reshaped to engender forms of climate adaptation, and policy change that address the root causes of harm for Inuit in the context of climate change, while centring their agency.

A number of Indigenous scholars have written about the harm that problematic narratives of Indigenous Peoples and climate change can cause and the importance of retelling these narratives (Howitt, 2001; Smith, 1999; Walter & Andersen, 2013; Whyte, 2016, 2018). Although critical analysis of existing policy narratives is an important step in starting to dismantle those that are harmful, it is also key to consider the power relations and imbalances involved in producing narratives of climate change and health in the first place. Policy is a particularly powerful discursive space, and one which Indigenous Peoples are still largely excluded from at higher levels (Lindroth & Sinevaara-Niskanen, 2017). Bieger (2018, p. 9) describes the concept of 'narrative agency' as "the capacity to make choices about the telling of one's story and impose them on, relate with, and ultimately be in the world", and for Indigenous Peoples, having narrative agency will be key to the process of challenging the dominant and problematic narratives that do not reflect the root causes of harm in their experience.

5.3 Overarching research question two: How is Inuit Knowledge being engaged in narratives of climate change and health?

Shifts in narrative agency will inevitably involve shifts in power relations, as agency to impose a narrative on the world is closely linked to social agency and other forms of power (Bieger, 2018; Foucault, 1972). Findings in chapter three revealed that public policy on climate change and health commonly contained narratives that propose engagement with Indigenous Knowledge and Indigenous leadership as solutions to addressing the health dimensions of climate change, with a particular focus on 'knowledge production' (chapter three). This reflects a broader recognition of the

value of Indigenous Knowledge and Indigenous engagement for research and policy in the context of climate change (Abram et al., 2019), and has been met by an increase in research that seeks to engage communities and Indigenous Peoples in the production of climate-relevant knowledge (Carter et al., 2019; Ford et al., 2016; Jones et al., 2018). However, this trend has been followed by warnings against 'extractive' approaches to Indigenous Knowledge, a term used to describe the use of Indigenous Knowledge by non-Indigenous people and institutions, where limited decision-making or participation is granted to the Indigenous Knowledge holders (David-Chavez & Gavin, 2018). Additionally, use of participatory methodologies in places such as the Arctic have been limited and heterogeneous in their approaches (Brunet et al., 2014; Flynn & Ford, 2020; Mosurska & Ford, In Press). Where engagement with Indigenous Knowledge is superficial, or the goals of engagement are not also in line with Indigenous priorities, knowledge production is at particular risk of being extractive (David-Chavez, 2019; Smith, 1999). Many have offered critiques of tokenistic, apolitical approaches towards these community engagement and participation that are common in climate policy (Brunet et al., 2014; Jones et al., 2018; Leal, 2007; Mosurska & Ford, 2020; Sultana, 2022).

Given that the dominant narratives around Indigenous Knowledge that emerge in chapter three contain little detail about the specific goals of engagement, what Indigenous Peoples will 'lead' on, or how power-shifting will actually take place, it is worth critically analysing Indigenous Peoples' engagement in these types of knowledge production. Chapter four set out to analyse the degree of participation in research engaging non-Western knowledge types in the modelling of climate sensitive processes in the Arctic. All research reviewed engaged with non-Western knowledge types to some degree. Out of the countries included, Canada had the greatest number of participatory modelling studies within the time period, which may be indicative of a greater push to include stakeholders and rightsholders in the creation of policy-relevant knowledge. However, results suggest primarily that power dynamics in research and control over research process is under-reported in participatory modelling research, with an assumption of engagement through 'participation'. Where information was available, participation was most commonly reported in the process stages, such as participant identification and model generation, but least in the planning stages such as choice of modelling approach. While this is based upon the reporting of the research process, this suggests that Indigenous Peoples have low levels of involvement in the design and planning of research, meaning that their own priorities and research agendas may not be being centred in the process. This may then mean that Indigenous knowledge is being 'extracted' while the Indigenous Peoples themselves are not given power in the process. These types of research project, which claim to be 'producing knowledge', are important processes of narrative production, and the narratives produced in these processes, which seek to explain how climate change, society and

human health are linked, go on to inform policy agendas and are sometimes directly incorporated into environmental policy production and natural resource management (Jones et al., 2009).

While engagement in research and knowledge production for climate adaptation could offer a way to shift dominant narratives of climate change and health, these findings suggest that insufficient attention to power in participatory research may be a barrier to Indigenous narratives of climate change and health, and Indigenous priorities, influencing policy and policy narratives. Thus, in answer to the overarching research question two, we can establish that narratives of climate change and health tell a story in which engagement with Indigenous Knowledge and partnership with Indigenous Peoples and leaders is key for acting on health in the context of climate change, but that processes of engagement with Indigenous Peoples through research are not well reported on and risk being tokenistic engagement.

5.4 Power as a cross-cutting theme

A dominant theme weaving through the findings of this thesis is that of power, unequal power relations, and a lack of attention to the need to change power relations. While this thesis has focused primarily on power imbalances revolving around historic and contemporary settler colonialism, these intersect with others such as gender, race, age and disability (Amorim-Maia et al., 2022).

There are a number of ways in which power acts, or is present, in the processes analysed in this thesis. Chapter two highlights the ways that inequities and power imbalances structure the processes of colonialism and governance that create unequal health outcomes within society and shape the differential experiences of disasters and climate change over a range of timescales. Because these power imbalances are the root causes of disaster in the context of climate change in particular, action to avoid human suffering will mean addressing them. However, it is important to see these power imbalances not only as a problem in the context of climate change, and the social determinants of health framework reminds us that these power imbalances are problems that cause harm regardless of the presence of a hazard such as climate change.

Chapter three highlighted the ways that power acts through narratives of disasters and climate change. Narratives are powerful because of their ability to shape our collective understanding of a phenomenon like climate change, as part of an atmosphere of influences (Eve Tuck, 2015). These include influencing whether the root causes of disaster are at the centre of that collective understanding, but also what possibilities are imaginable for the future. Narratives can highlight issues and suggest solutions while simultaneously hiding others and concealing injustices (Tschakert, 2012). Not only do dominant policy narratives identified in chapter three not discuss power

imbalances as the root cause of harm in the context of climate change, but they drown out other narratives that do.

Power imbalances also provide people with differential abilities to create and influence these dominant narratives and thus to shape our collective understanding of the causes of (and potential solutions to) the challenges we face in the context of climate change. This includes the policies that are put forward by governments (among other institutions) to address and adapt to a changing climate and associated hazards. Common approaches to policy, particularly that addressing climate change, focus on the linear, apolitical, and technical, and more powerful voices are more able to articulate a strong narrative (Tanner & Allouche, 2011). Policy must be recognised as the power-laden, meaning-making process that it is. Indigenous Peoples have been excluded from decision-making processes and spaces of power for centuries, at the same time as they continue to demonstrate leadership in the face of climate change (Lindroth & Sinevaara-Niskanen, 2017). Barriers include primarily structural processes like funding, but also governance structures and ongoing clashes over land rights and external market systems. These things need to be acknowledged and addressed but, for the most part, are not being discussed in dominant narratives.

Some attempts have been made to redress the power imbalance involved in the creation of policy narratives, and to include a greater diversity of voices in research and policy-making (Hügel & Davies, 2020). This will require some degree of power-shifting so that those involved have control over the process of knowledge production or synthesis (Holland, 2017). However, chapter four identified a lack of power-shifting reported in processes of participatory research that are seeking to bring together diverse knowledge types to produce policy-relevant outputs. Where this power shifting is absent, this acts to constrain the participation and control afforded to others in creating legitimate knowledge about climate change, limiting the potential to shift the narrative.

Ultimately, these findings suggest a cycle whereby power imbalances in society, which are the root cause of harm in the context of climate change, also shape the creation of dominant policy narratives. This power imbalance is a barrier to the engagement of diverse knowledge types in policy making and to the challenging of dominant narratives of climate change and health by diverse non-dominant narratives. Superficial engagement of diverse knowledge types in policy-relevant research provides a further hindrance to shifting dominant policy narratives, which remain relatively apolitical and do not engage with the power imbalances and inequities at the root of harm in the context of climate change. Given the power of these dominant narratives, there is a risk that policy action will therefore not address these root causes, which would lead to the perpetuation of power imbalances and inequities in society, which will increasingly cause harm in the context of climate change. Thus, we see a reinforcing and a recreation of power structures.

Many currently existing avenues and channels to create accountability and inclusion exist in sector silos and act to prevent the challenging of existing power structures (Tanner & Allouche, 2011). However, the power that narratives can hold points to their potential role in changing the way that we collectively understand the issue of climate change, in drawing attention to accountability and in providing a narrative path forward that can bring hope. Sultana, (2021) suggests that we need to engage meaningfully with narratives that offer "trajectories beyond the 'new normal'" (p1726). Narratives have the potential to highlight what is wrong with policy and governance and narratives can open up possibilities for change. If discourses construct the social world, then it will only be when narratives start to tell stories of genuine change in power relations that we will start to see it as possible in a broader, collective way.

So how can and will broader narratives shift? Given vested interest for powerful voices to create narratives that protect the status quo, it is unlikely that the current creators of dominant narratives will lead this change (Käkönen et al., 2014; Mahony & Endfield, 2018; Sultana, 2021, 2022). In fact, shifts in narrative that draw attention to injustices and unequal power relations have rarely come from those with more power. Additionally, Eve Tuck argues that narratives that focus on documenting damage are built on colonial theories of change because they locate the power to change outside of communities (Eve Tuck, 2015). In many cases, it has been the voices of colonised peoples who have been responsible for challenging dominant and powerful narratives (Murdock, 2020).

Some broader examples include the shift towards discussion of critical climate justice in narratives around climate change, which focuses attention on social impacts and outcomes, reframing climate change as a justice issue, and offering a "praxis of solidarity and collective action" which Sultana (2022) argues can bring about the potential for more accountable action. This shift has roots in, and owes its momentum to, the social and environmental justice movements that community activists and non-governmental organisations have led, and which have created strong narratives that highlight how climate change, colonisation and environmental racism are all deeply intertwined (Pellow, 2016). Indigenous narratives of endurance can also disrupt the dominant narratives that seek to silence them (Davis & Todd, 2017; Howitt, 2020; Sze, 2015; Whyte, 2020, 2018) and, as discussed previously, highlight themes of care and relationality (Todd, 2017; Tschakert, 2012).

In an Inuit context, the Qanuippitaa? National Inuit Health Survey, which is Inuit-controlled and led, is collecting Inuit-determined health data, gathered with indicators and processes approved by Inuit organizations and informed by the insights of Inuit (including the social determinants of Inuit health) useful for planning action to support Inuit health, representative of the health strengths of Inuit, and with data collection guided by Inuit knowledge, values, and worldviews (Qanuippitaa? National Inuit

Health Survey, 2021). This provides some insights into what new narratives could look like; Indigenous created narratives that are both embedded in Indigenous priorities and have clear mechanisms for policy uptake (Qanuippitaa? National Inuit Health Survey, 2021).

There is a diverse range of ideological worldviews that will impact ideas about how to collectively move forward in the face of climate change (Tanner & Allouche, 2011). There will need to be space for narratives to be diverse, locally contextual, and to exist in plurality so that these narratives can reframe many things in multiple ways (Demaria, 2019; Escobar, 2020). Sultana (2022) suggests that this reframing must include "reformulations of institutional arrangements to foster solidarities across differences and redistribution of power" (p121), which in turn will require accountable collaboration in the transition away from existing, harmful power structures.

It is important to keep power in mind in discussions about attempts to shift narratives. This includes how power plays out in political participation, participation in research, representation in narratives and participation in the production of narratives. Alongside this, there is a need for critiques of powerful and dominant narratives that do not do justice to these issues or make space for other narratives (Tschakert, 2012). This includes thinking beyond the federal, territorial and provincial policy actors that produce the policy documents that have been analysed in this thesis to the diversity of other actors in the policy space, and the use of power analysis to situate policy narratives and the institutions creating and shaping them in broader hierarchies of power.

5.5 Limitations

This thesis has been based upon secondary analysis of data and existing sources of information. While many of the shifts in research approach and methodology have been responses to the ongoing pandemic and have included decisions to reduce travel and mitigate research burden on communities and research partners, there is a lack of direct Inuit voices in the research. Decisions were made throughout the research in order to draw as much as possible from existing interviews and direct quotes from Inuit, and from writing and reports authored by Inuit organisations, so that the research could strive to be aligned with Inuit priorities and perspectives.

The broader focus (primarily on Arctic North America) has meant that this research has not engaged deeply with the nuances of contextually specific root causes of disaster or local narratives of climate change and health. These are very important areas of inquiry, and the research in this thesis is just one piece of the puzzle in what will hopefully be increasing research into these questions at many scales.

5.6 Concluding thoughts and future research directions

This thesis has highlighted that dominant policy narratives that discuss the links between climate change and health in Inuit Nunangat fail to identify or address the root causes of harm to human health, instead proposing solutions that do not address power imbalances or histories of colonisation. Much research that does set out to engage Indigenous Knowledge holders in the modelling of climate-sensitive processes in the Arctic has been found to do so superficially and without engagement with Indigenous priorities or attention to power-shifting. This has revealed a number of key missed opportunities. There is a missed opportunity for policy narratives to identify and address the structural root causes of harm in the context of climate change, particularly where governance and policy is responsible for creating these. There is a missed opportunity to enable a greater degree of participation and leadership of Indigenous Knowledge holders in processes of climate-relevant knowledge production that can ensure that such knowledge production reflects Indigenous priorities and perspectives. Ultimately, there is a missed opportunity to create a dominant narrative about the links between climate change, health and the root causes of harm, that can reflect diverse and plural experiences of climate change, can identify the role of colonisation and power in shaping these inequitable experiences, and can engender and motivate change at all levels that addresses these root causes.

This thesis has highlighted the broader structural power imbalances between Indigenous governments and federal governance structures, including the constraining factors that present challenges and implementation gaps for transformative policy and governance, even in contexts of high self-determination. Indigenous governments undoubtedly already have a deep understanding of these dynamics, but findings of this thesis may be useful for Indigenous governments to elevate ongoing work on climate change policies and programming agendas within land claims regions, with an increased evidence base of the root causes of harm in the context of climate change potentially bolstering moves towards transformative policy change (ITK, 2018). In the context of increased calls from Indigenous scholars and policy-makers to use strengths based approaches (Walter, 2005; Tuck, 2009), participatory modelling frameworks, such as those used in this thesis, offer critical tools for Indigenous governments to understand how Indigenous Knowledge can and is being engaged in research and policy making at different levels, as well as the potential longer-term impacts of such engagement and how it might be measured to understand the influence of Inuit voices in governance. Considering the presence of Inuit narratives in wider policy is a potential way to look at this influence.

Future research should continue to ask how we can shift dominant narratives so that they do engage with the root causes of disaster, suggest policy solutions that tackle inequities and colonial legacies,

and centre Indigenous Peoples in the creation of these narratives. For this, we must be attentive to the role of governance in creating power shifts, but we must primarily look to the work of Indigenous scholars and activists, work that centres justice considerations, and focus on capacities, opens future possibilities, and offers hope.

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6 Appendices

6.1 Appendix A: Supplementary materials from chapter two

Table 6.1: List of Documents Included in Review

Peer reviewed journal articles
Akande, V. O., Hendriks, A. M., Ruiter, R. A. C., & Kremers, S. P. J. (2015). Determinants of dietary behavior and physical activity among Canadian Inuit: A systematic re- view. The International Journal of Behavioral Nutrition and Physical Activity, 12, 84. https://doi.org/10.1186/s12966-015-0252-y
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6.2 Appendix B: Supplementary materials from chapter 3

Table 6.2: Federal and regional governmental institutions of relevance

Level	Detail	Departments/ Ministries/ Programmes of relevance
Federal	Canadian Government	Government wide
		Health Canada
		Public Health Agency of Canada
		Environment and Climate Change Canada
		Environment and Natural Resources Canada
		Crown-Indigenous Relations and Northern Affairs Canada
		Indigenous Services Canada
		Women and Gender Equality Canada
		Canadian Centre for Climate Services
		Canadian Institutes of Health Research
		Infrastructure Canada
		Natural Resources Canada
		Public Safety Canada
		Transport Canada
Regional	Newfoundland and Labrador	Department of Environment and Climate Change
		Department of Health and Community Services
		Provisional advisory council on the status of women
		Nunatsiavut Government?
	Northwest Territories	Health and Social Services Department
		Lands Department
		Environment and Natural Resources Department
		Executive and Indigenous Affairs Department
		NWT Health and Social Services Authority
	Nunavut	Environment Department
		Department of Health
	Quebec	Quebec National Institute for Public Health
		Ministry for Health and Social Services
		Ministry of Sustainable Development Environment and the Fight Against Climate Change
		Agriculture, Environment and Natural Resources
		Health Public Safety and Emergencies
	Yukon	Department of health and social services
		Department of Environment
		Department of Community Services
		Women and Gender Equity Directorate

Table 6.3: List of included policy documents

	Name	Date	Scale	Institution	Type
1	Pan-Canadian Framework on Clean Growth and Climate Change		Federal		Plan
2	A Healthy Environment and a Healthy Economy	2020	Federal	ECCC	Plan
3	Canada's Climate Actions for a Healthy Environment and a Healthy Economy	2021	Federal	ECCC	Report on actions taken
4	Health Canada 2021-22 Departmental Sustainable Development Strategy	2021	Federal	Health Canada	Strategy
5	Science Narrative - Climate Change Impacts on the Health of Canadians	2017	Federal	Public Health Agency of Canada	Report
6	Environment and Climate Change Canada 2016–17 Report on Plans and Priorities	2016	Federal	ECCC	Report
7	Environment and Climate Change Canada 2021–22 Departmental Plan	2021	Federal	ECCC	Plan
8	Environment and Climate Change Canada 2017–2020 Departmental Sustainable Development Strategy	2017	Federal	ECCC	Strategy
9	Environment and Climate Change Canada 2019–20 Departmental Results Report	2020	Federal	ECCC	Report
10	Pan-Canadian Framework on Clean Growth and Climate Change: Third Annual Synthesis Report on the Status of Implementation	2020	Federal	ECCC	Report
11	Canada's Adaptation Communication to the United Nations Framework Convention on Climate Change	2021	Federal	ECCC	Report
12	Canada's 7th National Communication and 3rd Biennial Report	2017	Federal	ECCC	Report
13	Achieving a sustainable future winter 2021 update, a federal sustainable development strategy	2021	Federal	ECCC	Report
14	Federal Actions for a Clean Growth Economy - Delivering on the Pan-Canadian Framework on Clean Growth and Climate Change	2016	Federal	ECCC	Report
15	Strategy on Short-Lived Climate Pollutants – 2017	2017	Federal	ECCC	Strategy
16	Measuring progress on adaptation and climate resilience: recommendations to the government of Canada, expert panel on climate change adaptation and resilience results	2018	Federal	ECCC	Recommendations
17	Climate Science 2050: Advancing Science and Knowledge on Climate Change	2020	Federal	ECCC	Report
18	Strategic Assessment of Climate Change	2020	Federal		Strategic assessment (strategy)
19	Canada in a Changing Climate: National Issues Report	2021	Federal	NRC	Report
20	Adapting to the Impacts of Climate Change in Canada: an update on the National Adaptation Strategy	2021	Federal	ECCC	Report
21	Crown-Indigenous Relations and Northern Affairs Canada Departmental Plan 2021–22	2020	Federal	CIRNAC	Plan
22	2030 NWT Climate Change Strategic Framework 2019-2023 Action Plan	2019	Territorial	Government of Northwest Territories	Strategic framework (strategy)

23	Annual report 2019/20 Government of Newfoundland and Labrador, Environment, Climate Change and Municipalities	2020	Provincial	Government of Newfoundland and Labrador, Environment, Climate Change and Municipalities	Report
24	Health Effects of Extreme Weather Events and Wildland Fires: A Yukon Perspective	2020	Territorial	Government of Yukon, Health	Report
25	Our Clean Future 2020 annual report	2021	Territorial	Government of Yukon	Report
26	Our Clean Future, A Yukon strategy for climate change, energy and a green economy		Territorial	Government of Yukon	Strategy
27	Pan-Territorial Adaptation Strategy	N.d.	Territorial	Pan-territorial adaptation strategy (three governments)	Strategy
28	Framework Policy on Electrification and the Fight Against Climate Change	2020	Provincial	Government of Québec	Framework/plan
29	The way forward on climate change in Newfoundland and Labrador	n.d.	Provincial	Government of Newfoundland and Labrador, Municipal Affairs and Environment Climate Change Branch	Framework/plan
30	Working within the Territorial Health Context: A Framework to Understanding and Applying a Northern Lens		Federal		Framework/plan
31	2030 NWT Climate Change Strategic Framework		Territorial		Strategic framework (strategy)
32	NWT Climate Change Action Plan: Annual report 2019/20		Territorial		Plan
33	Canada's Adaptation Communication to the United Nations Framework Convention on Climate Change	2021	Federal	ECCC	Report
34	Canada's 2021 Nationally Determined Contribution Under the Paris Agreement	2021	Federal		Plan
35	Clean Canada: Protecting the Environment and Growing Our Economy	2019	Federal		Report
36	Inuvialuit on the front line of climate change	2016	Regional	Inuvialuit Regional Corporation	Strategy
37	Achieving a sustainable future: Draft federal sustainable development strategy 2022 to 2026	2021	Federal	ECCC	Strategy
38	Canada's Arctic and Northern Policy Framework	2019	Federal	CIRNAC	Framework
39	Federal Adaptation Policy Framework for climate change	2016	Federal	ENR	Framework
40	Health of Canadians in a Changing Climate: Advancing our knowledge for action	2022	Federal	Health Canada	Report

Table 6.4: Common narrative element codes that emerged from the policy documents

Narrative element		Narrative summary	Number of documents
Scene	Climate change and health framing	Climate change causes direct harm to health	33
		Climate change harms health indirectly through affecting underlying factors that contribute to health	19
		Climate change and social factors intersect to cause harm to health	7
		Underlying social factors and inequalities shape or create experience of climate change	4
	Vulnerability framing	People as vulnerable	18
		Location as a source of vulnerability	17
		Social determinants and inequality as a source of vulnerability	10
		Colonial legacies as a source of vulnerability	6
		Does not engage with discourses of vulnerability	2
Act	Solution	Work in partnership and collaboration to address climate change impacts	29
		Leverage knowledge and information to understand climate risks	25
		Build resilience to climate change	24
		Utilise innovative tools and technologies	19
		Provide help and support	14
		Provide funding	13
		Reduce emissions or mitigate climate change to protect health	12
		Pursue reconciliation, Indigenous self-determination, and Indigenous sovereignty	9
		Pursue engagement or participation of Indigenous Peoples	9
		Encourage community-level action	9
		Encourage capacity-building	9
		Pursue justice and equality	8
		Promote Indigenous leadership	6
		Provide health interventions	6
		Implement regulation and policy instruments	5
		Address food insecurity	4
		Address social determinants of health	3
		Security	1
		Address industry, development and environmental governance	1
		Care	1
		Resourcefulness	1
		Cultural programming	1
	Responsibility	Adaptation requires strong leadership from government	20
		Indigenous leadership is required to adapt to climate change	18
		Acting on climate change is a collective commitment/shared responsibility	11
		All Canadians have a responsibility to act to protect health from climate change	10
		Public services have a responsibility to protect health in the context of climate change	7
		The private sector has shared responsibility for climate adaptation	4
		NGOs and civil society have shared responsibility for climate adaptation	3
		Academia has shared responsibility for climate adaptation	2