

Exploring the Use of Managed Retreat in Canada's Policy Domain

by

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Author's Declaration

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Statement of Contributions

Exceptions to sole authorship:

Chapter 2: Cottar, S., & Wandel, J. (2024). Municipal perspectives on managed retreat and flood mitigation: A case analysis of Merritt, Canada after the 2021 British Columbia flood disaster. *Climatic Change*, 177(3), 50. <https://doi.org/10.1007/s10584-024-03707-4>

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Chapter 4: Cottar, S., Henstra, D., Thistlethwaite, J., Doberstein, B., Wandel, J. (Submitted October 24, 2024). Navigating Land Use After Managed Retreat: Decisions Facing Local Governments in the Post-Buyout Environment. *Environmental Hazards*.

I hereby declare that I am the lead author for all three manuscripts, and I served as the principal investigator for all three studies that pertain to this dissertation. I conceptualized the research, collected and analyzed research data, and drafted and submitted the manuscripts to reputable journals. I addressed the comments and feedback from peer-reviewers. My supervisor (Dr. Johanna Wandel) and collaborators (Dr. Brent Doberstein, Dr. Daniel Henstra, Dr. Jason Thistlethwaite) offered feedback, suggestions, and editorial changes for these manuscripts.

Abstract

The use of managed retreat is growing and will continue to evolve within Canada's policy domain to better adapt to the realities of climate change. Climate induced managed retreat involves the strategic relocation of people, assets and critical infrastructure from high-risk areas via the use of government funded property acquisitions (buyouts). Amid increased flood risks and rising recovery costs, communities in Canada have recognized that conventional approaches to flood risk management (FRM) are no longer sustainable and will require the use of practical policy solutions, such as managed retreat, that are cost-effective, politically viable, and publicly accepted. Given the growing adaptation deficit in municipalities, there is an inherent need to identify the policy gaps and barriers to implementation, analyze the policy levers, and explore opportunities for future managed retreat policy and program development.

Rooted in the climate change adaptation and disaster risk reduction literature, this dissertation explores the theoretical tenets of FRM, particularly the lack of alignment between flood risk governance, risk reduction and risk prevention through the empirical application of post-disaster managed retreat policies in Canadian communities. The current policy discourse in Canada focuses on the development of a subsidized national flood insurance program whilst provincial jurisdictions like British Columbia (BC) are contending with how to amend existing disaster and emergency management policies to effectively integrate community led managed retreat. Similarly, provinces like Quebec have significantly advanced in their progress and have implemented multiple buyout cycles as part of their disaster financial assistance programs. By analyzing multiple case studies across different timeframes during their recovery process, this dissertation investigates the complex post-disaster decision-making process amongst different levels of government and explores potential pathways towards building climate resiliency. Through three interrelated qualitative studies, this research documents the development, application and implementation of managed retreat buyout programming and its wider implications for communities.

The findings suggest that flood disasters often act as focusing events and open policy windows during the post disaster recovery stage providing an avenue for renewed disaster recovery discussions including the use of managed retreat as a policy tool which may not be politically justifiable in a proactive context. A case study analysis critically documents the recovery process by analyzing municipal perspectives on managed retreat and flood mitigation signaling a shift from a hazards-based to a risk-informed approach in Merritt, Canada after the 2021 flood disaster. Moreover, existing path dependencies

and outdated disaster policies can favour recovery decisions and limit the types of mitigation measures that are considered by jurisdictions. Likewise, the development of a buyout program for flood mitigation purposes should account for design considerations that include community led and pricing methodologies that follow an equity-based approach. While the use of buyouts is an important tool to become climate resilient, partially retreated communities must strategically develop land use plans that reconcile the benefits of floodplain restoration and provide recreational spaces for public use. A longitudinal study analyzes the institutional alignment of provincial buyouts policies and regulatory tools in Gatineau, Canada, five years after the Quebec Spring 2019 floods.

In broader terms, this dissertation ascertains that in the face of surging disaster costs and conflicting governmental priorities, the use of managed retreat will continue to grow and evolve within the Canadian policy arena as a viable climate adaptation and risk reduction strategy. As a result, this critique presents novel approaches for evaluating managed retreat policies to minimize the negative impacts on communities whilst maximizing the co-benefits. Moreover, this dissertation makes key contributions to the managed retreat literature by linking the topics of flood risk governance, flood risk management, and applied policy. The research provides valuable insights for policymakers on buyout policy development, program implementation, and long-term land use plans for communities in Canada.

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Dedication

This work is dedicated to my mom Manisha, the kindest and most inspiring person I know. You gave me the gift of dreams and the ability to realize them.

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List of Abbreviations

ARDM	Adaptation, Resilience and Disaster Mitigation
BBB	Build Back Better
BC	British Columbia
DCCRA	Disaster and Climate Risk and Resilience Assessment
CBA	Cost-Benefit Analysis
CCA	Climate Change Adaptation
CEPF	Community Emergency Preparedness Fund
C-EDR	Coldwater – Existing Dike Rebuilding
C-EPA	Coldwater – Expanded Protection Areas
C-LAP	Coldwater – Land Acquisition Program
CREEDO	Regional Council for the Environment and Sustainable Development of the Outaouais
DFA	Disaster Financial Assistance
DFAA	Disaster Financial Assistance Arrangements
DFO	Fisheries and Ocean Canada
DM	Disaster Management
DMAF	Disaster Mitigation and Adaptation Fund
DRM	Disaster Risk Management
ECCC	Environment and Climate Change Canada
ECCS	Environment and Climate Change Strategy
EDMA	Emergency and Disaster Management Act
EM	Emergency Management
EMBC	Emergency Management British Columbia
EMCR	Emergency Management and Climate Readiness
EOC	Emergency Operations Centre
EPA	Emergency Program Act
ESS	Emergency Support Services
FDRP	Flood Damage Reduction Program
FEMA	Federal Emergency management Agency (United States)
FMP	Flood Mitigation Plan

FNLP	First Nations Leadership Council
FRM	Flood Risk Management
FRP	Floodway Relocation Program
ICIP	Investing in Canada Infrastructure Program
IMT	Incident Management Team
LMFMS	Lower Mainland Floodplain Management Strategy
LRT	Light Rail Transit
MAMH	Ministry of Municipal Affairs and Housing
MAMOT	Municipal Affairs and Land Occupancy
MEFCCWP	Ministry of the Environment, the Fight against Climate Change, Wildlife and Parks
MELCC	Ministry of Environment and Climate Change Control
MERN	Ministry of Energy and Natural Resources
MPS	Ministry of Public Security
OCP	Official Community Plan
OPI	Ouvrages de Protection Contre les Innodations
ORE	Office of Research Ethics
PDA	Master Plan
PLRLF	Protection Policy for Lakeshores, Riverbanks, Littoral Zones and Floodplains
PPTFI	Territorial Protection Plan again Floods
PSC	Public Safety Canada
RDA	Rapid Damage Assessments
RDCO	Regional District of Central Okanagan
ROC	Recovery Operations Centre
ROI	Return on Investment
RSC	Resilience Support Centre
TEMHP	Transitional Evacuee Manufacturing Home Program
TRMFZBC	Transitional Regime for the Management of Flood Zones, Banks and Coastlines
UBCM	Union of British Columbia Municipalities
WLRS	Water, Land and Resource Stewardship
ZIS	Zone d'Intervention Spéciale/ Special Intervention Zone

Chapter 1

Introduction to Dissertation

1.1 Research Context

In recent decades, climate change induced disasters, such as floods and wildfires, are growing in both occurrence and severity (Jetten et al., 2021; Thistlethwaite et al., 2018). Flood hazards in particular are threatening where people live, their livelihoods, properties, critical infrastructure, transportation routes, and the social fabric of communities themselves. In Canada, the costs of disasters have ballooned from an average of \$8.3 million per event in the 1970s to an average of \$112 million between 2010-2019, totaling over \$18 billion in insured losses (Canadian Institute for Climate Choices, 2020). Concerns over increased flood risks and rising disaster recovery costs are prompting governments to consider alternative forms of adaptation, such as managed retreat and flood insurance, as opposed to exclusively relying on conventional structural flood mitigation measures (e.g., sea walls, dikes, flood gates) to build climate resilience. Consequently, flood hazards can lead to patterns of displacement, relocation and retreat from high-risk areas (Binder et al., 2015; Carey, 2020). As a result, long term risk reduction approaches are needed to support vulnerable communities, enhance their adaptive capacity and build resilience to future climate risks (Cinner et al., 2018).

Mitigating and adapting to climate change is a priority for Canada, as demonstrated through the national adaptation strategy (NAS) and strategic investments in floodplain mapping, climate modelling, disaster financial assistance, and structural/ natural infrastructure projects (Government of Canada, 2023a). Approximately 80% of federal disaster assistance payments have been allocated to flooding disasters and flood-related damages cost Canadians an average of \$430 million annually (CBC News, 2020). In 2021, the Government of Canada committed to creating a new low-cost national flood insurance program to protect homeowners at high risk of flooding, as well as to develop a national action plan to assist those at the highest risk of recurrent flooding to relocate. Despite commitments from upper levels of government, these risks are increasingly falling on the shoulders of municipalities who must assume the burden of adaptation.

In recent years, Canadian governments have begun to develop and implement managed retreat policies via property buyouts – a policy tool used to acquire properties in high-risk areas to avoid repeated flood losses. Specifically, managed retreat is distinct from other kinds of climate related migration in that it entails not just relocating a community but also redeveloping land for recreational purposes or restoring it back to its original state (Siders, Hino & Mach, 2019). Executing

community-scale relocation can have significant benefits and transform social, environmental, and economic systems (Siders, 2019). Retreat plans that are developed with a long-term goal of risk reduction can transform the community and incite behavioural changes at the household level. Appropriately designed and implemented property buyout programs can reduce exposure to hazards, allow for the restoration of natural floodplains with protective functions and provide a long-term cost-efficient and sustainable solution for governments. However, most relocation programs in Canada have been top-down, ad-hoc and non-collaborative, further marginalizing vulnerable populations.

The current discourse on managed retreat is grounded in literature on either climate change adaptation or disaster risk reduction. According to the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report, climate change adaptation is defined as the “the process of adjustments to actual or expected climate stimuli and its effects in human or natural systems” (Agard et al., 2014, p. 1758). Alternatively, disaster risk reduction signifies “both a policy goal or objective, and the strategic and instrumental measures employed for reducing disaster risk through prevention, mitigation and preparedness” (Adger et al., 2014, p. 1763; UNISDR 2015). Historically, these two disciplines have been independent of one another and operated as mutually exclusive despite sharing common priorities of strengthening resilience to changing risks (Field et al., 2012; Thomalla et al., 2006), enhancing disaster preparedness for effective response (UNISDR, 2015), employing risk assessments to reduce risk transfer (Field et al., 2012), building adaptive capacity (Cinner et al., 2018), and reducing existing exposure, hazards and vulnerable conditions (Agard et al., 2014). Both fields are of particular importance to researchers, policymakers, practitioners, and government entities as they facilitate the development of informed, evidence-based decisions that can help communities adapt to the changing climate.

The origins of managed retreat date back to the late 1990s appearing in early IPCC First Assessment reports on alternatives to coastal protection which considered applications of coastal zone management and mitigation tools to move assets away from eroding shorelines (Abel et al., 2011; Hino, Field & Mach 2017; Kousky, 2014). This strategy was first developed for coastal communities as an adaptation to erosion risks and sea level rise, but it quickly garnered attention for its usefulness and potential applicability in communities that faced chronic inland flooding (Doberstein et al., 2018). As illustrated by the City of Vancouver’s *Climate Change Adaptation Strategy* and the City of Surrey’s *Coastal Flood Adaptation Strategy*, both municipalities are actively considering retreat as a policy option along with continued reliance on technical protection measures to avoid damages

caused by sea level rise, fluvial and pluvial flooding (Doberstein et al., 2020). Retreat can also be categorized as one of three kinds – traumatic post-disaster retreat, chaotic, market-driven retreat, or forward-looking managed retreat (Dundon & Abkowitz, 2020).

The Sendai Framework for Disaster Risk Reduction recently addressed retreat as a risk reduction option that could be pivotal in facilitating land use planning in recovery stages (Greiving et al., 2018; Siders et al., 2019; UNISDR, 2015). This policy priority indicates that institutions are recognizing that climate change will exacerbate existing vulnerabilities (Adger, Arnell & Tompkins, 2005; Adger et al., 2007). It is important to note that retreat is a common thread in the broader migration, displacement, and resettlement literature. Efforts to integrate retreat into community adaptation plans are underway across Canada with many governments investing into adaptation and risk reduction measures, conducting impact assessments, and planning for future climate scenarios. More recently, managed retreat has re-emerged as an effective adaptation and risk reduction option, where previously it was regarded as unfeasible or unnecessary.

The application of retreat strategies provides an alternative to other costly structural protection (e.g., dams, beach nourishment) and accommodation measures (i.e., elevated properties, wet/dry proofing) that have the potential to fail (Hino, Field & Mach, 2017). For example, in 2021 British Columbia saw disastrous flooding with multiple municipalities, such as Merritt and Abbotsford, reporting breached dikes and the failure of critical pump stations (Owen, 2023). These structural protection measures can provide a false sense of security and encourage development in high-risk areas, making them maladaptive in nature (Siders, 2019). These threats, combined with the inflated costs of protection (e.g., coastal defences) and limits to accommodation (e.g., static elevations, retrofits), suggest that retreat from some locations will become inevitable (Mach et al., 2019; Siders, 2019). For example, the Government of Quebec in 2019 included buyouts as part of its disaster recovery assistance program, which allowed residents to retreat after experiencing consecutive years of flooding (Cottar et al., 2021). In many jurisdictions, this policy change is rationalized because the damage sustained is too expensive and offering repeated or unlimited compensation to disaster victims is an unfair burden on taxpayers (Cottar et al., 2021). As such, retreat is the only strategy ‘that effectively eliminates risk’ (Freudenberg et al., 2016).

It is important to acknowledge that managed retreat may not always be the most appropriate or preferred adaptation approach (Alexander et al., 2012). For instance, the consideration of retreat

options for Indigenous communities living on reserve lands can be contentious because of their strong place attachment to their ancestral grounds, history of forced expropriation and the lack of alternate reserve lands available for purchase (Siders, 2019). Other communities may not be equipped with the financial resources to retreat and thus must stay in place and rebuild or “build back better” (BBB) after a flood disaster (Fernandez & Ahmed, 2019; Maly 2017; UNISDR, 2015). Although a retreat option may prevent future damage, limit recovery costs, and provide numerous ecological benefits, this option is not feasible for everyone. Simply put, the ‘one-size fits all’ model may not be suitable for all cases as community needs and resource capacities differ amongst one another (Adger et al., 2007). There is a gap in managed retreat policy in the Canadian domain with many communities wondering how ‘managed retreat’ will fit into their climate change adaptation plans.

1.2 Research Objectives

The overarching goal of this research is to advance the climate change adaptation (CCA) and disaster risk reduction (DRR) scholarship by analyzing the role of managed retreat within Canada’s ever evolving policy landscape as a politically viable, cost-effective, and successful strategy to eliminate future flood risk and strengthen climate resilience. To date, there has been minimal documented research on managed retreat in Canada, especially concerning how decisions are made about managed retreat policy and programming in post-disaster environments, the types of adaptations considered in a post-disaster environment, the policy levers that enable the use of this adaptation, and finally the policy design, planning and implementation of buyout programs in communities. The first manuscript uses a case study approach to depict how managed retreat is conceptualized at the municipal scale immediately following a disaster. The second manuscript examines the issue more broadly with a focus on the provincial context, particularly addressing how provincial disaster management policy changes either support or do not support municipal flood mitigation initiatives. The third manuscript uses a case study approach to document the post-buyout land use changes in a community that has partially retreated. To this end, three qualitative interrelated studies were conducted about the use of property buyouts in Canadian communities, each with its own research questions (RQ) and objectives:

1. **Research Questions for Study 1:** (RQ1) What factors lead local governments to pursue a retreat or rebuild decision as the community transitions from a response phase to recovery operations, finally towards a long-term flood resiliency? (RQ2) What types of policy instruments (e.g.,

lifetime limits to disaster aid, buyout compensation, regulations prohibiting future development) are considered in the immediate post-flood environment, and how do these evolve during the post recovery period?

Objective 1: Engage a diverse range of stakeholders (including emergency operations center (EOC), recovery operation center (ROC), resilient support center (RSC), municipal representatives involved with flood recovery and long-term planning in the areas of finance, engineering and housing) involved in the post-disaster recovery process and document the discussions had by decision makers about flood mitigation planning, community recovery challenges, transitional supports, and the intersection of data, funding and policy.

Objective 2: Conceptualize gaps between climate risks and existing municipal/provincial disaster recovery policies and explore different policy pathways for transformative change.

2. **Research Questions for Study 2:** (RQ1) How and why are municipalities in British Columbia developing managed retreat policy? (RQ2) What disaster management policies were in force over the 2021 to 2024 period, and what role did they play in municipal post-disaster recovery in relation to the development and implementation of flood mitigation plans?

Objective 1: Evaluate the causality between provincial emergency and disaster management policy changes and broader flood mitigation program outcomes for municipalities through a post-disaster recovery lens.

Objective 2: Interview policymakers to analyze the impact that provincial disaster recovery legislation and funding mechanisms have on emergency response, post-flood recovery, and long-term mitigation in communities like Merritt after the 2021 British Columbia flood disaster.

3. **Research Questions for Study 3:** (RQ1) Since the inception of Quebec's buyout program, what policy changes have occurred between 2019-2024 and how do those changes align with other provincial/ municipal disaster management and land use policies? (RQ2) In partially retreated communities, how are municipalities managing vacant lots, and to what degree is there a sense of strategic community visioning for post-retreated land?

Objective 1: Document the policy changes in the provinces flood management regime and assess the post-buyout land use decision making process in post-disaster environments.

Objective 2: Assess the spatial and temporal changes Gatineau, five years after the spring 2019 floods to evaluate the long-term impacts of buyouts in partially retreated communities.

1.3 Outline of Dissertation

This dissertation is written in a manuscript-style format composed of five chapters. This introductory chapter (**Chapter 1**) provides an overview of the climate change adaptation, disaster risk reduction and managed retreat literature, outlines the context of managed retreat in Canada, and describes how the proposed research addresses literature gaps identified by international scholars. The body of the dissertation is divided into three chapters (Chapters 2, 3, and 4). Each of the chapters presents its own set of research questions, literature review, methodology and results, but are conceptually aligned and build upon one another.

Chapter 2 titled “Municipal Perspectives on Managed Retreat and Flood Mitigation: A Case Analysis of Merritt, Canada after the 2021 British Columbia Flood Disaster” is published in the journal *Climatic Change*. By framing the 2021 British Columbia flood disaster as a focusing event, this study examines the different types of adaptations (e.g., investments in climate resilient infrastructure, rebuilding, construction of structural mitigation, zoning, buyouts) considered by policymakers in a post-disaster environment in advance of official municipal decisions. This research provides an empirical contribution to the disaster risk reduction and managed retreat literature in Canada by exploring the preliminary discussions among decision-makers surrounding long term risk reduction options including rebuild and retreat strategies, perceptions of flood risk, recovery challenges faced by small-scale municipalities, the development of the community’s flood mitigation plan, and recommendations for post-disaster transitional supports. The research results indicate that communities in the post-disaster recovery phase, such as Merritt, are considering the use of buyouts as a risk reduction tool amongst other flood mitigation strategies indicating that buyouts are emerging as a policy instrument within the wider Canadian policy arena.

Chapter 3 titled “From Flood Mitigation Plans to Property Buyouts: Evaluating Disaster Risk Management Policy Changes in British Columbia, Canada Through a Post-Disaster Recovery Lens” is under review in the journal *Mitigation and Adaptation Strategies for Global Change*. Using a post-disaster recovery lens, this study builds on the findings from Chapter 2 and assesses British Columbia’s myriad of disaster management policies to analyze how policy changes are impacting the development and implementation of municipal flood mitigation plans that include the use of property

buyouts. This study documents how certain provincial policies and funding programs influence the types of structural or non-structural mitigation measures that are adopted by municipalities and highlights the importance of property buyout program design considerations that account for pricing methodologies that rooted in an equity-based approach. This research offers an applied policy contribution to the flood risk governance literature by using a case-study to exemplify the tenets of flood risk management, specifically the need for resources and the adequate coordination of responsibility to eliminate policy gaps and redundancy between different levels of government.

Chapter 4 titled “Navigating Land Use After Managed Retreat: Decisions Facing Local Governments in the Post-Buyout Environment” is under review in the journal *Environmental Hazards*. This longitudinal qualitative study builds upon the work of Cottar et al. (2021) and outlines the long-term impacts of post-disaster decisions on flood risk management practices, land use plans and buyout policy changes in Quebec since the 2019 spring floods. The research assessed the long-term changes in policy development and evaluated the alignment between intergovernmental policies related to property buyouts and post-retreated community plans through the lens of Gatineau, a community that has partially retreated. This research offers insights on how governments can develop flood protection plans that integrate regulatory tools, buyouts, and land use planning guidelines to become more climate resilient. Given that research on buyouts is sparse in Canada, this research offers an empirical contribution to the literature by examining the long-term ecological and social impacts on partially retreated communities that have implemented buyouts.

Chapter 5 summarizes the broader research findings, highlights their contributions to the wider flood risk management and disaster risk reduction literature, and presents an agenda for future research and practice. Specifically, this chapter describes how the dissertation addresses theoretical, applied policy, and empirical research gaps identified by international scholars in the literature. Additional information (e.g., interview theme guides, participant recruitment and information letters) can be found in the Appendices section.

Chapter 2

Municipal Perspectives on Managed Retreat and Flood Mitigation: A Case Analysis of Merritt, Canada after the 2021 British Columbia Flood Disaster

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In response to the catastrophic flooding that occurred in British Columbia, Canada in November 2021, the City of Merritt is facing a difficult decision about whether to rebuild or not. The developing situation in Merritt provided a unique opportunity to explore the different types of adaptations (i.e., investments in climate resilient infrastructure, rebuilding, construction of structural mitigation, zoning, and buyouts) considered by policymakers in advance of official municipal decisions. Through qualitative mixed methods (e.g., interviews, open houses, town council meetings), the study explored preliminary discussions among decision makers surrounding long term risk reduction options including rebuild and retreat strategies, perceptions of flood risk, recovery challenges faced by small-scale municipalities, the development of the community's flood mitigation plan, and recommendations for post-disaster transitional supports. The results indicated that communities in the post-disaster recovery phase are considering the use of buyouts as a risk reduction tool amongst broader flood mitigation strategies, however policy constraints and a lack of funding are impeding the implementation of a flood mitigation plan that includes buyouts. The findings suggest that decisions about post disaster recovery are often independent of broader municipal climate change adaptation plans instead focusing on short-term risk reduction mechanisms. Additionally, transitional supports including interim housing need to be accounted for in recovery planning. Governments in Canada can capitalize on the policy windows during the post-disaster recovery stage and learn from municipalities about the challenges and opportunities in the design and implementation of flood mitigation plans that can help to improve disaster policy.

2.1 Introduction

The November 2021 British Columbia (BC) flood disaster is considered one of the costliest severe weather events in Western Canada. Starting on November 13, 2021, an unprecedented amount of rain fell across the province resulting in mudslides, destroyed roads, failure of critical infrastructure, flooded homes, and displaced communities, leaving the province in a state of emergency. Consecutive impacts led to major supply chain issues, variability in municipal post-disaster response efforts, and years of recovery and flood mitigation planning for many communities in the Lower Mainland. Estimates suggest that the flood events across Southern BC were estimated to have topped \$675 million in insured damage (IBC, 2022). In this paper, we examine the state of BC's disaster policies and evolving flood-related disaster management 1.5 years after the 2021 flood disaster through the lens of one of the hardest-hit communities, Merritt.

From a policy decision-making perspective, undoubtedly, there are lessons learned about the response and recovery process that unfolded in many BC communities, including Merritt. At present, there is limited research on the post-disaster decision-making process in Canada (see studies conducted in the US by Binder et al., 2015; De Vries & Fraser, 2012), especially regarding the types of adaptation options considered in a post-recovery environment. Moreover, there are many questions about how decisions are made about managed retreat as an adaptation to flood disasters, and the policy design, planning, and implementation of community mitigation measures. This paper summarizes the literature on policy windows and its applicability to managed retreat, before situating the study on Merritt's recovery process and future flood mitigation plans. We examine ongoing decision-making in Merritt by exploring observations made by flood recovery specialists with respect to funding, information, and Canadian disaster management policies. The study will also focus on tracing the development of Merritt's flood mitigation plan and identifying the types of transitional supports needed in communities' post-disaster.

2.2 Policy Windows and Managed Retreat

Are disasters an opportunity for instituting change? Similar to focusing events, disasters can be 'policy windows' that can lead to important agenda setting opportunities (Birkmann et al., 2010; Kousky, 2014; Michaels et al., 2006; Solecki & Michaels, 1994). These predominantly arise in extraordinary circumstances where the normative policy environment is disturbed, and a calamity is needed to trigger innovation (Bubeck et al., 2017; Kousky, 2014). Particularly, flood disasters can

provide a window of opportunity (Kingdon, 1995) for policy change as they create an environment for governments to reevaluate existing programming and take a chance to rebuild differently, advocate for proposed alternative policies such as nature-based solutions, or lobby for retreat strategies via the use of buyouts for communities at highest risk (Birkmann et al., 2010; Vries, 2017; Kousky, 2014; Solecki & Michaels, 1994; Thistlethwaite et al., 2019). These policy windows allow for new and existing stakeholders to become engaged in the issue which can lend itself to problem reframing (Birkmann et al., 2010) and innovative solution thinking leading to more resilient communities. However, flood crises do not always result in immediate policy change indicating that discussions about potential policy changes need to be proactively planned for in advance (Bubeck et al., 2017). For instance, the Government of Quebec revamped its disaster financial assistance program in 2019 to include a buyout option after experiencing catastrophic flooding in 2017, citing the need for renewed policy change that reflected current climate conditions. On a temporal scale, windows of opportunity can be capitalized on by emergency managers to provide homeowners with information that would enable them to make a more informed decision about whether to accept a buyout (De Vries, 2017). Additionally, they can heighten public attention on the issue, facilitate positive social change and prepare vulnerable populations for similar disasters (Henstra & McIlroy Young, 2021; Silver, 2019).

One adaptation option that has gained attention in communities that are prone to recurrent flooding is managed retreat (i.e., planned relocation or strategic retreat). Climate induced managed retreat can be defined as “the purposeful, coordinated movement of people and assets out of harm’s way” (Siders, 2019). In western industrialized nations, this form of adaptation typically employs government funded voluntary buyouts as a policy tool to enable retreat from flood prone areas in a post-disaster environment (Siders, 2019; Dundon & Abkowitz, 2021). Buyouts are a type of property acquisition program that allow for governments to purchase private properties from willing homeowners through a one-time offer, demolish the structure and then revert the land back to its natural state (Siders & Gerber-Chavez, 2021). Managed retreat involves land acquisition, which includes relocation programs, land trusts, conservation easements, and most commonly, buyouts (Siders, 2013). These mechanisms are used in conjunction with land use planning policies, legislative tools, and zoning bylaws to limit future development of high-risk areas (Cottar et al., 2021). Overall, managed retreat is a contentious strategy that has its own implementation challenges, social complexities, administrative deficiencies, political limitations, and legal restrictions that can hinder its

effectiveness (Hino et al., 2017). Though, this has not hindered governments from forcing people to move in the name of development and regeneration projects, for example relocating residents to acquire transit corridors to build light rail transit (LRT) (Koslov, 2016).

Post disaster environments create optimal conditions and provide opportunities for the use of property buyouts. Mainly, policy windows are made up of three streams (e.g., political, policy, problem) which converge together in the aftermath of a disaster (Michaels et al., 2006). Firstly, the political stream actively considers public opinion and the current political landscape (Michaels et al., 2006) – there is little evidence in Canada to show that buyout programs are solely a by-product of community driven action and not already considered part of the larger institutional agenda especially for communities who are at highest risk.

Secondly, the policy stream focuses on potential solutions or adaptations to the problem during the recovery phase (Edmund et al., 2017; Michaels et al, 2006) – this is by far the most critical step as it details division of responsibilities and the different combinations of structural/ non-structural measures that will be used in disaster recovery (Johnson & Priest, 2008). This is where non-structural measures like managed retreat can emerge, taking multiple forms such as targeted independent buyout programs of high-risk areas, amending existing disaster aid programs to support retreat programming in addition to the use of natural or engineered defences, and limiting rebuilding and servicing of critical infrastructure in partially retreated lands (Kousky, 2014). For example, in 2018 the City of Grand Forks in British Columbia was devastated by record floods triggering the removal of 140 properties through a targeted buyout program funded by the federal and provincial government (Keystone Consulting, 2021).

Thirdly, the problem stream concentrates on characteristics and patterns with the problem (Edmund et al., 2017; Michaels et al., 2006) – common examples include mass media attention on the focus event and policy problem or the feasibility of implementing a retreat strategy in a historically significant community that has faced recurrent flooding such as what was seen in Calgary with the 2013 floods. In Canada, there has yet to be research focused on how post-disaster policy windows have created opportunities for the development of a provincially administered buyout program. The following study identifies policy windows in the aftermath of the 2021 British Columbia flood disaster, a focusing event, that provided an avenue for renewed disaster recovery discussions, and

perhaps new provincial policy formulation about retreat and buyout programming to be considered by decision-makers.

2.3 Merritt and the 2021 British Columbia Flood Disaster

Merritt is a city located in between the Lower Mainland and the Interior in the regional district of Thompson-Nicola in the province of British Columbia. Situated at the confluence of the Nicola and Coldwater Rivers, Merritt borders several First Nations communities (Coldwater, Lower Nicola, Nooaitch, Shackan, and Upper Nicola). Historically, the city was built on resource industries such as logging, ranching, and mining but has since shifted focus to become a retail and service hub (City of Merritt, 2022a). The estimated population of Merritt in 2021 was 7,606 (Government of British Columbia, 2022a) living in 3,149 dwellings with the average property assessed at \$259,321 CAD (City of Merritt, 2022b). Located at the intersection of the Coquihalla and the Princeton-Kamloops Highways, the city serves as a stop for travellers visiting the Interior and Okanagan regions as well as a major transportation corridor between Western and Interior Canada (City of Merritt, 2022a). In 2021, British Columbia was hit by a series of atmospheric river events bringing unprecedented precipitation causing mudslides and widespread flooding across the lower mainland region sending the province into a State of Emergency and displacing nearly 20,000 people (CTV News, 2022; Government of British Columbia 2022b).

The BC flood disaster had a direct impact on 17 regional districts including the cities of Abbotsford, Merritt, Princeton, and Vancouver (Global News, 2021). On November 15, 2021, the Coldwater River breached its banks and flooded Merritt forcing mass evacuations (CBC News, 2021; City of Merritt, 2022a). By 4pm on November 15, access into the city had been prohibited for the safety of the public and residents were evacuated to the neighbouring cities of Kamloops and Kelowna (City News, 2021). The southern interior community estimated that upwards of 7100 people were displaced due to the extreme flooding that resulted in the failure of the municipality's wastewater treatment plant and the inundation of transportation infrastructure including the Middlesborough Bridge (Fig. 1) and major highways along the Coldwater River (CBC News, 2021). Water levels in the City of Merritt increased steadily through the following week causing widespread damage to private property, critical infrastructure, and rendered transportation routes inaccessible.

By November 20, the city of Merritt started conducting rapid damage assessments (RDA) in the flood zone with support from BC Housing, Merritt's building inspection and fire departments, the

City of Kamloops, and the Ministry of Forests, Lands, Natural Resource Operations (CBC News, 2021). The RDA's suggested that a number of homes in the 1:200-year flood elevation were uninhabitable, while numerous others were heavily damaged and irreparable. On November 22, 2021, the city released their three phase *Return Home Plan*, outlining when and who could return home safely, and the types of services (e.g., gas, groceries, medical) that would be available (CBC News, 2021). By late November, the provincial government announced that disaster financial assistance (DFA) was available for those impacted by the floods and for anyone who was unable to obtain insurance to cover disaster related losses (CBC News, 2021). The amount of financial assistance approved for reach accepted claim is 80% of the total amount of eligible damage that exceeds \$1000, to a maximum claim of \$400,000 up from the previous \$300,000 limit (Government of British Columbia, 2022d).



Figure 1: (Left) Barriers are posted along the Voght Street after the Middlesborough Bridge collapsed during the floods. (Right) 8 months post flood event, debris is scattered on the street as residents try to remediate and salvage their homes (Cottar, 2022).

By December 2021, the city estimated that 226 properties still remained on evacuation order with municipal authorities working on finding alternative temporary housing arrangements for displaced residents (City of Merritt, 2022). The following weeks saw the continued efforts of the Emergency Operations Center (EOC) and the Merritt Support Centre, organized clean-up efforts and debris removal by local volunteers, the deployment of disaster relief agencies (e.g., Red Cross, Samaritans Purse) across the Thompson-Nicola Regional District, and the development of Merritt's

Flood Resilience Plan which outlined the City's plans for floodplain protection with a particular focus on buyouts and floodplain relocation. By March 2022, the City of Merritt had estimated that 600 residents were still displaced and unable to return home (CBC News, 2022).

In mid-April 2022, the provincial government announced that ten BC communities would receive \$53.6 million in funding, of which Merritt received \$24.25 million, to support recovery work, restore infrastructure, conduct small scale recovery capital projects, and implement feasibility studies (Government of British Columbia, 2022c). Out of the \$24.25 million, the city decided that \$11.75 million would be dedicated for housing solutions that range from temporary modular homes to 3D printed homes with the remaining \$12 million going towards infrastructure and recovery funding to help the community (Merritt Herald, 2022). Early flood recovery estimates indicated that the local government had explored options for 20 3-D printed homes and 40 new mobile homes, dispersed 6200 cubic meters of rock for bank stabilization and dike repair, and distributed 2580+ supplies of clean up equipment (City of Merritt, 2022c). Additionally, the province provided Merritt with \$329K to update their flood hazard maps and conduct hydrotechnical assessments to develop new flood mitigation plans (Government of British Columbia, 2022e). By June 2022, the City of Merritt had rescinded all evacuation orders, but many residents were still unable to return home, with countless still waiting on DFA from the province. In February 2023, the Ministry of Emergency Management & Climate Readiness approved \$2 million in funding for the City's Public Works to Canford Avenue Dike Project (City of Merritt, 2022g).

The 2021 British Columbia floods provides communities such as Merritt with a prime opportunity, perhaps not by choice, to rethink their municipal planning and consider a variety of long-term flood mitigation strategies that would help make the community more climate resilient. This paper explores some of those preliminary discussions had by decision makers surrounding long term risk reduction options including rebuild and retreat strategies, perceptions of flood risk, recovery challenges faced by small-scale municipalities, and recommendations for future scenario-based disaster planning.

2.3.1 Description of the Study

Previous studies have identified decision-making factors (policy type, compensation, and place attachment) and processes that have led homeowners to participate in a buyout program (Binder et al., 2015; De Vries & Fraser, 2012; McNeil et al., 2015). However, there is little understanding of

the factors considered leading to decisions to pursue managed retreat at the municipal or provincial scale. The majority of managed retreat research takes place after a formal decision has been made by governments to fund buyout programs providing both a gap and opportunity to document how such options emerge on the local agenda.

The dynamic situation in Merritt provided a unique opportunity to explore the possible adaptation options (i.e., investments in climate resilient infrastructure, rebuild/elevate properties, use of engineered defences, zoning, buyouts) considered by policymakers before deciding on the retreat or rebuild course of action. Firstly, this study assesses the factors that lead local governments to pursue a retreat or rebuild decision, as the community transitions from the response phase to recovery operations, and finally towards long-term flood resiliency. Secondly, it analyzes the various policy instruments that are considered in the immediate post-flood environment, and how these evolve during the post-recovery period (e.g., lifetime limits to disaster aid, buyout compensation, regulations prohibiting future development in high-risk areas). This research provides key insights into both the factors that influence post-disaster recovery decisions, including managed retreat decisions by government authorities. Furthermore, this could contribute to a better understanding and development of a broader provincial or federal buyout program.

2.4 Methods

This study used a qualitative mixed methods approach to analyze the community of Merritt from a post disaster perspective spanning from November 2021 till February 2023. The research utilized primary and secondary sources to construct a timeline of events and capture responses from key stakeholders involved in the disaster recovery process. Prior to data collection, ethics approval was obtained from the Office of Research Ethics (ORE) at the research teams' institution. Primary data was collected by the authors via informal, semi-structured interviews in the Summer of 2022 with members ($n=17$) of the emergency operations centre (EOC), recovery operations centre (ROC), resilience support centre (RSC), and other key municipal representatives who were involved with flood recovery and long-term planning in the areas of finance, engineering, and housing. The goal of this quick response disaster research was to learn from recovery professionals' that were in the disaster zone and document the decisions that unfolded whilst identifying potential policy windows that could be used to propose and implement retreat or rebuild options. It is important to note that homeowners were not interviewed for this study. Given that many affected residents were either in

the process of filing for DFA or displaced from their home and living in temporary housing, researchers had no means to get in touch with these participants. Additionally, the researchers acknowledge that flood disasters can have negative impacts, both in the short-term and long-term, on psychosocial and mental health (Burton et al., 2016), and thus did not want to inflict more trauma on affected residents as they navigate their personal recovery.

Purposeful, snow-ball sampling was used to identify other potential interviewees who would fit the study criteria and would be knowledgeable in a professional capacity about the flood recovery process in Merritt. Key informant interviews were scheduled accordingly, and informed consent was obtained from all participants prior to partaking in the interview. Interviews were conducted virtually or in-person ranging in length from 50 to 60 min and were recorded, transcribed, and coded for data collection purposes. Rooted in grounded theory methodology (Corbin & Strauss, 2008), manual axial coding was used to develop a set of 18 thematic concepts, and then later used to identify connections between these themes which ranged from community preparedness, challenges faced by small-scale municipalities, intergovernmental affairs, transitional recovery supports, policy and planning limitations, and discussions about long term flood risk management measures. A set of open-ended prompts were posed to Canadian interviewees to examine the post disaster decision making process, identify policy gaps, and explore the role of retreat and rebuild strategies within municipal climate change adaptation plans. Some of the prompts included:

1. Recount your experience of the 2021 flood disaster, recovery efforts, emergency management procedures, disaster impact on Merritt.
2. Outline the community's perception of flood risk, retreating, and rebuilding.
3. Role of various agencies in recovery.
4. What challenges/ service gaps do local governments face in post-disaster recovery?
5. Are property buyouts an effective way to reduce flood risk for the highest risk properties? Why? What types of considerations are important in a buyout program?
6. Opinions and recommendations about future climate change adaptation/disaster assistance programming.

The interviews focused on recovery needs assessments, flood disaster experience, social and economic dimensions of recovery, operational challenges faced by local governments, data sharing

and availability between organizations, and transitional housing and financial supports following the 2021 flood disaster. Additional primary data was also collected via observations of virtual public town hall recovery sessions ($n= 12$) from November 2021 to February 2023, and an in-person community flood recovery open house ($n=1$) held by the city in late June 2022 which proposed possible flood mitigation measures to the public. Secondary sources in the form of public municipal reports and presentations (e.g., Official Community Plans, Flood Mitigation Plan, Housing Needs Reports, Strategic Plans, Transitional Housing Program) were gathered to illustrate timelines, validate program details, examine flood hazards maps, and review existing provincial disaster mitigation policies via document analysis.

2.5 Results

2.5.1 Key Observations from Flood Recovery Specialists

Data collected after the 2021 flood season provided ample insights into how flood recovery specialists coped with the ongoing recovery and the overwhelming challenges faced by small-scale municipalities regarding emergency planning, distribution of risk information, and delivery of basic operational services. Similar studies (De Vries & Fraser, 2012) have outlined that both homeowners and city workers tasked with flood recovery were overwhelmed by the emotional and infrastructural impact of the disaster. Flood recovery is a huge undertaking for any community especially if there aren't experienced personnel in place handling day to day operations to identify strategies and resources that will help the community recover and become more resilient.

After the initial weeks, an EOC (Emergency Operations Center) recovery operations team was formed with internal and contracted specialists focused on the areas of critical infrastructure, housing, environment, community health and wellness, finance, communications, and a cultural liaison who were positioned to guide recovery efforts, share critical information between the government and the public, and work towards transitioning Merritt from a short-term recovery plan to a long-term resiliency plan. Many participants noted the importance of subject matter experts (SMEs) who had the expertise to carry out specific tasks that were pertinent to the recovery process especially in regard to information sharing and acute long-term decision making.

I would say that I do not believe that council is best suited to handle it [recovery operations]. The skill sets are not always the same. Some of those jobs are not directly related to their post. They are not subject matter experts in this. They are also elected. They want to be re-elected. None of that actually works well with making decisions, strategic decisions about these things. You need subject matter experts, consultants, etc.

Despite having an EOC team onsite, many City staff took on additional roles related to recovery support which was beyond the normal scope of their job in the months following the floods. For the most part, participants were adamant that it was critical to differentiate roles and responsibilities between local actors and the recovery team from the onset of the disaster to avoid the spread of misinformation, improve the organizational workflow, and create realistic expectations on how the ‘return home’ process would unfold for residents. Many expressed that recovery teams were not familiar with the local landscape and benefited from having local staff working in both areas to maintain business continuity in key functions. The city also employed *Community Navigators* and case workers to identify and meet with all homeowners/ renters in the flood zone to inform them about the resources (e.g., food, shelter) and services (e.g., emotional, financial, and psychosocial supports) available to them via DFA, Red Cross, Salvation Army, Samaritans Purse, and other private charitable organizations. Participants noted the importance of having this service available to evaluate the recovery needs of the most vulnerable populations (e.g., seniors, low-income), and allocating funds to prioritize the needs of the community.

Without the understanding that if you don't have community navigators that go knocking on doors, you will not get the 82-year-old widow down to the Support Center... the province wouldn't actually fund community navigators to go door to door knocking on places. So, we had to bend our job description of it. And then Salvation Army actually stepped in and said, hey, we'll come forward, and we'll fund these positions.

Adding to the concerns, staff turnover and retention was a major challenge that the city had to navigate in the months after. Staff that were allocated to the response and recovery portfolios mentioned the immense stress with juggling multiple areas leading to burn out, and the emotional toll they experienced from working with frustrated residents. One of the respondents noted that numerous non-profit organizations and individuals volunteered with the cleanup of residential properties and worked with the EOC for relieving overworked staff in the initial weeks of response. Others cut their losses and pursued new opportunities in neighbouring cities. Though, the city continued to operate as best as possible with reduced capacity following flood-related staff reorganization (City of Merritt, 2022h). One key informant noted that the city reported losing 60% of their staff over that period of time. In an initiative to retain staff and increase morale, the City of Merritt began their one-year trial of a compressed four-day work week starting in November 2022 (City of Merritt, 2022e). Despite receiving financial support from the Province of BC for public works and housing initiatives, the city did not receive administrative support from provincial authorities on the management aspect of

running the EOC which led to the city bringing in expertise from the Regional District of Central Okanagan (RDCO) and the BC Wildfire Service Incident Management Team (IMT) to help support operations. As such, municipalities are often left to fend for themselves with respect to the operationalization of EOCs, administration of resiliency support centers, and organization of disaster logistics. By early 2023, the federal government paid over \$1 billion in disaster payments to BC via the Disaster Financial Assistance Arrangements (DFAA) program (Government of Canada, 2023). Disasters like the 2021 floods emphasize the downloading of responsibility from upper levels of government to municipalities.

When you're in a small muni...people don't have the training or experience to run an EOC & don't understand anything about emergency management. Some people learn quick, but it would have been super helpful to have the province dialed in. EMBC [Emergency Management BC] just lets you hang. You know what, this is the municipalities responsibility. If you guys didn't train, then that's your fault. I would give them an F-grade on supporting the EOC. Basically, they say file the paperwork, and then we'll approve some of the funding requests that you have, but you're on your own for management.

2.5.2 Challenges Related to Funding, Information, and Policy

Funding was and still continues to be a major challenge in Merritt's flood recovery journey, as is such the case in many communities across the Lower Mainland. Similar to other Canadian provinces, the province of British Columbia via the Ministry of Emergency Management and Climate Readiness (EMCR), formerly Emergency Management BC (EMBC) administers two disaster financial assistance (DFA) programs – one targeted for individuals, small businesses, farms, and charitable organizations and another for Indigenous communities and local governments (Government of British Columbia, 2022d). The latter program is intended to help communities recover by providing partial reimbursement for eligible infrastructure repairs which focuses on rebuilding or replacing essential public infrastructure to a pre-disaster condition (Government of British Columbia, 2022e). However, many participants noted that due to DFA program restrictions, it was difficult to secure funding for other parts of the recovery process such as project management, and administration which further burdened day-to-day municipal operations. The lack of available funding at the provincial level left Merritt scrambling to find other sources.

The problem is that the province of BC doesn't fund anything to do with recovery, except for vital infrastructure. So, there's DFAA at the federal level. Feds distribute money to the provinces, and BC runs the DFA. So, if there's critical infrastructure that was compromised in the flood, the DFA program will handle that but there's no funding

for the project management or human aspect of it, there's no funding for the 747 invoices over and above what we have due to flood. The fact that the municipality has so much more administration building permits to bear.

The DFA program for homeowners also raised concerns about limits on assistance, application deadlines, the need for prescriptive claims, eligibility thresholds, and processing periods. Analogous to the DFA program for municipalities, the homeowner targeted program is intended to provide financial assistance up to a maximum claim of \$300,000 with accepted applications being paid at 80% of the amount of the total eligible damage (Government of British Columbia, 2022d). Conditions attached to the disaster assistance dictated that the claims for the cost of repair or reconstruction of a structure to pre-disaster condition in a disaster-prone area would need to meet the prevailing building code (Government of British Columbia, 2022d). Participants – both local government and citizens, at public town hall recovery sessions maintained that the provincial disaster financial assistance offered was insufficient to make basic repairs, leaving many to dig into their personal savings and consider alternatives like cutting their losses and moving. Additionally, there were significant disparities noted by participants when it came to claimable items and repair costs. It was noted that approximately 85% of the town was uninsured, leaving many reliant on government assistance which took months to process and left some homeowners unable to return home (Participant 6). Prolonged application processing times left households in Merritt stalled in the rebuilding phase. Additionally, an overwhelming number of participants raised concerns about rebuilding in a flood prone area just to be bought out a few years later and indicated that it would be financially wiser to buyout those homes which were beyond repair.

I'll take BC, for example, the restrictions, processes, and policies are not archaic, but have not kept up with what is actually happening. The maximum amount you could get from DFA is \$300K whether your house is worth \$2 million or not. I'm not saying governments should be insurers, but there's something to fix there. Either you're in it or you're not because half the effect is really hard on people where you've got a \$100k mortgage and DFA is giving you \$40K. Well, I'm walking away, which is what we're seeing happening, people are leaving because they can't afford the mortgage. And that's not uncommon for a lot of places.

More broadly, participants discussed the interjurisdictional challenges met by local government when it came to information and data sharing amongst key recovery actors. There were mixed responses amongst participants who observed challenges in establishing data sharing agreements between municipalities and other charitable organizations. Prior to any data sharing agreements, it was conceivable that all actors were collecting their own household recovery data

resulting in duplicative efforts. In a larger context, participants suggested that additional flexibility be afforded to local governments who required this information from private organizations to start making early damage assessments and short-term decisions about who could return and when they could return home.

I've mentioned to the province... the needing a better way to deal with data and policy. Not just the province, not the feds, but Red Cross policy, city policy. And, you know, provincial governments have to figure out a way to work better with Red Cross before this stuff happens. And be better at working with people and the cities to bring the people back. So back to the data. It's been a struggle every month to find out how many people are in hotels, and out of the city, so we're collecting it and they're collecting it, but the current policy doesn't allow to share it. So, lots of policy and data sharing that did or didn't happen between parties.

2.5.3 Developing Merritt's Flood Mitigation Plan

In early 2022, the City of Merritt began developing a long-term flood mitigation plan (FMP) with consultants from *Associated Engineering* to present multiple potential flood mitigation options to Council and the public (Fig. 2). Project objectives included providing robust flood protection to reduce future risk; having low capital, operational, and maintenance costs; limiting the impact to property and environment, maintaining river access, and providing recreation opportunity, developing a plan that considers ease of implementation; and providing room for the Nicola and Coldwater Rivers (City of Merritt, 2022f).

In late June of 2022, the city held a flood recovery open house to consult the public on the flood mitigation plan which included an array of rebuild and managed retreat options with consideration of structural and non-structural measures. The proposed plan included a multi-step approach to seek guidance and feedback on what mitigation efforts should be implemented to protect Merritt against future riverine flooding and more broadly climate change impacts. The FMP developed proposed seven conceptual options which included: do nothing/status quo, full floodplain retreat, waterside diking, and combination diking (i.e., use of both waterside diking and setback diking).

The “status quo” option meant that the city would do nothing, and no future flood mitigation work would occur all with an expected recovery cost of \$579 M (City of Merritt, 2022f). The second option involves a full floodplain retreat involving large scale property buyouts to relocate people and structures with an estimated cost of \$764 M (City of Merritt, 2022f). The third option emphasizes

waterside diking which entails the design and construction of new diking systems on the banks of the Nicola and Coldwater rivers with some waterside properties being impacted, all with an appraised cost of \$176M (City of Merritt, 2022f). The fourth option highlights the use of combination diking primarily focusing on the use of setback and waterside dikes to protect existing natural and developed features along both rivers with an estimated cost between \$121-\$167M (City of Merritt, 2022f). As of now, Merritt's preferred flood mitigation choice is a combination of the options listed above as it uses a blend of structural and non-structural measures to become more flood resilient. For governments that are even willing to broach the idea buyouts in their FMP, it emphasizes that retreat is doable under the right circumstances.

The FMP was developed for city planning purposes and has no formal funding attached to the project for implementation. At the time of conception, Merritt had not secured any provincial funding and had backstopped the project from a municipal basis. Subsequently, federal funding constraints with the Disaster Mitigation and Adaptation Fund (DMAF) saw the closure of the program in the second intake (July 2022) by Infrastructure Canada, leaving the city to secure funds from other sources. As of January 2023, the DMAF program has reopened and the City has begun to collate a submission along with exploring other avenues such as the Adaptation, Resilience and Disaster Mitigation (ARDM) program under the Investing in Canada Infrastructure Program (ICIP) - Green Infrastructure Stream which is jointly funded by the federal and provincial government (Government of British Columbia, 2022g). Although the "piecemeal" funding opportunities from the provincial and municipal governments are helpful, they do not cover the amount needed to become more flood resilient (Norwell, 2022). Despite engineering plans to support the FMP, the city is hoping that the federal government will step up to alleviate some of the project costs.

And we need to need another \$167 million for the diking for both rivers. What we've learned just recently is that the Disaster Mitigation Adaptation Fund (DMAF) is available, but we're only looking at about 40% recovery from that, and perhaps another 40% from the province. But that leaves \$35 million for citizens to be able to pick up this cost, when a 1% increase in taxation equates to only \$85,000. This just isn't going to work. But there has to be some other funds available for us to be able to rebuild. Whatever diking plan we build also affects our managed retreat plan. We tell residents they should rebuild but can't guarantee that their home may have to be moved. Nor can we tell them that the money they currently put into their home will be reimbursed. And these costs are pretty substantial for those having to pay the bill.

The development of Merritt's FMP saw additional considerations about the community's use of structural flood mitigation (e.g., setback and waterside dikes) measures and acquisition tools such


as property buyouts. Participants noted it would be difficult to complete the dike upgrades without first acquiring properties along the Coldwater River which are needed to accommodate for the footprint of the dike. A targeted managed retreat strategy would allow for the development of the waterside dike and prevent any future re-development from occurring. Despite no formal policy on buyouts, community actors expressed that the plan would only be successful if 100% of properties in the targeted area were relocated to enable the wider flood risk management strategy to avoid a ‘swiss cheese’ issue. Although there was initial community resistance to the idea of buyouts, many acknowledged the wider implications of the strategy to achieve flood resilience often referring to it as “the sacrifice of a few to save the rest of the town”. Even when retreat is justified as necessary, as is Merritt’s case for the construction of new diking infrastructure, there continue to be political and financial obstacles (Koslov, 2016).

Because in order to actually put in good flood mitigation programs or infrastructure, you need the room to do it. And if you’ve got a piecemeal approach, I think it would be challenging to put in infrastructure. I guess the question would be, not whether or not they’re allowed to stay and make their choice around that, but what they’re allowed to do with the money, you know. It would be expensive; it might be less effective. And then what, people are living right next to a dike?

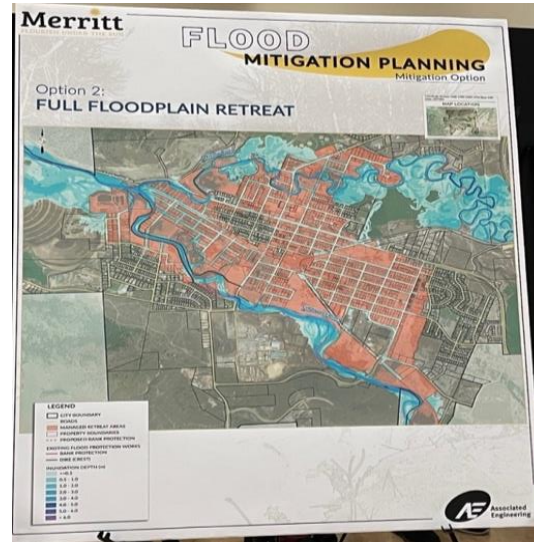
In the case of BC, the absence of a managed retreat policy and funding program has forced decision makers to pilot innovative retreat governance methods (Hanna et al., 2021). That being said, when municipalities are developing their FMP, they have the opportunity to institute network governance which focuses on power-sharing between different stakeholders and the use of voluntary managed retreat strategies through negotiated agreements as opposed to the conventional top-down governance framework (Hanna et al., 2021). For example, this could include negotiations between local governments and individual homeowners on the type of compensation they receive which could include the provision of moving top-ups or relocation subsidies. Given where Merritt is in their recovery process, the municipality could look to engage with homeowners before a buyout strategy is rolled out to alleviate community tensions, build trust, and improve program uptake.

Merritt FLOOD MITIGATION PLANNING
Option Summary & Opinion of Probable Cost

OPTIONS:	OPTION 1	OPTION 2	OPTION 3	OPTION 4a, 4b, 4c
NAME	Status-Quo	Full Floodplain Retreat	Waterside Diking	Combination Diking
DESCRIPTION	<ul style="list-style-type: none"> Do nothing. No future flood mitigation works in City of Merritt. Costs are future flood damages. 	Large-scale retreat from floodplain areas in City of Merritt.	Design and construct new diking systems on banks of Nicola & Coldwater Rivers.	Design and construct new diking systems on and setback from banks of Nicola & Coldwater Rivers.
PROPERTY IMPACTS	Future overland flooding is possible across floodplain areas in City of Merritt.	Major impact to existing property and future land development opportunities in City of Merritt.	Some impacts to properties situated along rivers in City of Merritt (partial and full buyouts, or right-of-ways).	More impacts to properties situated along rivers compared to Option 3.
OPINION OF PROBABLE COST (\$ MILLION)	\$445 - 580	\$587 - 764	\$135 - 176	4a. \$121 - 158 4b. \$129 - 168 4c. \$126 - 165



a.



b.



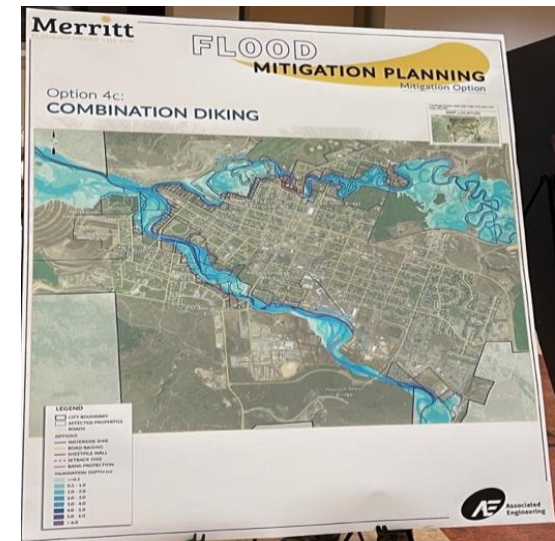
c.



d.



e.



f.

Figure 2: Flood mitigation plans developed by Associated Engineering for Merritt. **a** A flood mitigation plan depicts 4 comprehensive options that is showcased to the public at a flood recovery open house in June 2022. **b** Option 2 categorized as a full floodplain retreat is graphically represented on a flood map. **c** Option 3 represented as waterside diking is shown on a flood map. **d** Option 4a categorized as combination diking includes the raising of roads and setback dikes. **e** Option 4b includes setback dikes behind the mobile home park. **f** Option 4c includes waterside diking upstream of the Houston Street Bridge (Cottar, 2022).

2.5.4 Investing in Transitional Housing Supports

Housing is one of the major challenges faced by communities in the aftermath of a flood disaster. A key factor associated with post-disaster decision making is the reintegration of displaced residents by way of transitional housing. Participants working in a EOC and ROC capacity noted that the lack of access to temporary housing (e.g., hotel) during the initial months of recovery affected residents' ability to recover and led to people permanently moving away. As of June 2022, a participant estimated that 130 families were still living in temporary shelters with many still relying on Red Cross emergency supports outside of the community (City of Merritt, 2022g). Given that Merritt has a rental vacancy rate of 0%, it was critical for the city to develop a long-term housing strategy that would replace some of the housing stock lost in the flood and provide subsidized accommodations for residents. Moreover, participants reiterated the value of a rapid housing program to act as a social safety net for residents that were most impacted by the floods.

With a budget of \$8.5 M from the BC Ministry of Municipal Affairs, the Transitional Evacuee Manufactured Home Program (TEMHP) was established by the City of Merritt to provide housing at 70% of the market rate (City of Merritt, 2022g). Majority of the funds were used to purchase 31 mobile homes to provide temporary housing for flood affected evacuees for a period of 4-24 months at which point residents were then able to transition to a permanent rental or buy the property outright (City of Merritt, 2022g). The TEMHP was developed in two phases with the initial phase targeting flood affected residents based on information from Red Cross and Merritt case workers and the latter phase open to all residents affected by the flood-induced rental shortage. Practitioners were able to identify a housing gap which was further exacerbated by the floods leading to a renewed municipal initiative to address the housing deficit and provide additional non-market and supportive long-term housing options for community members.

2.6 Discussion

This study conducted in Merritt after the 2021 flood disaster revealed major gaps in existing Canadian disaster risk management policy whilst highlighting temporal windows of opportunities for wider policy diffusion. Though some provincial governments, such as Quebec, have started to amend their disaster management policies to include a buyout option, BC has yet to develop a policy or program that allows for this form of adaptation to occur in communities' post-disaster. In the course of this study, we found that community and government stakeholders generally favored improved

flood protection and rebuild options over the use of buyouts as a flood mitigation strategy though there was an appetite to see an interim provincial buyout/retreat policy with guaranteed funding. This preference in a rebuild strategy can be traced back to existing policy and structural path dependencies in small-scale municipalities whereby long-standing diking systems make it more challenging to pursue other costly adaptation options like buyouts which reduce the tax base and can threaten the community's long-term sustainability. Recognizing these policy gaps, Merritt consciously explored different policy streams at the provincial level to provide insights on how existing policies and funding streams could be amended to facilitate the development of their flood mitigation plan.

2.6.1 Lack of Political Will and Policy Entrepreneurship

We identified two main findings: the lack of political will within higher levels of government to pursue managed retreat policies post-disaster, and the consequent emergence of local actors who took on an entrepreneurial role to advocate for the revision of disaster management policies. Firstly, political interest is highest in the immediate aftermath of a disaster though after the 2021 BC floods in Merritt, there was little evidence at the provincial or federal level that supported the use of community-scale buyouts apart from the provision of fiscal resources to aid in critical infrastructure recovery and disaster mitigation-related projects. Much of the discussion surrounded securing funding to reduce and mitigate the risks of floods through the use of rebuild techniques and increased flood protection (e.g., dikes) to make communities more resilient as opposed to trying to eliminate the risk itself. Though, these focus events triggered the appointment of a new provincial cabinet position focusing on Emergency Management and Climate Readiness (EMCR) in December 2022.

Secondly, political actors may be hesitant to support buyout programs as this directly conflicts with the housing shortage issue in Merritt. By taking away properties, the government reduces the housing stock making it more challenging to attract newcomers and industry into the community. However, the community has made significant investments through the TEMHP to address the rental housing need. High uptake of the TEMHP meant there was an evident gap in housing availability even before the disaster. Additionally, the commitment to include buyouts as part of a larger flood mitigation plan that aligns with Merritt's risk reduction initiatives makes the program more politically feasible. Thirdly, timing is a crucial factor when it comes to enacting political action. Unlike the buyout program in Quebec, the provincial government of BC did not capitalize on the post-disaster policy window to introduce a buyout program and instead focused on returning afflicted communities back to normal. Two years post-disaster, constituents in Merritt have started to

disengage from the buyout policy issue diminishing the interest of senior political actors (Henstra and McBean, 2005).

Despite there being a lack of political interest to pursue a formal managed retreat program, there were policy entrepreneurs within the local government that sought to gain attention to the issues and advocated for the development of a provincial buyout/acquisition policy that could be implemented in Merritt to further progress the city's FMP. In order to successfully capitalize on policy windows, multiple conditions need to be met including institutional conceptualization of risk, institutional strength and flexibility, and effective policy entrepreneurs (Solecki & Michaels, 1994). With no designated provincial flood buyout policy, funding stream or administering authority, policy entrepreneurs within local government in Merritt were able to identify a policy problem affecting their community and subsequently started networking with other communities, like Grand Forks, to learn more about their policy innovations that targeted inundated properties (Mintrom, 1997). This form of intercommunity learning provided Merritt with the basis to develop and table their own form of an acquisition (buyout) program which was part of their larger FMP to the province of BC. Although, it is yet to be decided if the buyout program will be supported either through a larger provincial buyout strategy or a targeted one-time community grant. Empowering community efforts necessitates eliminating political obstacles (i.e., red tape) and making resources available in pre-disaster settings so municipalities don't have to compete for these funds in the disaster aftermath (Hino et al. 2017). What is known is, that there is a provincial wide need for a buyout program that would aid local governments in delivering risk reduction and resilience initiatives.

You had Grand Forks in 2018. And now you have Merritt. It happens enough that we should have policy. But it happens infrequently enough that it's not somebody's problem. They've fixed Grand Forks and now they're trying to link Merritt along with a bulk distributed disbursement of money without actually putting any policy or thought behind it. So, if it continues to happen, that will be a very expensive approach. Probably not a great approach without internal government projects, academic projects to talk about what this should look like, and what price tag as a society, we're willing to pay for this. Because without that, we just have financings like Grand Forks and Merritt has, on a one-off basis, which is just probably going to result in poor end results, because somebody will get absolutely nothing.

The efficacy of any program, especially large-scale flood mitigation projects, are generally dependent on the support and governmental backing they receive from political actors (May 2005; Thistlethwaite et al. 2023). Looking across Canada, there are multiple examples of post-disaster

retreat that were considered politically contentious at the time due to divergent interests and tensions amongst different levels of governments, but strong political will and alignment of policies allowed for the development of these programs. For example, the Government of Alberta introduced the Floodway Relocation Program (FRP) to voluntarily relocate homeowners from the riskiest areas as a direct result of the 2013 floods implying provincial political support for resilience-based flood management though they faced criticism due to low program uptake (Bogdan 2019). Nevertheless, there was evidence of political will in High River when the municipality lobbied to higher levels of government to include the neighborhood of Wallaceville, which was previously excluded, in the provincial buyout program (Thistlethwaite et al., 2023). Similarly, Quebec saw heightened political attention and government mobilization in the aftermath of the 2017 and 2019 floods when the province established a provincial wide buyout program that saw continued funding and regulatory support (Cottar et al., 2021). In both cases, elected officials expressed political support in favor of these types of policies whether they were one-off buyout programs or part of a larger flood mitigation plan. In comparison, the Government of BC is not considering leading managed retreat processes in communities though they are developing policy on how to respond to community-led, managed retreat initiatives which may or may not benefit Merritt in the future (Luymes, 2023).

2.6.2 Short-Term Risk Reduction or Climate Change Adaptation

Whether the development of Merritt's FMP is considered a short-term risk reduction strategy or part of a longer-term climate adaptation plan remains to be seen. From a policy decision making process, flood mitigation planning be it long or short-term, has been viewed in the literature (see Driessen et al. 2016; Tariq et al. 2020) as a risk reduction method with the aim of identifying the areas most prone to flooding, and determining the best alternative for flood damage reduction (Heidari 2009). In Merritt's case, a comprehensive FMP was needed even before the flood disaster because of infrastructure vulnerabilities but was only developed in reaction to the disaster when the city was obligated to consider alternative forms of structural measures. The qualitative interviews with flood recovery practitioners suggested that proactive adaptation (e.g., dike upgrades) was difficult to economically justify in a small municipality due to resource constraints (i.e., low budget) and conflicting priorities. Furthermore, funding received from provincial and federal counterparts to date has been for recovery and disaster mitigation-related projects.

Despite publicized plans to use buyouts to acquire properties along the Coldwater River, it is uncertain whether managed retreat will be built into the community's future climate change

adaptation strategy or official community plan (OCP). Participants noted it was likely that the outcomes (i.e., infrastructure decisions) of the FMP would be integrated into Merritt's future climate adaptation strategy to build flood resilience. Without a buyout program to acquire the properties needed for the dike footprint, it is highly probable that the damaged homes will end up on the market followed by rebuilding in the floodplain. Moreover, the city has yet to develop a land use policy or regulation to limit/prohibit redevelopment for properties in the targeted dike area which can lead to perverse outcomes for the wider community. At the provincial level, there are files that support cross ministry coordination to enhance BC's resilience through the Climate Preparedness and Adaptation Strategy, and the BC Flood Strategy which work to build back better from recent disasters (Government of BC, 2022h). Regardless, these programs are still a few years away from implementation and do not support the quick response needed to advance Merritt's FMP. As such, retreat heavily relies on support from institutions that have their own priorities which can be different from a local governments' priorities (Koslov, 2016).

2.6.3 Study Limitations and Future Directions

As is the case with quick response research, there are limitations to this study. Given the timeline of the research, it is important to note that in-person data collection was permitted with Covid-19 safety protocols. Firstly, timing in relation to data collection in the form of in-person interviews presented some challenges. Given that the flood disaster occurred in November 2021, and ethics approval was obtained in May 2022, the research team was only able to collect primary data (i.e., interviews) and conduct field visits in June 2022. As such, we noticed personnel turnover in the EOC, and job functions were adapted to suit the recovery plan. Regardless, the interviews that were conducted were representative of the EOC organizational structure. Secondly, the concentrated sample size and similarity of professional experience amongst key informants was a key limitation. Although the data does not directly reflect the perceptions of affected homeowners, majority of the participants interviewed resided in Merritt and experienced the flood disaster firsthand. Regardless of the limitations, this research is needed to better understand how Canadian municipalities make decisions about the disaster recovery process and the considerations that go along with developing a flood mitigation plan.

Based on the results of this study, there are several directions for future research. Whether or not, Merritt receives governmental support for their flood mitigation plan, additional research is needed to explore the medium to long-term implications of those decisions (e.g., use of structural vs.

non-structural measures) on the community. A follow-up study could prioritize insights from affected homeowners on their preferred mitigation and adaptation strategies which could be indicative of their experience navigating recovery programs. Knowing that flood mitigation plans are complex and often involve the use of multiple mechanisms such as buyouts, structural mitigation or working with upstream communities, further research is required to compare the effectiveness of a tailored buyout program that is developed in conjunction with an existing FMP and a standard province wide buyout program. Given the lack of Canadian literature on this topic, these research avenues are integral to bridging the gap in jurisdictional variation on flood mitigation policy and programming.

2.7 Conclusion

The 2021 BC flood disaster revealed the adverse impacts of human-induced climate change to communities across Canada. However, the disaster also provides a window of opportunity for governments to shift from a reactive to a proactive governance approach that supports recovery and prioritizes investing in risk reduction that goes beyond the use of structural mitigation, including nature-based solutions, land use planning tools, and managed retreat (Safaie et al., 2022). By learning from the post-disaster recovery process, communities can consider their natural hazard risks and work to develop strategic plans that integrate the areas of land use development, climate adaptation and flood mitigation, housing, and economic recovery. Thus, this research study illustrates the post-disaster recovery process, explores the discussions had by decision makers about flood mitigation planning, details the effectiveness or lack thereof of existing disaster provincial policies, and offers recommendations about future retreat programming. Examining the floods through a post disaster lens offers insights related to community recovery challenges, funding deficits, policy and administrative gaps, transitional supports, and the need for data sharing between governmental and non-profit organizations. These experiences are critical to shaping new and improved disaster recovery policies. Furthermore, the results suggest that FMPs developed in the aftermath of disaster are most often tied to short term risk reduction mechanisms rather than long-term municipal plans about climate change adaptation.

As the city passes the two-year anniversary of the 2021 floods, there are many unanswered questions about the city's future flood mitigation prospects. Despite the political uncertainty and major funding setbacks, the city of Merritt has continued on their road to recovery. Similarly, as flood affected communities continue to recover and advocate for long term viable flood mitigation

strategies, it is of crucial importance that Canadian municipalities capitalize on the window of opportunity and seriously consider the use of retreat for the highest risk properties.

In order for managed retreat to be implemented in BC and other Canadian jurisdictions, extensive amendments and alignment of policies need to be made to existing provincial/federal disaster financial assistance programming in order to allow for this form of climate adaptation. Pursuing retreat requires democratic debate and collective decision-making because there is no “one-size fits all” model (Koslov 2016). Moreover, these emergencies underscore the administrative and financial resources required in response and recovery with many communities calling on more support in the form of policy, training, and committed funding from senior levels of government.

Chapter 3

From Flood Mitigation Plans to Property Buyouts: Evaluating Disaster Risk Management Policy Changes in British Columbia, Canada Through a Post-Disaster Recovery Lens

Cottar, S., Doberstein, B., Wandel, J., Henstra, D., Thistlethwaite, J. (submitted May 22, 2024). From Flood Mitigation Plans to Property Buyouts: Evaluating Disaster Risk Management Policy Changes in British Columbia, Canada Through a Post-Disaster Recovery Lens. *Mitigation and Adaptation Strategies for Global Change*

Given the increased frequency and rising costs of disasters, provincial governments in Canada are revamping their disaster and emergency management policies to better reflect the realities of climate change. This paper assesses British Columbia's (BC) myriad of disaster management policies through a post-disaster recovery lens to analyze how policy changes are impacting the development and implementation of municipal flood mitigation plans that include the use of property buyouts specifically after the 2021 BC flood disaster. Using qualitative mixed methods, we document how certain provincial policies and funding programs influence the types of structural or non-structural mitigation measures that are adopted by municipalities and highlight the importance of property buyout program design considerations that account for pricing methodologies that are rooted in an equity-based approach. We found that disaster policies in BC are shifting from a hazards-based to a risk-informed approach. The results indicated that flood risk management is difficult to implement without the adequate resources and multi-level governance in spite of the demand at the municipal and regional levels. Moreover, there is a growing impetus from Canadian municipalities, such as Merritt, to develop their own community-led property buyout programs to advance their flood mitigation plans, despite a lack of provincial investment in managed retreat programming.

3.1 Introduction

Under the threat of climate change, flood disasters are growing in frequency and intensity in Canada, which will require a mix of policy tools to adapt and cope with the increasing risks. The 2021 British Columbia (BC) ‘atmospheric river’ flood disaster was a focusing event for governments and insurers, who were forced to deal with the costly aftermath. It has since been documented that BC’s disaster and emergency management policies were outdated, under-funded and did not address the needs of vulnerable communities at the time of the 2021 flood event (Charlebois, 2023; Xu & Hunter, 2023). In response to the extreme weather events in BC, many governments across Canada are in the process of developing improved disaster management policies and funding mechanisms that emphasize climate preparedness and risk reduction. In BC, the provincial government has revamped its Provincial Flood Strategy, introduced a new Emergency and Disaster Management Act, and added a climate change readiness mandate by elevating Emergency Management British Columbia (EMBC) to the Ministry of Emergency Management and Climate Readiness (EMCR) (Cottar & Wandel, 2024; Fionda, 2023; Hoekstra, 2023). This paper evaluates BC’s changing disaster management policies through a post-disaster recovery lens and assesses how these policy changes have affected the development and implementation of municipal flood mitigation plans (FMPs) in Merritt, a community that has been actively working on flood recovery and mitigation since November 2021.

Canadian studies have generally found that disaster management policies have failed to integrate mitigation and risk reduction approaches into their policy design (Deschamps, Bourdeau-Brien & Boudreault, 2023; Haque, Choudhury & Sikder, 2019; Henstra & McBean, 2005; Raikes et al., 2022). This study focuses primarily on how disaster risk management (DRM) policy changes in BC have influenced municipal flood mitigation planning with an emphasis on the emerging use of property buyouts. Additionally, we incorporate homeowner perspectives and document how these policy approaches have impacted their recovery journeys. In light of the increased probability of recurrent flooding and rising value of at-risk assets (e.g., private properties, infrastructure), we document how certain policies and funding programs directly influence the types of mitigation measures that are proposed and implemented by municipalities in a post-disaster environment. This paper summarizes the evolution in policy approaches to flooding as seen primarily in developed countries, before assessing the legislation and policy changes in BC. We also highlight program design considerations for buyout pricing methodologies that are integral to advancing municipal flood

mitigation plans. This research finds that communities in Canada will have to consider unconventional options to become more flood resilient.

3.2 Background

3.2.1 Evolution in Policy Approaches for Flood Risk Management

Globally, approaches to flood risk management (FRM) have evolved gradually from an emphasis on engineered, structural flood defense to “living with water”, whereby occasional flooding is expected and accommodated (Butler & Pidgeon, 2011; Johnson & Priest, 2008). Historically, engineered structures (e.g., levees, sea/flood walls, dams, dikes, channel diversions) were employed to divert flows and defend densely settled areas from flooding (Sayers et al., 2015). “Keeping the water out” was a system wide perspective before the twentieth century, at which point flood management evolved to combine structural engineering with non-structural social mitigation measures (e.g., buyouts, zoning bylaws, forecasting, warning systems, community awareness, insurance) (Sayers et al., 2015). Non-structural measures are social practices that can be employed to mitigate or alleviate the impacts of flood disasters by reducing vulnerability without the use of conventional defensive infrastructure (Tariq et al., 2020). The most common non-structural measures that are reflected in global flood risk management practices include risk-based investments, long term spatial and land use planning, flood resilient building regulations, backcasting and forecasting, public awareness campaigns, evacuation preparedness plans, and insurance arrangements (Sayers et al., 2015). Increasingly, flood risk management is being pursued in an adaptive manner as climate change affects the nature of the flood risks being experienced by communities.

The use of an adaptive risk-based flood management strategy not only allows for adjustments to existing flood policies, but also recognizes the most effective strategies that can meet the needs and demands of vulnerable communities whilst preserving vital ecosystem services (Tariq et al., 2020). Globally, the most evident change in flood risk management policy is a pivot away from a ‘direct approach’, which aims to reduce disaster losses, towards an ‘indirect approach’ which relies on the resilience of the system to recover autonomously from the losses fairly quickly (Tariq et al., 2020). Direct actions can typically be identified as those that provide flood relief, flood control, or aid in recovery in the aftermath of a disaster (Tariq et al., 2020). Fundamentally, direct approaches aim to reduce the vulnerability of people living in high-risk areas, whereas indirect approaches aim to decrease indirect loss by fostering the ability of the system to persist if disturbed by a disaster whilst

simultaneously offering opportunities for nature and landscape development (Sayers et al., 2015; Tariq et al., 2020; Vis et al., 2003).

Notable examples of this shift to indirect approaches include the Netherlands' 'Room for the River' (Van Herk et al., 2011; Vis et al., 2003), Germany's 'Flood Control Act' (Tariq et al., 2020), and England's 'Making Space for the Water' (Johnson & Priest, 2008) initiatives, which have shifted from a reliance on traditional river training and levee construction measures, to adopting a more nature-based approach which restores the river's natural floodplain. These programs put a heavy emphasis on shared responsibility between a variety of public and private stakeholders (e.g., developers, water authorities, insurers, government), the combined use of structural and non-structural measures to protect high valued assets, increasing institutional capacity to manage risks, and an increased onus on property level protections for those at highest risk (Tariq et al., 2020; Van Herk et al., 2011; Vis et al., 2003). Risk-based approaches imply that various options are being implemented to keep the water out of certain areas, warning systems are activated to warn of residual risk, and flood insurance is purchased proactively to aid in recovery efforts (Johnson & Priest, 2008). By contrast, Canada has been heavily criticized for its lack of risk-based anticipatory strategies and federal government direction, prompting a continued reliance on funding that supports structural defences and post-disaster reconstruction rather than proactive risk reduction (Golnaraghi et al., 2020; Safaie, Johnston & Hastings, 2022). In Canada, the federal government is accountable for disaster recovery whereas flood management is the responsibility of provinces, with implementation falling onto municipalities and local authorities (Beltan, 2021). Although every jurisdiction has different policy approaches to managing flood risks, proactive consideration of different approaches is imperative to reducing overall risk.

Another component of the emerging indirect approach to flood risk management is managed retreat, or "the purposeful relocation of people and property out of areas vulnerable to flooding" (Siders, 2019; Thistlethwaite, Henstra and Ziolecki, 2020, 3). Canada has witnessed several high-profile examples of managed retreat over the last 10 years (e.g., 2013 High River/ Calgary, Alberta; 2017/2019 Gatineau, Quebec; 2018 Grand Forks, British Columbia; 2018 Fredericton/ Maugerville, New Brunswick), predominantly via the use of property buyouts, which are increasingly being included in provincial disaster recovery policies. Presently, the management of flooding in Canada is controlled by government entities with minimal shared responsibility from non-government actors (Henstra et al., 2019). Provincial governments typically bear responsibility for the development and

administration of disaster recovery assistance programming and property buyouts, with support from municipal authorities on technical implementation (Cottar et al., 2021). Funding for buyout programs is sparse: there is no dedicated federal funding stream, which leaves primary responsibility to the provinces. Buyouts have been utilized primarily in riverine communities within a post-disaster reactive environment and they are rarely considered as a proactive strategy due to community resistance and a lack of consistent funding resources. Moreover, floodplain buyouts are often developed as part of a larger post-flood mitigation strategy (Wiley & Kousky, 2020). As a result, buyout programs are usually developed hastily in the aftermath of a disaster with little consideration for equity and compensation parity.

Municipalities in Canada are tasked with the responsibility to adopt and use policy instruments to manage their risks (Deschamps, Bourdeau-Brien & Boudreault, 2023), yet many municipalities are ill-equipped to respond to these risks and lack the resources to apply advanced modelling approaches (Safaie et al., 2022). Canadian municipalities are already stretched with conflicting priorities on land use and development, weak resource capacity, financial constraints, the rising cost of infrastructure, and the shortage in housing supply, municipalities are overstretched as it is without the added burden of addressing post-disaster recovery. These challenges are further complicated by the trend toward decentralization and fragmentation of flood risk management responsibilities from provincial authorities to local governments, including the planning, mapping, and production of flood risk maps (Deschamps et al., 2023; Golnaraghi et al., 2020; Government of Canada, 2023d). There is a growing impetus from smaller municipalities to explore different policy instruments that reduce their risk, including targeted property buyouts and use of rights-of-way that enable the development of large-scale flood mitigation.

Against this backdrop, this study assesses the role of buyouts as a municipal policy instrument in British Columbia (BC), Canada as part of a post-2021 de-risking strategy that prioritizes flood risk reduction. Considering the scale of the 2021 BC flood disaster, and the absence of a provincial or federal buyout policy over the 2021 to 2024 period, there are many valuable lessons to be learned about policy development at the local level by program administrators. These include understanding the costs and benefits associated with flood mitigation, and the lack of policy coherence which has impeded post-disaster recovery decision-making at different levels of government. Similar to studies in the U.S. (Binder, Baker & Barile; 2015; Binder, Greer & Zavar, 2020), we use BC as a case study to document the causality between emergency and disaster

management policy changes and broader flood-mitigation program outcomes for the community of Merritt, BC through a post-disaster recovery lens. The research addresses the following research questions: 1) How and why are British Columbia municipalities developing managed retreat policy? 2) What disaster management policies were in force over the 2021 to 2024 period, and what role did they play in municipal post-disaster recovery in relation to the development and implementation of flood mitigation plans?

3.3 Methods

To conduct this empirical research, we employed a qualitative mixed methods approach to document the emergency and disaster management policy changes in British Columbia through a post-disaster recovery lens. The research team used primary and secondary sources to analyze the impact that provincial legislation and funding mechanisms had on emergency response, post-flood recovery and long-term mitigation in Merritt after the 2021 BC flood disaster (this disaster is outlined in a study by Cottar & Wandel, 2024). Following conventional research protocols by Allan & Skinner (1991), primary fieldwork and field observations were conducted from November 2021 until February 2024 via interviews, regional dialogue forums, collaborative symposiums, and town-council meetings. In addition to selecting interviewees from the researchers' professional networks, we employed purposive snowball and convenience sampling to identify key stakeholders who were knowledgeable about provincial and regional emergency management policies, response and recovery operations, flood mitigation (including the use of buyouts), post-flood municipal needs, and linear corridor infrastructure programs. Primary data collection was supplemented through an analysis of relevant secondary data consisting of academic journal articles, grey literature, online reports, and news media articles (approx. n =35), and observation of relevant events such as council meetings and symposia.

Online and in-person semi-structured interviews were conducted with stakeholders (n=22) from local and provincial government agencies tasked with the finance, housing, and mitigation portfolios, as well as with elected officials and homeowners, business owners, humanitarian aid organizations, and community groups in flood-affected communities. Given the range of stakeholders interviewed, homeowners and business owners were specifically asked about their flood disaster experience, the challenges they faced in recovery and rebuilding, their perspectives on government response and emergency management policies, and their opinions about disaster financial assistance programs. Policymakers and disaster recovery professionals were asked to reflect on the use of policy

instruments that would support flood mitigation, the decisions around pursuing different flood mitigation options, the community's response to the resiliency plan, the limitations in provincial disaster management (DM) policies, and the program considerations for linear corridor buyouts. Interviews were 60-75 minutes long with informed consent acquired prior to commencing the interview. Interviews, town council meetings and collaborative symposium sessions were recorded, transcribed using Otter.ai, and thematically analyzed via deductive coding.

Using grounded theory methodology (Corbin & Strauss, 2008) and hierarchical frames, we developed a list of 14 codes to analyse interview responses to the research questions and open-ended prompts. Some of the questions posed included the following:

1. Since the Disaster Mitigation Adaptation Fund (DMAF) submission, recount the community's recovery and mitigation progress to date.
 - a. How are buyouts being considered in relation to your municipality's flood mitigation plan?
 - b. What program considerations are necessary to build into a buyout program?
2. In recent years, there have been new disaster management policies (e.g., Emergency Disaster Management Act, BC Flood Strategy, Climate Preparedness Strategy) developed in BC, what has been the impact (or lack thereof) of these policies on communities?
3. Were there any moratoria on rebuilding in place in the damaged areas? If so, what did they entail?
4. Elaborate on the decision-making criteria for community-wide mitigation measures (e.g., Least Cost Alternatives, Multi-Criteria Analysis, Options Analysis)
5. Outline the role of different levels of government: Is there adequate institutional capacity to address disaster risk management at the municipal/provincial scale? If not, how can it be improved?
6. What were your observations when it came to cross-collaborative governance post-disaster?
7. What are some lessons to be learned or opportunities that have come out of the BC flood disaster that have made your community more resilient to future hazards?
8. Thoughts on future DM programing or funding mechanisms in BC/Canada

Secondary data were collected from regional dialogue forums (n=3), collaborative symposia (n=2), town council meetings (n=15), and public reports (e.g., *City of Merritt Cost Benefit Analysis (CBA) and Return of Investment (ROI) of Flood Disaster Risk Management on the Coldwater River*,

Flood Mitigation Plans, Official Community Plans, *Resilient Pathways Report: Co-creating New Knowledge for Understanding risk and resilience in BC*, *Lower Fraser Floodplains Forum Dialogue 2023 on Regional Action*, *From Flood Risk to Resilience in BC: An Intentions Paper*, *Treading Water: The impact of and response to the 2021 BC floods*, *Fairness in a changing climate: Ensuring disaster supports are accessible, equitable and adaptable*, *Turning the tide: How flood risk transparency can drive equitable outcomes in Canada*, *Housing Needs Report*, *Strategic Plans*, *Economic Development Strategy*). Researchers triangulated data across primary, secondary, and observational sources.

3.4 Results

3.4.1 Post 2021 Disaster Risk Management Legislation and Policy Changes in British Columbia

In 2023, the provincial government introduced the modernized Emergency and Disaster Management Act (Bill 31) (EDMA) which included enhanced responsibilities for local government such as pre- and post-disaster risk assessments, upgraded emergency management and business continuity plans, consultation, cooperation with neighboring Indigenous groups, and improved post-disaster reporting (UBCM, 2023b). To support the implementation of the Indigenous engagement requirements within the EDMA, the provincial government granted funding awards ranging from \$40K-65K to First Nations and local municipalities without a formal application process (Government of British Columbia, 2023). Simultaneously, the Ministry of Environment and Climate Change Strategy (ECCS) developed the Climate Preparedness and Adaptation Strategy, which highlighted specific actions aimed at building community resilience through infrastructure improvements, fostering partnerships through collaboration, and supporting natural ecosystems (Government of British Columbia, 2022i). The First Nations Leadership Council (FNLC) is also in the midst of developing the BC First Nations Climate Strategy and Action Plan directed at identifying strategies and actions to reduce emissions, strengthen Indigenous climate leadership, improve emergency management response and recovery systems, enhance collaborative opportunities with government stakeholders to mitigate disasters, and build capacity and understanding amongst First Nations communities (BC Assembly of First Nations, 2022).

Considering that the last provincial-scale hazard, risk, and vulnerability assessment (HRVA) was completed in 1997, the Ministries of Emergency Management and Climate Readiness (EMCR) and Environment and Climate Change Strategy (ECCS), along with input from First Nations and Treaty Nations, are co-developing the Disaster and Climate Risk and Resilience Assessment

(DCCRA) which is a framework for identifying and prioritizing risks, gathering quantitative and qualitative information to make informed decisions, and mobilizing knowledge to support community level action. This effort will be followed up by a Disaster and Climate Risk Reduction Plan to systemically coordinate and implement cross government interventions consistent with the priorities identified in the DCCRA. Despite the parallel initiatives to safeguard against disaster risks, many municipalities in BC are concerned about the added responsibilities to meet these targets without adequate resources, funding, and implementation guidance, further impeding their ability to implement necessary flood mitigation (Fionda, 2023; Hoekstra, 2023; UBCM, 2023b).

The City of Merritt received provincial funding (\$329K) in 2023 to conduct a hydrotechnical assessment to feed into a flood mitigation plan (FMP), but has yet to receive funding to implement some of the large infrastructure projects it identified in response to the atmospheric river disaster, including waterside diking and land buyouts along the north side of the Coldwater River, leaving Merritt vulnerable to future climate disasters (City of Merritt, 2023; Government of British Columbia, 2022e). The funding agreement from the province for the FMP stipulated that the project would consider the use of non- structural options including managed retreat, although there is to date no policy or funding stream to support that work. As one official explained:

So, we did this whole FMP based on that, we brought the plan to the province who said yes, like we'll figure out a way to get this funded, and they go oh, I guess we don't actually have a way to fund property purchases and manage retreat.

Within BC, there are multiple legislative acts that govern flood management (Government of British Columbia, 2023f), including:

- The Environmental Management Act,
- Local Government Act,
- Land Title Act,
- Community Charter,
- Dike Maintenance Act,
- Drainage,
- Ditch and Dike Act,
- Flood Hazard Statutes Amendment Act,
- Climate Change Accountability Act, and
- The Miscellaneous Statutes Amendment Act (No.2)

This mix of legislation is intended to enable provincial authorities and local governments to effectively manage land use in flood prone areas, maintain flood protection systems and dike safety, and implement disaster mitigation programs (Government of British Columbia, 2023f). Regulatory

complexity has increased incrementally over time, leading to the current patchwork and archaic system which leaves municipalities responsible for decisions about land use, urbanization, emergency planning, and floodplain designation without corresponding funding or legislative authority (McElroy, 2021). After the 2021 BC flood disaster, local governments ended up competing against each other for mitigation funding with minimal coordination, leaving many unsuccessful communities vulnerable to the rising cost of inflation and the effects of climate change (Hoekstra, 2023; McElroy, 2021; Phillips, 2021). The uneven allocation of flood management resources across municipalities raises questions about whether neighboring communities who are unsuccessful in receiving mitigation funds will be prepared for flooding.

Recognizing the problems brought about by the lack of a comprehensive framework, the provincial government developed the BC Flood Strategy in order to create a coherent and innovative vision for holistic flood risk management in BC by enhancing public safety, ensuring economic stability, and assuring environmental sustainability (Gamage, 2021; Government of British Columbia, 2023a; Government of British Columbia, 2024). Launched in March 2024, the strategy was the first in BC that calls for action to “enhance community-led managed retreat investments” through the use of buyouts (Government of British Columbia, 2024, 19). Currently there are no supporting BC policies or legislation that enables the use of land acquisitions other than the Adaptation, Resilience and Disaster Mitigation Program (ARDM), a sub-stream under the Green Infrastructure umbrella, which allows for the use of land acquisitions for the development of natural infrastructure. Despite the province’s interest in enhancing investments in flood avoidance, accommodation, protection, and community-led retreat, the strategy has yet to identify any new or existing funding pathways that could support local governments in planning or implementation (Government of British Columbia, 2023a; UBCM, 2022).

In addition to the provincial Flood Strategy, the BC Lower Mainland Flood Management Strategy (LMFMS) initiative was underway from 2014-2023. This supported the development of a targeted regional approach that reduced the risks associated with coastal and Fraser River flooding to increase resilience for communities in the Lower Mainland (Fraser Basin Council, 2023). Moreover, evidence at the local level suggests that there is a misalignment between existing funding programs and the newly proposed policies, as the current legislation prohibits combining different provincial grants to fund mitigation projects. For example, one key informant noted that municipalities could not combine disaster financial assistance (DFA) funding and other sources of

provincial grant money to build back better for critical infrastructure repairs (KI#1). This lack of policy incoherence indicates that diversification in flood management policies is a priority for the province, although barriers, including a lack of investment, capacity issues, and misalignment of disaster management policies and funding streams, may lead to a lengthier implementation process (Hegger, Driessen & Baker, 2018).

The development and modernization of BC's disaster management policies is progressing, although additional work needs to be done to support the local implementation of the managed retreat option. Given the priorities of the numerous DRM initiatives in BC, we were interested in assessing the alignment of federal/provincial disaster management strategies and funding programs that support the use of managed retreat via land acquisitions or property buyouts, and thus did a keyword search across 10 separate documents (Table 1). Despite explicitly mentioning managed retreat as a risk reduction tool in both the BC Flood Strategy and the report by the federal Task Force on Flood Insurance and Relocation (Government of British Columbia, 2024; Government of Canada, 2022b), we found no evidence at either the federal or provincial levels of any dedicated funding for buyouts or to support provinces in designing their own customized acquisition programs. Moreover, existing federal programs, including DMAF and the Disaster Financial Assistance Arrangements (DFAA), do not allow for the purchase of flooded homes unless the land acquisition is part of a natural infrastructure project (Government of Canada, 2022a). The federal government's hesitancy around supporting a national relocation program could be attributed to the parallel development of a Canadian low-cost national flood insurance program that would also consider options for retreat of the highest risk properties (Sparling, Eyzaguirre, & Wale, 2024). Regardless, none of these programs currently provide support for any sort of linear corridor retreat or community wide buyout that would prove beneficial to communities like Merritt.

Table 1: These outline the various disaster management, flood-related, or climate change-related strategies and funding programs that are available at the provincial (British Columbia) and federal level (Canada) with a particular focus on identifying if these enable the use of managed retreat, property buyouts or land acquisitions.

Jurisdiction	Strategy	Governing Organization	Goal	Mention of Managed Retreat/ Buyouts/ Relocation/Land Acquisition
British Columbia	BC's Flood Strategy	Ministry of Forests	Proposes a strategic framework that is complemented by four strategic program areas and potential actions for future implementation to enhance BC's flood resilience (Government of British Columbia, 2023, p. IV): <ul style="list-style-type: none"> • Understanding flood risks • Strengthening flood risk governance • Enhancing flood preparedness, response, and recovery • Investing for flood resilience 	Program Area 4: Investing in Flood Resilience <ul style="list-style-type: none"> • Action 4.4 Enhance investments in community-led retreat: Involves the use of managed retreat or buyouts that can be achieved through fee simple purchase, expropriation, or land swaps (Government of British Columbia, 2023a, p.23). • First Nations in coastal and inland areas expressed the ongoing loss of reserve land as a major issue that would need proactive federal and provincial collaboration to implement measures (i.e., retreat) (Government of British Columbia, 2023a, p.23).
British Columbia	Emergency and Disaster Management Act (EDMA) (Formerly known as the Emergency Program Act [EPA])	Ministry of Emergency Management and Climate Readiness (EMCR)	Proposes legislative changes to modernize BC's emergency management (EM) legislation whilst adopting the Sendai Framework (Government of British Columbia 2019; Government of British Columbia, 2023b, p. 6): <ul style="list-style-type: none"> • All four management phases mitigation, preparedness, response, recovery) are recognized • Promote co-management where provincial government, local government and Indigenous governing bodies are all decision makers • Recognize the authority of Indigenous government bodies in EM • Include options for agreements between Indigenous governing bodies and other decision-makers • Include roles for critical infrastructure owners and volunteers 	Under BC's Modernized Emergency Management Legislation: Re-Imagining Financial Assistance After Emergencies. <ul style="list-style-type: none"> • The concept of managed retreat is eligible under the Federal Disaster Financial Assistance Arrangements program but, the Province of B.C. is not able to access funding for these types of projects due the terms of B.C.'s current regulation. Currently, the accommodate and protect approaches taken in B.C. are to 'rebuild' after disasters, with funding from insurance or government financial assistance though these are limited. (Government of British Columbia, 2023d, p. 20).

			<ul style="list-style-type: none"> • Require the province, local governments, and critical infrastructure owners to consult and cooperate with Indigenous governing bodies • Outline guiding principles for EM • Include Indigenous knowledge in EM plans • Require assessment of the risks created by climate change • Update the concept of what constitutes an emergency • Provide improved tools for response and recovery • Improve cultural safety and ensure that planning is attentive to the disproportionate impacts of emergencies across our population • Include reporting requirements to enhance accountability and transparency 	
British Columbia	Climate Preparedness and Adaptation Strategy	Ministry of Environment and Climate Change Strategy	<p>Proposes a range of actions for 2022-2025 to address climate impacts and build resilience across BC in these four areas (Government of British Columbia, 2022i):</p> <ul style="list-style-type: none"> • Foundations for success: partnerships, knowledge, and decision-making • Safe and healthy communities • Climate ready economy and infrastructure • Resilient species and ecosystems 	No Mention
Canada	National Adaptation Strategy	Environment and Climate Change Canada (ECCC)	<p>Outlines a shared path amongst five key systems to become more climate resilient (Government of Canada, 2023a; 2023b):</p> <ul style="list-style-type: none"> • Disaster resilience <ul style="list-style-type: none"> ○ Target: By 2025, complete the modernization of the Disaster Financial Assistance Arrangements to incentivize disaster risk reduction and improve recovery outcomes from large-scale disasters (p.21) • Health and wellbeing • Nature and biodiversity • Infrastructure • Economy and workers 	<p>Section 3.1 Disaster Resilience</p> <p>New or expanded actions:</p> <ul style="list-style-type: none"> • Support the outcomes of the <i>Task Force on Flood Insurance and Relocation</i> that outlines considerations and options for offering low-cost residential flood insurance to residents of high-risk areas that are prone to flooding. Budget 2023 proposed to stand-up a low-cost flood insurance program, aimed at protecting households at high risk of flooding and without access to adequate insurance (Government of Canada, 2023b, p. 17).

Canada	Emergency Management Strategy	Public Safety Canada (PSC)	Builds on foundational principles in the EM and Sendai frameworks to establish, federal, provincial, and territorial priorities to strength the resilience of Canadian society by 2030 through five areas (Government of Canada, 2019): <ul style="list-style-type: none"> • Enhance the whole of society collaboration and governance to strengthen resilience. • Improve understanding of disaster risks in all sectors of society • Increase focus on whole of society disaster prevention and mitigation activities. • Enhance disaster response capacity and coordination and foster the development of new capabilities; • Strengthen recovery efforts by building back better to minimize the impacts of future disasters 	No Mention
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Jurisdiction	Funding Programs	Governing Organization	Goal	Mention of Managed Retreat/ Buyouts/ Relocation
British Columbia	Disaster Financial Assistance (DFA) for local governments	Ministry of Emergency Management and Climate Readiness	Funding is intended to help communities recover by providing partial reimbursement for eligible infrastructure repairs, funding may cover the following (Government of British Columbia, 2023e): <ul style="list-style-type: none"> • Rebuilding or replacing essential public infrastructure to the pre-disaster condition • Repair or replacement of essential materials • Removal of heavy deposition in gravel beds • Insurance deductibles • Costs of inspection, appraisal, planning and design • Up to 10% of the eligible, incurred, construction costs of a project for administration 	No Mention
British Columbia	Community Emergency Preparedness Fund	Province of BC and is administered by the Union of BC Municipalities (UBCM)	Suite of funding streams intended to enhance the resiliency of local governments (Union of BC Municipalities, 2023a): <ul style="list-style-type: none"> • Disaster Risk Reduction-Climate Adaptation • Emergency Operation Centres Equipment Training 	No Mention

			<ul style="list-style-type: none"> • Emergency Support Services Equipment and Training • Extreme Temperatures Risk Mapping, Assessment and Planning • Flood Risk Assessment, Flood Mapping and Flood Mitigation Planning • Indigenous Cultural Safety and Cultural Humility Training • Public Notification and Evacuation Route Planning • Structural Flood Mitigation • Volunteer and Composite Fire Departments Equipment and Training 	
British Columbia/ Canada	Adaptation, Resilience and Disaster Mitigation Program (ARDM) – Green Infrastructure	Ministry of Emergency Management and Climate Readiness (EMCR)	Joint funding program between federal and provincial partners to support flood mitigation infrastructure projects that increase structural capacity and/or natural capacity with the intent of reducing or negating the effects of flooding (e.g., fluvial, pluvial, coastal, debris flow). Green ARDM will target public infrastructure asset work including natural infrastructure, where the purpose of the project is to build, modify, and or reinforce to prevent, mitigate, or protect against floods. Projects must result in tangible capital assets in BC primarily for public use/benefit (Government of British Columbia, 2022j).	<p>Eligible costs include:</p> <ul style="list-style-type: none"> • Land acquisition, if approved by Canada, directly related to the development of Natural Infrastructure of a Project that aligns with an adaptation, resilience, and disaster mitigation outcome (Government of British Columbia, 2022j, pg. 31). <p>Ineligible costs include:</p> <ul style="list-style-type: none"> • Involves relocation of whole communities (Government of British Columbia, 2022j, pg. 32). • Land acquisition costs not approved by Canada, and land acquisition costs not directly related to the development of natural Infrastructure (Government of British Columbia, 2022j, pg. 31).
Canada	Disaster Mitigation Adaptation Fund (DMAF)	Infrastructure Canada	A national, competitive, merit-based contribution program intended to support infrastructure projects designed to mitigate current and future climate-related risks and disasters triggered by natural hazards (e.g., floods). Eligible infrastructure projects under DMAF include new construction of public infrastructure,	<p>Land acquisition for the development of natural infrastructure could be an eligible expenditure where it is not the sole project component (Government of Canada, 2022a).</p> <ul style="list-style-type: none"> • A justification, as part of the project application, that is acceptable to

			modification, or reinforcement of existing public infrastructure (Government of Canada, 2022a).	<p>Infrastructure Canada, for the need to acquire land as an integral aspect of the approved project;</p> <ul style="list-style-type: none"> • A demonstration, as part of the project application, of how the land would be used as natural infrastructure; • A demonstration, as part of the Contribution Agreement for approved projects, of how the land would remain protected for 40 years by a provincial, territorial, municipal government, or Indigenous Recipients; and • An attestation, once the land has been purchased, that the price is at, or below, fair market value.
Canada	Disaster Financial Assistance Arrangements (DFAA)	Public Safety Canada	In the event of large-scale natural disasters, the Government of Canada provides financial assistance to provincial and territorial governments through the DFAA. (Government of Canada, 2023c).	No Mention

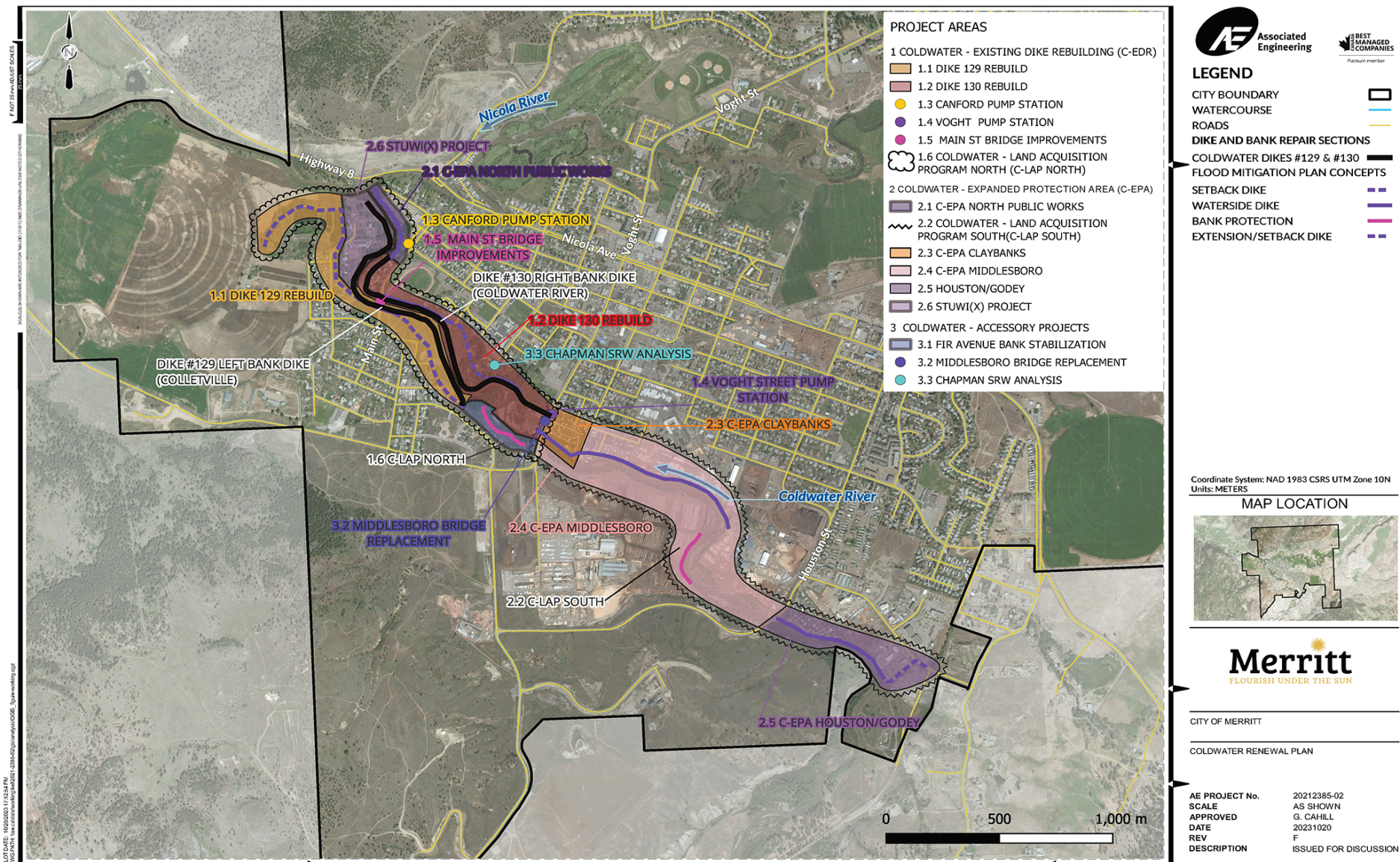


Figure 1: A map outlining proposed projects along the Coldwater River that require funding for dike improvements and other public infrastructure in Merritt as a result of the 2021 floods. If funded, several of these projects potentially involve property buyouts (City of Merritt, 2023).

3.4.2 Prioritizing Property Buyouts in a Flood Mitigation Plan

After the November 2021 BC flood disaster, the City of Merritt had to develop a plan to mitigate future flood risk (Cottar & Wandel, 2024). In November 2022, Merritt's city council adopted a flood mitigation plan (FMP) that relied primarily on structural flood mitigation. To effectively carry out the FMP, the city had to classify projects based on what could realistically be funded and whether they were eligible for an existing provincial or federal grant stream. In terms of infrastructure upgrades, the City categorized the Coldwater project areas under three streams, including existing dike rebuilding (C-EDR), expanded protection areas (C-EPA), and accessory projects (Figure 1). Each of the project areas have additional sub-projects that include dike rebuilding, public works, land acquisition, bridge replacements, and riverbank stabilizations. The C-EDR project involves formerly registered dikes (black lines on the map in Figure 1) that were destroyed after the flood and have not been rebuilt due to provincial regulations that require dikes to be wider and accessible with setbacks (aka 'setback dikes'). In order for the dikes to be rebuilt to modern standards, land along the Coldwater River must be purchased, either through partial or full land acquisition. Of the 1,274 properties in the 1:200 floodplain that are at risk of flooding, 32 properties along the north corridor were identified as qualifying for buyouts (Dawson, 2023). Since the dikes which existed pre-disaster have not been rebuilt, Merritt is substantially less protected now than before the 2021 BC flood disaster, indicating that the city is more likely to flood at water levels lower than those experienced in 2021.

Although the city has been granted approval for the earthwork and construction of the setback dikes, none of the land purchase required to execute the plan has been approved because there is no provincial policy or funding stream that supports the use of land acquisitions for a linear infrastructure corridor. One key informant (KI #22, 2024) noted that, together with the province, Merritt was able to secure upwards of \$42 million in federal DFAA funding to rebuild the dikes to modern regulations (i.e., setback dikes). In order for the project to move forward, however, the province must approve the land acquisition portion of the plan and arrange for an additional \$20 million for the buyouts. Additional time pressure has been exerted by the DFAA funding stipulation that the project must be completed in six years, after which the funds must be returned to the federal government (Luymes, 2024). Alternatively, the C-EDR plan could be engineered to require fewer buyouts, though conversations about project amendments have yet to happen with the province. Furthermore, there is no single grant stream apart from DMAF that could cover the full costs of what is required to execute the complete FMP. These realities have revealed major policy gaps in BC's disaster mitigation policies, further warranting the need for a

provincial buyout-funding program that prioritizes land acquisition for the purposes of flood mitigation. As one key informant suggested (KI# 19, 2023):

It's unlikely we'll get approval for a lot of waterside diking because of DFO (Fisheries and Ocean Canada) and WLRS (BC Ministry of Water, Land and Resource Stewardship) regulations. So, we have provincial and federal regulators who are preventing rebuilding any dike unless we buy the properties, and a provincial funding stream that can't come up with that money.

In 2023, Merritt worked with external consultants to develop the Coldwater Land Acquisition Program (C- LAP) North and South projects to further advance the C-EDR (Figure 1). The C-LAP north project was designed primarily to support approved flood mitigation works and buy out properties impacted by the new dike construction. Additionally, the dike construction required for C-LAP north has already been approved for funding by the federal government via DFAA. Conversely, the C-LAP south program was aimed at removing properties in the floodplain that were not protected by dikes, though this project has not yet been funded and still requires significant funding support from DMAF. The city has submitted a DMAF application to the federal government for a bulk of C-LAP south, though it remains to be seen if that will be funded.

Both C-LAP north and C-LAP south are intended to use equity-based approaches (i.e., voluntary relocation) for land acquisition as opposed to the expropriation that BC has historically used to compulsorily relocate people and property from high-risk areas (KI #22, 2024). Despite no funding for either project, the city has continued to advocate to the province the use of a voluntary acquisition plan using pre-flood valuations plus market adjustments. Using this principle, the city aims to purchase properties at fair market value, which would enable homeowners to acquire equivalent homes, ideally in the same community. Pricing could include allowances for additional compensation (e.g., top-ups, moving stipend). An equity-based approach in a linear corridor where there are clear reasons to move has numerous benefits for Merritt, including strong public support, reduced negative impacts on the most financially vulnerable homeowners, and a reduction in costs associated with expropriation and litigation cases. As one key informant (KI #22, 2024) explained:

So, you can't use that expropriation current valuation that is used in all other linear corridor activities in BC on this particular project. It's kind of a hybrid. It's a linear infrastructure corridor, but you need to use the same methodology or similar that you would do with conventional managed retreat (i.e. buy out an entire neighbourhood). So, on a linear corridor, you need to offer enough value that the voluntary buyout program goes to 100%.

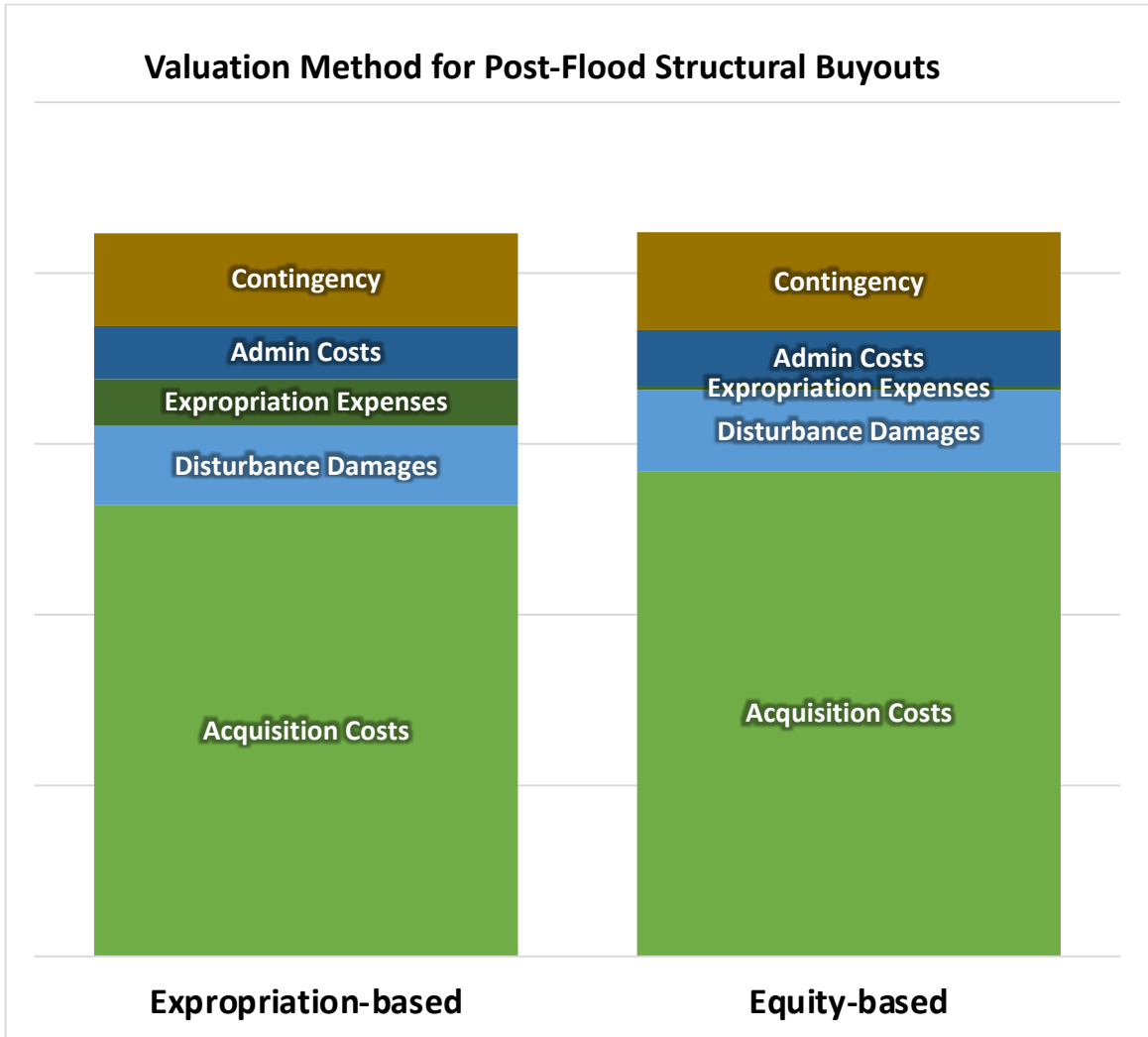


Figure 2: A visual comparison of an expropriation-based versus an equity-based valuation for the property buyouts in Merritt (City of Merritt, 2024).

To make the business case, the city of Merritt developed a valuation method for both C-LAPs that compared an expropriation-based to an equity-based total program cost. The program budget comprised of acquisition costs, expropriation expenses, disturbance damages, administration charges, and contingency costs. Adopting the equity-based program would ensure that residents are being fairly compensated or at an “equivalent to stay” methodology. After evaluating the total costs for both options (expropriation and equity-based), the program cost difference was estimated at 0.1% (Figure 2), with more of the total costs flowing to bought out homeowners in the equity-based approach. This relatively minor cost difference suggests that communities would be more inclined to adopt an equity-based

valuation to ensure maximum value for homeowners and high program participation. If a community were to employ an expropriation-based valuation, the total program cost would likely increase due to legal expenses (i.e., class action lawsuit) while the total amount flowing to homeowners would be less than an equity-based approach. The \$21.7 million Merritt buyout project was not listed when the BC budget was tabled in early 2024 (Hunter, 2024), and as of February 2024, the city has not secured the necessary capital from either the provincial or federal government to fund either of the C-LAPs.

Given the lack of funding to fully execute either program, the City of Merritt has been approved and is proceeding with a pilot project that will be funded by the provincial government using an equity-based voluntary buyout of 4 flood-affected properties in the north corridor (KI #20, 2023; KI #22, 2024). The properties involved in the pilot project reflect a wide range in market value due to variations in property size and dwelling purpose. Internal documents shared by key informants indicate that the implementation pathway would include owner intake meetings, appraisal, acquisition pricing, file classification, conditional offers, offer revisions, and conveyance. Given the scope of the program, the design, approval, and implementation schedule is likely to last anywhere from 1 to 1.5 years. The intent of the pilot program is to showcase the design and implementation of a voluntary acquisition program that could be replicated at a larger scale as part of the C-LAP portfolio for the City of Merritt. By engaging different stakeholders to execute the project and identifying critical program issues that may arise during implementation, this pilot serves as a critical educational and policy development tool that could inform larger Canadian buyout programs. Considering the absence of a provincial buyout program or funding stream, Merritt's pilot project, in addition to other buyout programs like the one in Grand Forks (see study by Le Geyt, 2022), provides examples for the province of BC on how to employ an equity-based methodology for future use of managed retreat.

3.4.3 Disaster Risk Management Policies: Fostering Collaboration or Competition?

Almost three years after the 2021 BC flood disaster, communities are still grappling with long-term recovery efforts and will likely continue to do so for the next several years. Moreover, municipalities in BC are struggling with competing financial demands and unmaintained, aging critical infrastructure (Safaie, Johnstone & Hastings, 2022). With finite resources, local governments are turning to the province to fund their flood mitigation plans, though not every project can be or will be funded, leaving communities to compete against one another for grants. Many participants (KI #16, 2023; KI #19, 2023; KI #21, 2023) noted that despite guidance in provincial policies like the BC Flood Strategy that calls for

increased regional coordination between communities, the funding mechanisms for these programs disincentivize collaboration and reward those that have the most compelling proposals, likely those with the most skilled staff and the most effective engineering departments. Not only are municipalities expected to propose complex and innovative projects that are multiple times the size of their annual budgets, but they are also left competing with other communities and First Nations on the same watershed. Smaller municipalities likely do not have the capacity to apply for these projects, further hindering their ability to invest in mitigation measures. One key informant noted (KI# 22, 2024):

It's not just a competition between municipalities. It's a competition between municipalities and First Nations on the same watershed. I have my area of influence right here and that's the only area that I have any opportunity to propose projects on. But Shackan is here. Nooaitch is here, so I was talking to Shackan the other day and they want to build a dike. They also qualify for a CEPF grant. We'll help them because we're all in the same community with the caveat that, that decreases Merritt's chance of getting our dikes paid for if our neighbor does it on the exact same watershed. So, it not only doesn't foster collaboration, but it also fosters competition between municipalities and First Nations.

Participants expressed that an alternative way to assess which communities would be awarded mitigation funding could be based on a centralized process led by the province. By using the province's inundation maps and a multi-criteria analysis to assess the watersheds, provincial governments could award grants based on need or where the highest risk areas are located. In turn, this would discourage competition, support a distribution of resources and funding that reflects the most vulnerable communities, and facilitate collaboration between upstream and downstream communities. Ultimately, some method of prioritization of mitigation funds is needed to execute structural and non-structural mitigation plans, and hence, existing disaster policies must be reviewed to determine their suitability for addressing multi-jurisdictional flood resilience (Adekola, Fischbacher-Smith & Fischbacher-Smith, 2020).

3.4.4 Reactiveness, Responsibility, and Recovery: Homeowner Perspectives

In the aftermath of any disaster, communities and governments are often hyper-focused on rebuilding and returning to a state of normalcy. Homeowners are often at the center of those recovery decisions. After the 2021 flood disaster, many affected homeowners in Merritt found it challenging to navigate the DFA program and criticized the bureaucratic nature of BC's disaster assistance programs. Issues around program eligibility, limits on assistance, lengthy processing timelines, and the need for prescriptive claims, all hindered homeowners' ability to start demolition and rebuilding their properties (BC Chamber of Commerce, 2022; Cottar & Wandel, 2024). Specifically, participants noted that the rigid

nature of the program guidelines did not align with the realities of homeowners on the ground who were coping with the difficulties of recovery. For example, many homeowners reported discrepancies in what was claimable, and highlighted cost gaps between what was covered by DFA and the actual cost of the repair itself. Homeowners shared grievances about communications lags, misplaced applications, rising inflation costs, and payouts delayed up to 18 months after the disaster. As of March 2023, the DFA program had approved 1,081 applications with an average payout of \$32,299 to eligible homeowners (BC Ombudsperson, 2023). Government authorities at the municipal and provincial level later highlighted the need to expand program eligibility and ensure the flexibility of funds so residents could be paid out faster, thereby sparing them from incurring additional debt throughout the recovery process. One key informant (KI# 15, 2022) highlighted that the process of navigating policies like the DFA program was a “follow-up administrative disaster” and noted that governments are increasingly offloading their responsibilities on the individual to limit their own recovery spending as opposed to taking accountability for allowing development on a floodplain. This key informant further noted that:

The guidelines that they create around these programs make no sense when you apply them to the actual disaster. For example, we'll cover the cost for you to fix this fence. But we won't cover the cost for you to fix your driveway. You're like we've been in this disaster, we don't understand the bureaucracy, we just need things to be fixed. Otherwise, we can't get our livelihood back, so you're having to become a bureaucrat and learn how to manage the administration of these very technical programs. And what ends up happening is you end up with massive expenses, that are not going to be covered that you've already incurred and timelines that last forever. It takes the government months on end to issue checks. So, you're left with cashflow problems, and then repairs that go on unfixed.

Similarly, tensions about response and recovery were apparent amongst homeowners who were dismayed with the handling of post-disaster operations and delayed deployment of emergency services. Key informants noted the outdated and reactive nature of BC's DM policies (i.e., DFA and Emergency Support Services [ESS]) and criticized the lack of support and readiness from institutions like the Ministry of Emergency Management BC (now known as EMCR) and the Red Cross immediately after the floods (KI #2, 2022; KI #7, 2022; KI #10, 2022; KI #11, 2022). Program mandates barred government officials from offering financial assistance to business owners until a critical damage threshold was met, at which point many had already evacuated and endured significant damage to their properties, livestock, and equipment. Homeowners also stressed that evacuee support should be extended beyond the stipulated seventy-two hours in the ESS so as to reflect the realities of communities that were forced to evacuate for a longer period (KI#14, 2022). Furthermore, business owners stressed the need for a retreat strategy that would pay them out without having to go through the DFA or insurance every flood season, particularly

for businesses at risk of foreclosure (KI #13, 2022; KI #15, 2022). Additionally, as private insurance becomes unavailable in flood prone areas, communities will continue to rely more on programs like the DFA unless proactive measures are taken at the community and household level. One key informant (KI #14, 2022) highlighted the limitations of the province's disaster response in 2021:

We really saw the cracks. It's very apparent that none of our government agencies are prepared at all, we have something called the emergency management services in BC, right? Their job is to respond to emergency situations. They are burdened and handcuffed by the limitations of their mandate. So, they can only respond once the disasters hit a certain critical level, they can't do anything proactively. They can tell you, there's a sandpit 15 miles from where you are, you can go fill sandbags up, you know, that's kind of rare. But once your property is destroyed, we're here to help you and even that is late.

3.5 Discussion

In this paper, we investigated major gaps in BC's disaster management policies and programs after the 2021 flood disaster, with a particular emphasis on understanding the relationship between municipal flood mitigation plans, including managed retreat, and long-term disaster recovery policies. Based on the results, it is evident that BC municipalities are inclined to develop managed retreat policies that follow a risk-based approach though there are conflicting objectives and outcomes via implementation (e.g., lack of resources) that ultimately inhibit the adoption of a risk-based approach. Moreover, the study revealed two main findings. First, disaster policy in BC has historically been highly reactive, but recent policy developments (e.g., BC Flood Strategy, EDMA and EMCR) appear to be shifting the emphasis from a hazards-based approach to a proactive risk-informed approach. Second, as seen in the case of Merritt, there is a growing impetus from municipalities in BC to drive their own community-led managed retreat programs, but a lack of dedicated provincial funding continues to be a major barrier to implementation.

3.5.1 Shifting Towards a Proactive and Risk-Informed Disaster Management Approach

In practice, BC's emergency management policies and disaster financial assistance programs were designed primarily to be reactive, with top-down government intervention employed in the aftermath of a catastrophic event. Critics of the outdated, under-resourced and inaccessible policies have argued that neither the DFA nor ESS have been sufficiently adapted to reflect the realities of climate change (BC Ombudsperson, 2023). With the recent policy developments like EDMA, EMCR, and the BC Flood Strategy, the provincial government is looking to strengthen proactive flood risk governance and

enhance preparedness and response by using technical guidance to inform its decisions about emergency management and land use planning.

The new BC Flood Strategy, EDMA as legislation, and EMCR as an institution, will employ a host of proactive flood risk reduction approaches. The Flood Strategy will use updated flood maps and risk assessments to better plan for and manage flood risks before a disaster strikes whilst also prioritizing the need to make this information publicly accessible (Ball, 2024; Government of British Columbia, 2024). By regularly examining and updating provincial guidelines related to flood infrastructure, diking, and nature-based solutions, communities will be better equipped to make decisions about FMPs, critical infrastructure projects, and emergency preparedness initiatives. Similarly, the EDMA seeks to take a proactive approach to emergency management by integrating mitigation, preparedness, response, and recovery into legislation to increase resilience, something that was not previously accounted for. Likewise, adding climate change to the formerly narrow emergency management mandate of EMBC (now EMCR) will almost certainly produce more proactive approaches to flood risk management. Comparable to other studies on post-disaster learning in Bangladesh (Haque, Choudhury & Sikder, 2019; Choudhury & Haque, 2024), BC's proactive policy changes were prompted by the 2021 disaster, and the need to adhere to the pre-existing standards set out in the Sendai Framework for Disaster Risk Reduction. The shift towards a proactive, anticipatory, risk-informed learning approach illustrates that disaster management in BC is undergoing a paradigm shift.

As part of this shift, BC's risk-informed Flood Strategy includes a combination of structural and non- structural approaches to increase flood resilience. The benefits of using both approaches include their adaptability, cost-effectiveness, and the comprehensive nature to risk reduction, particularly in communities where the use of one approach alone may not be feasible. Additionally, risk-informed land use planning in flood prone areas can employ non-structural solutions as a means of lowering flood losses whilst maintaining floodplain activities (Tariq et al., 2020). For example, Merritt's proposed plan to buy out and subsequently remove properties along the river can complement the construction of dikes that improves the city's flood protection. As of March 2024, the Minister of EMCR has committed an additional \$39 million in funding to support more than fifty projects across BC including strengthening riverbanks, upgrading dikes, reinforcing drainage, floodplain mapping, rehabilitating watersheds, and improving cooling and heating centers (Ball, 2024). What remains to be seen is how the BC flood strategy will be implemented in communities, and whether adequate funding will be provided to support the implementation process.

3.5.2 Property Buyout Programs: Policy Inaction or Policymaking

As exhibited with the case of Merritt, there is an impetus from communities in Canada to design and implement post-disaster voluntary buyout programs to advance their FMPs. A common thread in many of the qualitative interviews revealed “what gets funded gets done” and this holds true, especially in a jurisdiction like BC where there is no provincially funded buyout policy or program. Similar to studies in the U.S. (Binder, Greer & Zavar, 2020; Greer, Binder & Zavar, 2022; Maly & Ishikawa, 2013), buyouts are one policy tool in an array of mitigation options that can be considered by decision-makers in the aftermath of disaster, though a lack of government investment in buyouts can lead to policy inaction. Moreover, inaction can be prompted by the decentralization and offloading of responsibility to local governments that are closer to the policy problem, or more simply, institutions may want to pause and wait for better decision-making conditions (Brown & Stark, 2022; Cerna, 2013). This phenomenon is particularly evident in the BC Flood Strategy, which includes a specific call to action on enhancing community-led managed retreat investments (i.e. Action 4.5), though to date there is no concrete plan as to a new managed retreat policy, nor a plan to amend the province’s DFA program to include a buyout option. Critics have speculated that funding Merritt’s one-off buyout program might set a precedent for other municipalities that may be interested in developing their own programs, leaving the province on the hook to fund future buyouts.

Furthermore, there is evidence of political ‘buck-passing’ between the provincial and federal governments on the issue of publicly funded buyouts (Luymes, 2023). Governments at both levels appear to have adopted a passive approach that effectively downloads the responsibility to municipalities, but local implementation may offer a way to understand the complex nuances in buyout implementation and to facilitate future policy learning (Brown & Stark, 2022). This ‘learn by doing’ approach would help provincial institutions in developing their own policies by providing data on community-led program successes and failures. Funding Merritt’s buyout program, for instance, offers the BC government evidence to develop a provincial all-hazards buyout policy that would complement its DFA program. Without a dedicated federal agency and grant stream that would support buyouts for community-wide retreat or linear infrastructure corridors, it is challenging for provinces to develop and implement their own buyout policies, though it is not entirely impossible, as evidenced in Quebec, where buyout programs were implemented in response to the 2017 and 2019 flood seasons (Cottar et al., 2021). As such, there is no linear method to develop these strategies and politics plays a significant role in the development of policy.

3.6 Conclusion

There is a real need in Canada to update disaster risk management policies to be more reflective of the impacts of climate change. By evaluating the various DRM policies and strategies in BC, we were able to document the effect that these policies have on the development and implementation of local FMPs that support the use of buyouts in post-disaster communities, specifically Merritt. Furthermore, the results suggest that current DRM policies in BC do not support multi-year mitigation investments, further disadvantaging communities that are in the midst of implementing FMPs. The case of Merritt exemplifies that BC's DRM policies inadvertently promotes a culture of competition rather than collaboration. Given that mitigation projects are expensive and require cost-sharing between different levels of government, communities are more inclined than ever to collaborate with regional authorities and neighbouring localities to invest in infrastructure upgrades (e.g., dike rehabilitation, buyouts) that provide a multitude of co-benefits.

The study justifies flood risk governance practices particularly a more careful delineation of responsibility and implementation of risk-based management based on different stakeholders' capacity and resources (Driessen et al., 2016; Thistlethwaite & Henstra, 2019). Recognizing that flood risk management is a crucial component in policy development, we found that FRM is hard to implement without resources, despite the huge demand at the municipal level in BC. Moreover, FRM is also difficult to achieve without the adequate coordination of responsibility and the elimination of policy fragmentation, gaps, and redundancy between different levels of government. Additionally, the findings suggest that despite an absence of provincial buyout programs, municipalities in BC are inclined to develop their own buyout programs in order to advance their FMPs, despite a lack of provincial investment as a considerable barrier. Given that DRM policies continue to evolve in BC, further research is needed to assess the longitudinal and temporal impacts of current and emerging policies on communities like Merritt. Despite apparent gaps, the BC government's commitment to develop legislation that proactively develops plans to mitigate risks is a step in the right direction.

Chapter 4

Navigating Land Use After Managed Retreat: Decisions Facing Local Governments in the Post-Buyout Environment

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Five years following the Spring 2019 floods in Quebec, the City of Gatineau is grappling with questions on how to move forward with municipal land use plans that integrate provincial flood protection policies. This longitudinal study analyzes the policy changes in Quebec's flood management regime and assesses the post-buyout land use decision making process. Using mixed methods, we explore the evolution of buyout policies, assess the challenges in maintaining both occupied and vacant lots, and document potential post-buyout land use options that would reconcile the benefits of floodplain restoration and provide recreational spaces for the community. The results indicate the institutional alignment of provincial buyout policies and regulatory tools, such as the ZIS, that support the relocation of residents whilst acknowledging that some areas are no longer viable and prohibiting future redevelopment. However, there is a limited integration of the provinces flood management regime and municipal land use plans suggesting poor coordination of responsibility and policy fragmentation amongst intergovernmental partners. The case of Gatineau illustrates a municipality that has developed a community master plan though a lack of funding and direction from senior governments continues to hinder the city's progress. The research provides valuable insights for policymakers on buyout policy development, program implementation, and long-term land use plans for partially retreated communities in Canada.

4.1 Introduction

Canada's approach to flood risk management has evolved to include the use of *managed retreat*—the strategic relocation of households out of areas vulnerable to flooding—which is achieved primarily through publicly funded property buyouts (Agyeman, Devine-Wright, & Prange 2009; Hino, Field, & Mach 2017). The province of Quebec has been especially proactive in this domain, developing and implementing several managed retreat programs to reduce flood risks in a changing climate. After major spring flooding in 2017 and 2019, which prompted large-scale evacuations, the deployment of the Canadian Armed Forces, and widespread devastation to private property and critical infrastructure, the Quebec government shifted its approach to flood risk management and recovery. According to the Insurance Bureau of Canada (IBC), these flood events cost insurers approximately \$58 million and \$280 million, respectively, and more than \$390 million in non-insured losses was covered by the provincial treasury (Lowrie, 2024). Responding to these costly flood events, the provincial government implemented various policy tools to limit its future economic exposure, including lifetime caps on compensation, property buyouts, and restrictions on development in flood zones. In the aftermath of the buyouts, many communities were left 'partially retreated', with minimal guidance on how to manage the vacant land. This study focuses on bridging the gap between the initial buyout process and the subsequent land use decision-making process for retreated lands.

In Canada, there has yet to be research that documents post-retreat land use changes in communities that have implemented voluntary buyouts. Unlike in the United States (U.S), where the Federal Emergency Management Agency's guidebook on Open Space Management instructs local decision-makers on managing buyout lands (Smith et al., 2023), there is no such national guidance in Canada. Similar to other studies in the US (Binder, Barile, Baker & Kulp, 2019; Maly, Kondo & Banba, 2017; Zavar & Hagelman, 2016), this study analyzes the City of Gatineau, Quebec as a case study to document the decision-making process concerning post-buyout land use management. It outlines major changes to Quebec's flood risk management policies since the 2019 flooding, examines how the provincial government's property buyout programs affected Gatineau, and explores the decisions that local officials face in managing the buyout lands. Specifically, this longitudinal study aims to address the following questions:

1. Since the inception of Quebec's buyout program, what policy changes have occurred between 2019-2024 and how do those changes align with other provincial/ municipal FRM and land use policies?
2. In partially retreated communities, how are municipalities managing vacant lots, and to what degree is there a sense of strategic community visioning for post-retreated land?

The paper begins by discussing the nature and dynamics of managed retreat as a strategy for flood risk management. It then describes the methods used to analyze changes in policy development and evaluates the alignment of intergovernmental policies related to private property buyouts and post-retreat community plans through the municipal lens of Gatineau, a community that has partially retreated. The study concludes with policy critiques about the provinces approach to flood risk management. This research illustrates that communities who implement buyout programs will have to consider how to utilize and manage vacant lands either reactively when disasters strike or proactively as part of community climate change resilience planning.

4.2 Flood Risk Management and Managed Retreat

Confronted with growing climate risks, widespread flood damages and rising recovery costs, there is a pressing need for governments to implement flood risk management (FRM) practices to make communities more climate resilient. FRM is a framework that comprises a variety of structural and social/soft mitigation measures that aim to contain flooding and limit its damage to property and infrastructure as part of a broader effort to adapt to climate change (Cassel & Hinsberger, 2017). More broadly, FRM aims to minimize flood damage through five basic strategies: *prevention* through proactive spatial planning, *protection* via structural defences, *mitigation* through voluntary buyouts, *preparedness* through early forecasting and evacuation plans, and *response and recovery*, which can include rebuilding and disaster compensation (Driessen et al., 2016; Tariq et al., 2020). These strategies can reduce community vulnerability, promote disaster readiness, and increase the overall resilience of a socio-ecological system.

Canada's traditional approach to FRM sought to mitigate damage through costly, publicly funded protection measures and disaster assistance to fund recovery (Henstra et al., 2019; Thistlethwaite & Henstra, 2019). As noted by Morrison et al. (2018), Canada's approach to FRM has centred primarily on resistance-based strategies to control flood threats with structures and to control behaviour through laws and policies. In the 1970s, the Government of Canada launched the Flood Damage Reduction Program

(FDRP), a novel intergovernmental program designed to map floodplains, prohibit development in high-risk areas and refuse disaster assistance to any new development in designated flood risk areas (Henstra et al., 2019; Shrubsole et al., 2003). Despite the collapse of the FDRP in 1999, some of its core principles remain, such as the 100-year (1% AEP¹) flood as the minimum design standard, investments in flood protection infrastructure, and the distribution of disaster financial assistance when flood controls fail (Henstra et al., 2019). Following several major flood disasters (e.g., 1997 Red River, 2013 Calgary/High River disasters, 2017/2019 Quebec floods), policy questions were raised about the effectiveness of control structures, the rising cost of recovery and the long-term viability of repeated disaster payouts (Henstra et al., 2019; Shrubsole et al., 2003). These questions set the stage for the current embrace of managed retreat as an alternative FRM strategy.

Managed retreat is a governance challenge, whereby resources and responsibilities are fragmented between different levels of government. One significant challenge comes in the form of actors with the power to mobilize managed retreat plans (e.g. municipalities) facing financial barriers, while actors that have the financial wherewithal to encourage retreat (e.g. federal government) have little authority to carry out retreat (Siders, 2019). In the absence of national or regional guidelines concerning property buyouts, managed retreat programs have been implemented inconsistently, leading to inequity, weak accountability, and a lack of transparency (Shrubsole et al., 2003). These types of institutional arrangements can result in unclear divisions of responsibility between different levels of government, and confusion about which entity is responsible for planning, design, and implementation, resulting in a lack of accountability for decisions that are made or not made (Shrubsole et al., 2003). After the 2019 property buyouts in the City of Gatineau, for instance, participants decried excessive bureaucracy and a lack of coordination between intergovernmental partners, which led to process inefficiencies and implementation challenges (Cottar et al., 2021).

A pressing governance challenge associated with managed retreat is what to do with the vacant land once the buyout process is complete. Development is a substantial investment and can be difficult to undo given the added costs of land restoration and relocating critical infrastructure systems (Kousky, 2014). Competing goals of land restoration and flood protection are ongoing concerns that local municipalities often experience after the initial recovery period. For example, in 2018 the City of Grand

¹ AEP is defined as the annual exceedance probability. Accordingly, a flood that is estimated to recur once in 100 years has an AEP of 1/100 or 1%.

Forks in British Columbia implemented property buyouts and subsequently developed the open space with natural infrastructure to restore riparian areas (Thistlethwaite et al., 2023). Moreover, securing funding for restoration, feasibility assessments, and future maintenance of the land must be considered when implementing managed retreat plans. As part of a managed retreat effort, land use plans must be developed in consultation with the community in order to identify what purpose the land will serve in the future (Binder et al., 2019; McGhee et al, 2020, Siders 2019).

Numerous past studies (Binder et al., 2019; Siders et al., 2019; Cottar et al., 2021; Zavar & Hagelman, 2016) have commented on land use plans surrounding partial retreat leading to “swiss-cheese or checkerboard” patterns, whereby remaining structures are separated by vacant space. In cases of partial retreat, governments must actively work to revitalize vacant lots and commit funds to beautification projects to retain community appeal though this may seem feasible in theory, the practical application is often fraught with challenges. As a result of the buyouts, the open space may actually benefit neighbouring urban areas who have high land competition and thus the creation of an additional recreational space or conservation park in the community is valuable (Mach et al., 2019). Additionally, retreat from one risky area can lead to densification of other areas due to low housing supply, and sometimes even movement by homeowners from one risk zone to another.

Following up on the research conducted by Cottar et al., (2021), this longitudinal study explores the spatial and temporal differences in Gatineau, five years after the 2019 spring floods, while assessing the long-term impacts of the buyout policy on local land use planning and FRM. Since Quebec has implemented one of the few provincially funded buyout programs in Canada, it offers potential insights about buyout policy development, program implementation, and long-term land use plans for partially retreated communities.

4.3 Methods

This mix-methods qualitative study used interviews, field visits, curated walking tours, and document analysis to assess the municipality of Gatineau, Quebec after the 2019 floods. Over a five-year period (May 2019 – March 2024), the researchers documented the spatial and temporal differences in provincial buyout policy, assessed municipal development plans, reviewed flood maps, and visually inspected the community of Pointe Gatineau four times (July 2019, February 2020, May 2022, November 2023) to track the physical landscape changes resulting from the buyouts and other FRM initiatives. Pointe Gatineau is a municipal electoral district in the City of Gatineau. The research blended primary

and secondary sources to understand the long-term impacts of buyouts in partially retreated communities by analyzing disaster financial assistance (DFA)/buyout program priorities. This data was supplemented with in-person and virtual interviews ($n=12$) with a variety of stakeholders, including municipal and provincial governments, city councillors, disaster relief organizations, and homeowners. Secondary data was collected via internal program documents ($n=10$) compiled by participants, as well as grey literature, news articles (approx. $n=42$), academic journal publications, official community master plans, provincial legislation, and governmental policy reports. Similar to a freedom of information (FOI) request, researchers were able to request and receive program information and data records from the Ministry of Public Security for the Province of Quebec. Since some documents were written in French, the researchers used DEEPL, a machine-based AI translator, to translate documents to English for analysis.

The researchers obtained quantitative data for disaster claims and property buyouts in Gatineau and the province of Quebec from the *Directorate General for Recovery, Ministry of Public Security* for the spring floods in 2017, 2019 and 2023. Semi-structured interviews lasting approximately 60-90 minutes were conducted with participants with informed consent being obtained prior to the interview. Interviews were recorded and transcribed using Otter.ai with a combination of open and axial coding being applied to generate a list of 12 thematic codes. By using grounded theory methodology (Corbin & Strauss, 2008), we examined an array of topics ranging from property buyout program design considerations, provincial DFA policy development, interjurisdictional flood risk reduction and mitigation strategies, post buyout land use options, multi-objective decision-making outcomes for flood-prone municipalities, and municipal servicing challenges for partially retreated communities. Some of the questions posed to participants included:

1. What are the key components of the Quebec property buyout policy? How would you describe the origins of the policy? What factors or events promoted it?
2. What is the goal of the program? (e.g., full floodplain retreat or partial retreat of neighbourhoods) How do you measure the effectiveness of the program? What are the key performance indicators for the buyout program? (e.g., program participation/uptake, reducing the vulnerability of high-risk properties)
3. Please describe any moratoria on rebuilding in place. Since 2017/2019, what types of changes have been made to the provincial buyout program?
4. For properties that have been demolished, what will happen with the vacant lots?

5. What types of large-scale investments are being made for flood mitigation in the region? Do these align with the provincial buyout option? Is there alignment with other national and provincial policies? (i.e., flood-mapping, risk disclosure, insurance)

There were several limitations affecting our ability to interview relevant individuals. Firstly, over the duration of the study, we observed significant staff turnover at the city and a change in political representation for the district of Pointe Gatineau, which limited the number of people with a longitudinal perspective on the community's flood risk management efforts. Secondly, researchers chose not to interview residents who had participated in the Quebec buyout program due to both privacy and trauma/PTSD concerns, though their experiences are reflected through the comments made by others who were interviewed. Responses were verified via triangulation of data across multiple sources (i.e. interviews, secondary data, personal observations).

4.4 Results

4.4.1 Evolution of Quebec's Flood Risk Management Regime and Property Buyout Policy

Property buyouts have been part of Quebec's FRM regime since the 1996 Saguenay Flood (Ministry of Public Security, 2024)². Over the ensuing years, financial support for property buyouts increased in correlation with an increase in the scale and frequency of flood disaster claims. Prior to 2017, private property buyouts were granted on an individual claimant basis, though the financial assistance that was offered was limited to the amount of the damages the property sustained. After the spring 2017 floods, the Ministry of Public Security (MPS) introduced a specialized financial assistance program relating to floods that included buyouts (known as "departure allowances") for properties that had suffered extensive damage (Cottar et al., 2021; Porter, 2021). Quebec's buyout program is unique in that property acquisition has not been tied to flood mitigation projects but is rather a standalone policy tool to relocate households out of high-risk areas.

In June 2019, the Government of Quebec introduced a key FRM policy change by establishing a "Special Intervention Zone" (Zone d'Intervention of ZIS Spéciale/ Special Intervention Zone)—a regulation that prohibited building or rebuilding of residential properties in all flood zones with a recurrence rate of 0-20 years. This new regulation buttressed the existing *Protection Policy for*

² Program information and quantitative data was obtained from the Ministry of Public Security via an information request. In-text citations that read as (Ministry of Public Security, 2024) are from interviews with representatives from the Direction Générale du Rétablissement, a division of the Ministry of Public Security for the government of Quebec.

Lakeshores, Riverbanks, Littoral Zones, and Floodplains (PLRLF), which governs construction along coastlines, shorelines and other flood zones (Biron, 2019; City of Gatineau, 2019; KI 5, 2023). The ZIS was a transitional provision aimed at enabling local governments to establish and amend regulations pertaining to land use planning and development in high-risk areas (City of Gatineau, 2019). At the time, the provincial government introduced new flood maps and imposed a moratorium on reconstruction, which affected more than 800 municipalities, including some that had never experienced flood hazards (Stevenson, 2019). After immense backlash and contestation of the flood maps, the provincial government retracted 30 municipalities from the flood maps to better reflect reality, bringing the total to 783 municipalities that were impacted by the ZIS (CTV News, 2019).

The 2017 and 2019 spring floods revealed weaknesses with the PLRLF and highlighted its lack of coherence with municipal regulations (Government of Quebec, 2024c; Merkoukhina & Bornstein, 2020). Households were eligible for a property buyout if flood damages exceeded 50% of the property's value or amounted to \$100,000 in cumulative damages with a lifetime aid on disaster coverage (Krishnan & Montpetit, 2019). At the time, homeowners were eligible to receive a buyout offer of up to \$200,000 for the property with an additional \$50,000 for the land (Cottar et al., 2021; Laucius, 2019; Thistlethwaite et al., 2023). Additionally, the program stipulated that acquired properties must be demolished and the land ownership ceded to the municipality for a nominal sum of \$1 (Government of Quebec, 2021; Thistlethwaite et al., 2023). After the spring 2017 floods, 3,945 homeowners submitted disaster claims to the province, of which 419 were classified as property buyouts with 126 situated in Gatineau (Ministry of Public Security, 2024).

In 2019, the Government of Quebec established the *General Indemnity and Financial Assistance Program Regarding Actual or Imminent Disasters* (referred to hereafter as the 'buyout program'), which aimed to give financial support to disaster victims whose primary residences were damaged by the floods (Saunders-Hastings, Bernard & Doberstein, 2020). Under the revised program, property owners were eligible to participate in a voluntary buyout if their damages exceeded 50% of their replacement cost or reached \$100,000 (Cottar et al., 2021; Krishnan & Montpetit, 2019; Laucius, 2019). Similar to the 2017 program, compensation was capped at \$250,000 for the residence and the land despite an increase in home values. Concurrently, the provincial government enacted a lifetime limit on disaster financial assistance of \$100,000 for successive floods (Boudreault & Bourdeau-Brien, 2020). If a homeowner refused a buyout offer and rebuilt, the property was marked as ineligible for future disaster compensation

(Government of Quebec, 2024b). The last two stipulations are important since they introduced significant coercive elements to a program often described as ‘voluntary’.

Simultaneously in 2019, the Quebec government established a ministerial action group on spatial planning (related to floods) to develop an action plan on land use planning and FRM (Government of Quebec, 2024a). The ZIS was expanded to all flood zones with a 1:100 recurrence interval, as well as any flooded territory as documented by aerial photographs after the spring 2017 and 2019 floods (Government of Quebec, 2019; Merkoukhina & Bornstein, 2020). Pursuant to the decree, all new construction and rebuilding in these areas was prohibited (Government of Quebec, 2019). After the spring 2019 floods, 4,964 homeowners made damage claims to the province, which resulted in 979 property buyouts, 45 of which were located in Gatineau (Ministry of Public Security, 2024).

In 2020, the provincial government implemented the *Territorial Protection Plan against Floods (PPTFI)* comprising 23 flood protection measures categorized into four priorities—mapping; governance and supervision; planning and intervention; and knowledge and communication—with a budget of \$479 million (Government of Quebec, 2024a). Specifically, \$270 million was itemized to support municipalities with resilient development, \$89 million was allocated to establish flood management project offices at the watershed level, \$75 million was portioned for municipalities to relocate critical infrastructure located in high risk areas, \$37 million was catalogued for the knowledge mobilization of flood maps to the public, and \$8 million was granted for mapping flood hazards at the watershed level (Ministry of Municipal Affairs & Housing, 2020). These investments indicate that the relocation of people and critical assets from high-risk areas continues to be a priority for the provincial government particularly when mitigation measures are ineffective.

In March 2022, the PLRLF was replaced with the *Transitional Regime for the Management of Flood Zones, Banks and Coastlines (TRMFZBC)*, which lifted the ZIS and empowered municipalities to authorize development in flood zones (Government of Quebec, 2024c). Although this policy was intended to promote policy coherence amongst different levels of government, it actually restricted municipalities from developing in risky areas and imposed a procedural change that required municipal approval for development, further increasing costs and delaying projects. In July 2022, compensation for property buyouts for homeowners was increased to a maximum of \$325,000 for the property with an additional \$60,000 for the land (Ministry of Public Security, 2024; Thistlethwaite et al., 2023). Comparatively, small

businesses were eligible to receive up to \$485,000 for the property and land (Ministry of Public Security, 2024).

Limited flooding happened yet again in Quebec in 2023. After the spring 2023 floods, 797 homeowners made disaster claims to the province, which resulted in 11 buyouts, though none were in Gatineau (Ministry of Public Security, 2024). Table 1 summarizes the flood-related damage claims and buyouts for the province of Quebec and the City of Gatineau. Since 2023, buyout compensation amounts have remained unchanged for both homeowners and small businesses, but the program retains its core objective of supporting regulations that prevent rebuilding in floodplains and mitigating the economic cost of disaster financial assistance to the provincial treasury (Ministry of Public Security, 2024).

Disasters	Claim Type	Number of claims for the Province of Quebec	Number of claims for the City of Gatineau	Number of property buyouts for the Province of Quebec	Number of property buyouts for the City of Gatineau
Spring 2017 Floods	Homeowners	3,945	643	419	126
	Tenants	656	232	0	0
	Businesses	566	181	125	0
Spring 2019 Floods	Homeowners	4,964	508	979	45
	Tenants	899	94	0	0
	businesses	913	110	387	27
Spring 2023 Floods	Homeowners	797	139	11	0
	Tenants	111	17	0	0
	Businesses	164	23	0	0

Table 1: This table provides a detailed breakdown for the number of disaster claims and property buyouts for the spring 2017, 2019 and 2023 floods. They are further categorized to differentiate between the total claims and total number of buyouts for the province of Quebec and the City of Gatineau (Ministry of Public Security, 2024).

As of 2024, the Government of Quebec has committed to developing a new regulatory framework that will govern the type of modifications that can be made on flood protection structures in Quebec under the *ouvrages de protection contre les inondations* (OPI) to better protect communities from flood risks (Government of Quebec, 2024d). Concurrently, the province plans to release new flood maps that designate areas based on four categories of flood risk, ranging from ‘very high’ to ‘weak’, and it is estimated that as many as 55,000 more homes will be classified as located in the floodplain (Jonas, 2024). Based on the policy trajectory described above, it is likely that property buyouts will remain a key strategy in the Government of Quebec’s FRM portfolio. The provincial government will continue to offer

buyouts as part of their DFA program whilst looking at the federal government to offer solutions in the form of subsidized flood insurance amongst other risk reduction mechanisms.

4.4.2 Challenges in Maintaining Occupied and Vacant Lots in a Post-Buyout Landscape

In the wake of successive rounds of property buyouts, many Quebec municipalities face the challenge of servicing occupied properties and maintaining critical services in neighbourhoods where some homes remain occupied, because the owners either declined a buyout offer or did not meet program eligibility whereas others have been demolished, leaving vacant lots. Faced with this “swiss-cheese/checkerboard” (Cottar et al., 2021), municipal governments must continue to provide services such as waste collection and disposal, sewer and water supply, public transit, snow removal, and electrical utilities for the remaining occupied properties. As one municipal official explained:

All the infrastructure, the pressurized water system, and the sewage...both the pluvial system and the domestic waste, we have to fully maintain and operate them, and our tax base has been cut by probably 30%. So, there's an economic loss to us. So, if we can find a way to offload properties in risky areas whilst trying to increase the tax-base, that'll help. And we realized that we would have to redo a sewer pipe because there's only three houses on that road, so capital expenses increase.

Moreover, many occupied properties in the Pointe Gatineau area started to illegally add fill onto their properties to increase their lot elevations (KI 2, 2020; KI 4, 2023). Likewise, properties that are acquired in a checkerboard pattern hinder the creation of open parkland spaces due to connectivity issues further disenfranchising constituents from accessing the space and holding the city accountable for the upkeep of the vacant lots (Freudenburg et al., 2016; Zavar & Hagelmann, 2016).

Furthermore, year-round maintenance of vacant lots left beyond by property buyouts is a costly challenge for local governments (Zavar 2015; Zavar & Hagelmann, 2016). In Gatineau, for instance, maintaining post-buyout vacant land is a significant operational cost, especially when coupled with lost property tax revenue from the former properties. Data collected through curated walking tours suggested that property owners had begun to use adjacent vacant lots for their own purposes, such as raised-bed gardening and planting (Figure 1). Although these formal and informal uses of open space offer public value to residents (Zavar, 2014), interviewees for this study noted concerns about illegal squatting and garbage disposal on the vacant lots and called for increased enforcement. One informant reported that some municipalities have considered gifting these lots to adjacent homeowners, thereby offloading the

responsibility for upkeep and increasing property tax revenue. As one municipal informant explained, such a transfer of ownership would be accompanied by restrictions:

But this is an example where the lot is too small to do anything with. We'd probably approach this owner and say we'll would you be interested in acquiring it? That way, we don't have to maintain it. We get a lot of complaints that it's not managed. But there'd be restrictions on what they can and cannot do with it. They can make a nice garden. They can't change the topology, they can't dig, no permanent structure maybe a shed or a picnic table.



Figure 1: (Left) A raised garden bed is placed in a vacant lot as photographed in November of 2023. (Right) Decorative community plants and landscape lights have been temporarily placed, likely by residents, in a vacant lot between two occupied properties (Cottar, 2023).

4.4.3 Post-Buyout Land Use Options in Pointe Gatineau, Quebec



Figure 2: (Left) A community sign invites residents to convene on Thursdays to harvest from the community garden signifying an ecological and commemorative addition to the Pointe Gatineau community after the floods. (Right) Community raised garden beds and picnic tables have been placed in a vacant lot and have been designated a communal garden by the City of Gatineau (Cottar, 2023)

Although post-buyout landscapes in Gatineau present a unique opportunity to design and implement land use options that are climate resilient, this opportunity has only been pursued on a very small scale to date. Particularly, municipalities are bound by the confines of a reduced tax base whilst reconciling the benefits of open space conservation for the public good (Atoba et al., 2021). After the 2019 buyouts, local councillors and citizen committees worked together to revitalize and beautify a vacant lot by developing a small community garden (Figure 2) (Cottar et al., 2021). Following the pilot project, the City of Gatineau partnered with the Regional Council for the Environment and Sustainable Development of the Outaouais (CREDDO), Park People (a non-profit advocacy group), and design firm Mandaworks to develop a Master Plan (PDA) for the development of vacant land in the Pointe Gatineau and Lac-Bauchamp districts (Park People, 2021). Adopted in 2020 by Gatineau’s city council, the Master Plan aimed to revitalize communities impacted by buyouts through the implementation of green infrastructure that supports ecosystem services while simultaneously improving public recreational spaces and stimulating local economic growth (CREDDO, 2021). As illustrated in Figure 3, the PDA proposed a toolbox that prioritized five different lot typologies, including:

- *nature lots*, which would provide space for nature to flourish by featuring pollinator gardens or wooded areas

- *nourishing lots* that would benefit local residents and encourage homegrown food production through urban farming and greenhouses
- *gathering lots* that would provide opportunities for social congregation, including picnic tables and community art
- *by the shore lots* that would integrate land and water with drainage areas or river terraces; and,
- *sponge lots* that would offer ecological services and absorb excess water via hydrophilic plants (CREDDO, 2021; Park People 2021; Sabourin, 2021).



Figure 3: A visual depiction of the 25 different land typologies that were designed for the Master Plan (PDA) that includes nature lots, nourishing lots, gathering lots, by the shore lots, and sponge lots. All of these activities have long-term social or environmental benefits that can help to make Gatineau more climate resilient whilst improving the social fabric of the community (Photo Credit: CREDDO 2021; Park People, 2021).

The Master Plan outlined a toolbox which proposed a range of multi-use options for the vacant lots with a particular emphasis on supporting flood mitigation activities that adhere to provincial regulatory requirements while increasing the accessibility of unused spaces to communities. Given the vast scope of the project, the PDA was designed to follow an inclusive, iterative and participatory approach that allowed for input and collaboration from a variety of stakeholders and citizen groups. The PDA used a three-phase process which included the preparatory study (January – April 2020), the

conceptualization study (May – September 2020), and the overall plan that would equip local governments with the tools for implementation and project continuation (October 2020 – May 2021) (CREEDO, 2021). Community consultation was a key tenet of the PDA with a working committee being formed to oversee the plan whilst project members implemented multiple consultation tools to maximize citizen participation (e.g., postal flyers, newspapers/social media, posters, online survey, Zoom meetings, community information panels).

Additionally, the plan for Pointe Gatineau incorporated several lot-level criteria, including maintaining vehicle access, proximity to water sources, access to community parks and streams, prohibiting changes to topography, cognizance of microclimate impacts, and strategic prioritization of development of lots that were already located near critical infrastructure or parks. The consultation process identified residents needs while the design team focused on aligning community needs with opportunities for future lot development. Despite the development of the PDA, the City has yet to develop specific plot plans for each of the vacant lots. Furthermore, internal documents shared by key informants highlighted numerous challenges that working group members faced during the development of the PDA, including delayed project timelines, regulatory restrictions, resource capacity, financial constraints, and community involvement that could hinder implementation (KI 5; Ville de Gatineau, 2022). As with other buyout programs across Canada, many key informants (KI 2, 2020; KI 5, 2023; KI 6, 2023) noted the ambitious nature of the PDA and called for increased support from senior government partners. Given the length of time that has passed since the buyouts, it remains to be seen if and how the PDA will be funded.

4.5 Discussion

Given the longitudinal nature of the study, we were able to analyze the spatial and temporal changes in Gatineau after the 2019 spring floods while assessing the long-term impacts of the provincial buyout policy on communities. Throughout the research, we discerned two key findings. First, there has been a growing alignment of provincial policies (e.g., buyout program) and regulatory tools, (e.g., ZIS and TRMFZBC) in Quebec, leading to greater policy coherence that better ensures the relocation of residents and property from the 0:20 year flood zones, and the subsequent enactment of regulations to prohibit redevelopment in high-risk areas. Second, however, we found evidence of policy misalignment and institutional fragmentation between provincial policies and municipal regulations pertaining to the development of occupied and vacant lots. As evidenced in the case of Gatineau, this dynamic has made it challenging for municipalities to implement Quebec's new flood management regime.

4.5.1 Policy Coherence: Alignment between Provincial Buyout Policies and Regulatory Tools

Property buyout policies and regulatory tools, such as the ZIS, are institutionally aligned to support the mutual goal of mitigating the consequences of flooding by providing financial assistance while recognizing that some areas are no longer safe for future redevelopment. In the case of Gatineau, the combined use of buyouts and special intervention zones enabled residents to retreat while simultaneously preventing the reconstruction of properties in the 0:20 year flood zone (Cottar et al., 2021). This form of land use planning is considered the most practical and cost-efficient way of limiting future damages (Deschamps, Bourdeau-Brien & Boudreault, 2023). Despite the ad-hoc development of a buyout program, the provincial government mobilized to issue a moratorium on the reconstruction of structures in the floodplain, though critics of the ZIS contend the tool was created to “buy the government time” to update the outdated flood maps and modernize regulations concerning flood risk areas (Merkoukhina & Bornstein, 2020). Upon the release of the flood maps that demarcated the ZIS, many municipalities (including Gatineau) were shocked to learn that areas previously unaffected by flooding were now reclassified in the 0:20 year floodplain (Kupfer, 2019; Stevenson, 2019). This is possibly attributed to the provincial government trying to simplify regulatory processes and avoid further liability by overestimating the risk and delineating larger areas to be in the floodplain. Since then, the Government of Quebec has worked with municipalities to redefine the boundaries to allow certain activities in low-risk areas while working to develop draft regulations that will replace the Transitional Regime for the Management of Flood Zones, that set out the responsibilities of municipalities in the implementation of the regulatory regime (Government of Quebec, 2024e).

This form of policy coherence aims to increase the capacity of the provincial government by promoting cooperation and transparency between different ministries to avoid policy conflicts and the duplication of efforts (Geerlings & Stead, 2004; OECD 2024). Specifically, Quebec’s buyout policy and regulations illustrate the use of “horizontal integration” (Geerlings & Stead 2004, p.2), which seeks to align policies amongst actors within the same organisation. The floods garnered significant attention with elected officials expressing their political support and commitment to a renewed flood management regime for the province, signifying a necessary precondition for policy coherence (Thistlethwaite et al., 2023). Furthermore, the use of a buyout policy within Quebec’s broader range of FRM tools reflects a paradigm shift towards a risk-based approach. What remains to be seen is how the Transitional Regime for the Management of Flood Zones will be implemented in communities and if it will align with other flood management regulations to ensure policy coherence.

4.5.2 Policy Fragmentation: Disconnect Between the Provincial Flood Risk Management Regime and Municipal Land Use Planning

Compounding flood disasters and the development of a new flood protection plan has triggered renewed efforts of flood risk governance and management in Quebec. Following the 2017 and 2019 flood disasters, Quebec was heavily criticized for its lack of a central organization to oversee FRM, which contributed to fragmented government actions in the recovery process (Bruemmer, 2024). Multiple provincial ministries are tasked with aspects of flood management, resulting in program and service gaps (Cejudo & Michel, 2017). Particularly in 2019, homeowners who had experienced minimal flood damage and were not eligible to receive a buyout found it difficult to navigate the rebuilding process, especially if they were designated in the ZIS, which prevented residents from renovating their properties (KI 3, 2023; Northcott, 2019). This fragmented policy led to increased costs to local governments, rebuilding delays and a decreased efficiency in the delivery of flood risk information to constituents (Peters, 1998). Moreover, these policies do not account for what to do with the land if it cannot be redeveloped.

Conversely, the production and dissemination of flood hazard maps in Quebec is highly decentralized with municipalities, such as Gatineau, developing their own flood maps and data due to the outdated provincial flood maps (Golnaraghi et al., 2020). A byproduct of decentralized governance means that provincial and local governments function concurrently leading to the fragmentation of responsibilities and often, the duplication of initiatives (Gogsadze, 2022). The introduction of the proposed flood protection plan has prompted provincial regulators to release their own updated flood maps that define flood zones based on risk while accounting for the probability of flooding and the level of severity in terms of water depth (Bruemmer, 2024). However, provincial authorities have yet to publicize these maps, leaving many municipalities in a state of uncertainty concerning allowable land uses. This form of political paralysis has impeded the implementation of municipal post-buyout land use plans (e.g., PDAs) and has restricted residential/commercial expansion in Pointe Gatineau. As one municipal official commented:

I'm a bit frustrated, because I've got a lot of property in my district, which is underused or not used because of the floods. And the data we're using is old data like on our Atlas Gatineau, there's pressure because the city paid two years ago for new LIDAR data. And it's been compiled, analyzed, and it's ready to go. We had to submit it to the province first for analysis. And they have not given us the okay to post it yet. So, we're in a tight spot right now, because the current flood maps, we have, are not entirely accurate. We've got landowners who insist that they're no longer in the flood zone. But the data hasn't been released publicly.

Furthermore, the lack of policy direction increases municipal responsibility to authorize development and issue building permits that comply with provincial and municipal urban planning regulations. Municipal authorities must also develop communication tools to inform citizens of the procedural changes (i.e., obtaining municipal authorization) to avoid infractions (City of Gatineau, 2022). Moreover, a reoccurring theme in many of the qualitative interviews was that regulations will be needed once the provincial flood maps are released, including legal protections for municipalities that made decisions or allowances granted based on an older set of flood maps (Municipal Affairs Alberta, 2014; KI 4, 2023). Ultimately, the case of Gatineau speaks to the lack of coordination and downloading of responsibility from provincial actors onto municipal authorities without the adequate institutional guidance and resources to implement the regulatory regime.

4.6 Conclusion

The 2017 and 2019 Quebec Spring floods prompted the ad-hoc development of a property buyout policy, whereby the provincial government recognized the need to better promote a rigorous FRM approach. By documenting the evolution of Quebec's flood risk management regime and the post-buyout land use decision making process, this study illuminated the challenges and opportunities that municipalities face in the management of post-buyout vacant lots. The findings suggest that the provincial FRM regime is challenging to execute without the adequate coordination of responsibility and elimination of policy fragmentation between intergovernmental partners (Thistlethwaite & Henstra, 2019). The case of Gatineau illustrates a partially retreated community that has developed a community master plan with the potential for vacant lot revitalization. Without adequate funding and policy direction from the provincial government, however, progress on this plan could be hindered. In addition, the study highlights the importance of provincial agencies working with local governments during the implementation phase of the buyout process and providing the necessary financial, technical and administrative support for the enforcement of zoning regulations and post-buyout land use plans.

The study gives rise to several potential areas for further research. First, there is limited research on "receiving communities" in Canada, so an analysis of where bought-out residents move would be fruitful, with a focus on determinants such as accessibility, affordability, housing, social connections, and neighborhood amenities that might play a role in their decision-making process. Second, an exploratory study that surveys Gatineau residents about their buyout perceptions and willingness to participate in

leaseback/rentback schemes would prove beneficial to government agencies considering investments in proactive adaptation. For example, allowing buyout participants the option to remain in their homes and rent their property from the provincial government until the next flood could alleviate future buyout costs (Keeler et al., 2022). In turn, this could set a precedent for governments in Canada considering the use of a phased buyout approach in partially retreated neighborhoods but are hesitant to expropriate due to a lack of affordable housing. Despite evidence of policy fragmentation, the Quebec government's decision to develop a new flood protection plan along with the continued use of provincial regulatory tools, departure allowances, and land use plans signifies a commitment to become more climate resilient.

Chapter 5

Dissertation Summary and Conclusions

5.1 Summary of Dissertation Findings

The three studies that comprise this dissertation investigated six research questions as outlined in section 1.2, to explore the state of post-disaster managed retreat policy and programming in Canada via the use of multi-jurisdictional case study analysis. The primary focus of this dissertation is to a) improve policymakers' understanding of the intricacies of managed retreat by documenting the post-disaster decision-making process and b) identify relevant policy gaps, strengths and limitations and provide recommendations for policy enhancements to promote the continued use of managed retreat in Canadian communities. The following section outlines the objectives of each study and describes how the objectives were achieved through the empirical research. The chapter also summarizes the theoretical and practical contributions to the climate change adaptation and disaster risk reduction literature and concludes with opportunities for future research.

5.1.1 Study 1: Municipal Perspectives on Managed Retreat and Flood Mitigation: A Case Analysis of Merritt, Canada After the 2021 British Columbia Flood Disaster (Chapter 2)

Research Questions for Study 1: (RQ1) What factors lead local governments to pursue a retreat or rebuild decision as the community transitions from a response phase to recovery operations, finally towards a long-term flood resiliency? (RQ2) What types of policy instruments (e.g., lifetime limits to disaster aid, buyout compensation, regulations prohibiting future development) are considered in the immediate post-flood environment, and how do these evolve during the post recovery period?

Objective 1: Engage a diverse range of stakeholders (including emergency operations center (EOC), recovery operation center (ROC), resilient support center (RSC), municipal representatives involved with flood recovery and long-term planning in the areas of finance, engineering and housing) involved in the post-disaster recovery process and document the discussions had by decision makers about flood mitigation planning, community recovery challenges, transitional supports, and the intersection of data, funding and policy.

Objective 2: Conceptualize gaps between climate risks and existing municipal/provincial disaster recovery policies and explore different policy pathways for transformative change.

The first study (chapter 2) explored the disaster response and recovery process in Merritt, British Columbia after the 2021 atmospheric river event by documenting the discussions and adaptation options—e.g., *protect* (dikes/berms), *accommodate* (elevating properties/floodproofing), *retreat* (property buyouts)—considered by policymakers in advance of official municipal decisions. To the author’s knowledge, this is the first exploratory study published in a peer reviewed journal that examines a community in the immediate post-disaster period to document the various discussions about managed retreat/buyouts that ultimately does/does not lead to an actual decision to retreat. Given that most research takes place after a decision has been made or a formal policy has been implemented, this is both a gap and an opportunity to understand the inner workings of municipal decision-making.

By engaging a diverse range of stakeholders and decision-makers in the disaster recovery arena, the study found that communities in the post-disaster recovery phase are considering the use of buyouts as risk reduction tools amongst broader flood mitigation strategies, but policy constraints and a lack of funding are impeding the implementation of flood mitigation plans that include buyouts (**RQ1; Objective 1**). Municipal officials confirmed that transitional supports including psychosocial supports and interim housing must be accounted for in recovery planning. Moreover, the research concluded that decisions about post disaster recovery are often independent of broader municipal climate change plans instead of focusing on short term risk reduction mechanisms (**RQ2; Objective 2**). Despite political interest being highest in the aftermath of a disaster, there was little evidence at both the provincial and federal level that supported the use of community-scale buyouts apart from the provision of fiscal resources to aid in critical infrastructure recovery and disaster mitigation related projects. Recognition of these policy gaps allowed Merritt to explore multiple policy streams at the provincial level and provide insights on how existing policies and funding streams could be amended to facilitate the development of a transformative flood mitigation plan.

5.1.2 Study 2: From Flood Mitigation Plans to Property Buyouts: Evaluating Disaster Risk Management Policy Changes in British Columbia, Canada Through a Post-Disaster Recovery Lens (Chapter 3)

Research Questions for Study 2: (RQ1) How and why are municipalities in British Columbia developing managed retreat policy? (RQ2) What disaster management policies were in force over the 2021 to 2024 period, and what role did they play in municipal post-disaster recovery in relation to the development and implementation of flood mitigation plans?

Objective 1: Evaluate the causality between provincial emergency and disaster management policy changes and broader flood mitigation program outcomes for municipalities through a post-disaster recovery lens.

Objective 2: Interview policymakers to analyze the impact that provincial disaster recovery legislation and funding mechanisms have on emergency response, post-flood recovery, and long-term mitigation in communities like Merritt after the 2021 British Columbia flood disaster.

The second study (chapter 3) assesses British Columbia's myriad of disaster and emergency management policies through a post-disaster recovery lens to analyze how policy changes are impacting the development and implementation of municipal flood mitigation plans that include the use of property buyouts specifically after the 2021 BC flood disaster. This policy analysis is unique as it uses evidence-based evaluation, in the form of data and empirical evidence, and stakeholder perspectives (policymakers and homeowners) to assess the impacts of the outdated policies on disaster-stricken communities. The study identifies the theory-practice gap and denotes disaster policy in BC has historically been highly reactive but recent policy developments (e.g., BC Flood Strategy, EDMA, EMCR) signify a paradigm shift from a hazards-based approach to a proactive risk-informed approach (**RQ1; Objective 1**). Additionally, this study justified the principles of flood risk governance particularly a more careful delineation of responsibility and implementation of risk-based management based on different stakeholders' capacities and resources (Driessen et al., 2016; Thistlethwaite & Henstra, 2019).

As exhibited with the case of Merritt, there was an impetus from communities to use land acquisitions to advance flood mitigation projects but a lack of government investment in this policy tool has led to policy inaction. We found evidence of political 'buck passing' with governments adopting a passive approach and downloading the responsibility onto municipalities (Luymes, 2023). Specifically, the findings revealed the cost-breakdown and the benefits of using an equity-based pricing methodology for Merritt's land acquisition program including strong public support, reduced negative impact on financially vulnerable residents, and a reduction in expropriation and litigation costs. Local projects like the C-LAP exemplify that local development of land acquisition programs may offer a way to understand the complex nuances (e.g., equitable compensation, tenure, program administration) in buyout implementation and facilitate future policy learning leading to transformative change (**RQ2; Objective 2**).

5.1.3 Study 3: Navigating Land Use After Managed Retreat: Decisions Facing Local Governments in the Post-Buyout Environment (Chapter 4)

Research Questions for Study 3: (RQ1) Since the inception of Quebec's buyout program, what policy changes have occurred between 2019-2024 and how do those changes align with other provincial/municipal disaster management and land use policies? (RQ2) In partially retreated communities, how are municipalities managing vacant lots, and to what degree is there a sense of strategic community visioning for post-retreated land?

Objective 1: Document the policy changes in the provinces flood management regime and assess the post-buyout land use decision making process in post-disaster environments.

Objective 2: Assess the spatial and temporal changes Gatineau, five years after the spring 2019 floods to evaluate the long-term impacts of buyouts in partially retreated communities.

The third chapter (chapter 4) is a longitudinal study focused on analyzing the policy changes in Quebec's flood management regime and the post-buyout land use decision making process five years after the Spring 2019 floods. By assessing the spatial and temporal changes, the empirical case study explored the long-term changes in policy development and evaluated the alignment between intergovernmental policies related to private property buyouts and post-retreat community plans through the municipal lens of Gatineau, a partially retreated community. By tracing the evolution of Quebec's flood risk management regime, the study discerned the growing alignment of provincial policies (e.g., buyout policy) and regulatory tools (e.g., ZIS) to support the mutual goal of mitigating the consequence of a disaster by providing financial assistance and prohibiting future redevelopment in risky areas (**RQ1; Objective 1**). The study leveraged the principles of policy coherence coined by Geerlings & Stead (2004, p.2) to illustrate the use of horizontal policy integration which seeks to align policies amongst actors within the same organization as exemplified by the provincial government. However, there was evidence of policy fragmentation between provincial policies and municipal land use plans that has prevented communities from implementing plans for the redevelopment of vacant lots. Due to a lack of publicized provincial flood maps, municipal representatives reported political paralysis leading to building delays and decreased efficiency in the delivery of flood risk information to constituents (Peters, 1998). Moreover, the findings revealed major challenges, including increased operational costs for municipalities in servicing occupied properties and maintaining vacant lots in partially retreated areas (**RQ2; Objective 2**).

5.2 Contributions to the Managed Retreat & Flood Risk Governance Literature

This dissertation makes key contributions to the managed retreat literature by linking the theoretical concepts of flood risk governance (FRG), flood risk management, and applied policy. At its core, managed retreat is a governance challenge, whereby resources and responsibilities are fragmented between different levels of government. Particularly, all three studies showcase the principles of flood risk governance whereby FRM is implemented and evaluated to assess if Canada's current governance arrangements support the development and practice of managed retreat (Alexander, Priest & Mees, 2016). Many scholars describe FRG as the shift from a top-down, technocratic approach to a more inclusive, horizontal governance structure that aims to integrate both private and public sectors to manage flood risks holistically (Alexander et al., 2016; Matczak et al., 2020; Renn et al., 2011; Tariq et al., 2020). It is well-documented that flood-prone communities will need to diversify and align FRM strategies that will necessitate new forms of governance arrangements (Hegger et al., 2014). Given that FRM strategies are costly, resource-intensive, and institutionally and technically not feasible in some jurisdictions, there is a greater need to bring in new actors to support the decision-making process and ease fragmentation.

Specifically, study 1 outlines key opportunities for wider policy change by using Kingdon's (1995) *Multiple Streams Approach* to identify a policy problem (i.e., lack of a BC buyout policy) and subsequently utilizes the policy stream to identify potential adaptation strategies (i.e., buyouts to advance FMP). This study analyzes the evolution of a policy problem through the exploration of different adaptation solutions and assesses external factors such as a lack of political will and policy fragmentation to improve flood risk governance arrangements in BC. The study also highlighted that focus events triggered the appointment of a new provincial cabinet focusing on EMCR – outlining the need for new actors to ease fragmentation and streamline the decision-making process. Study 2 analyzes the importance of FRM in policy development and the need for a more defined delineation of responsibility and implementation of risk-based management based on different stakeholders' capacity and resources (Driessen et al., 2016; Thistlethwaite & Henstra, 2019). Despite the huge demand at the municipal level in BC for the use of alternative strategies, such as managed retreat, the research found that FRM is hard to implement without the adequate coordination of responsibility and elimination of policy fragmentation, gaps and redundancy between various government agencies. Moreover, there was evidence of adaptive governance in study 2 which conceptualized the idea that municipalities like Merritt could self-organize, challenge the political status quo and push the boundaries of policymaking by developing their own

community-led land acquisition program (C-LAP) to advance the municipal priorities related to flood mitigation.

According to Driessen et al. (2016), there are two key components that facilitate the practice of good flood risk governance. The first is the need to develop connectivity between different FRM strategies and strategic coordination between different levels of government. Second, diversification of FRM is only possible if investments are made to accompany these adaptations (Driessen et al., 2016). Study 3 found evidence of connectivity between FRM strategies, such as the buyouts and the ZIS, but there was a disconnect between municipal land use plans and provincial flood protection regulations. Conversely, the study found that the provincial government has continued to invest in the buyout program with regular top ups and an increased compensation cap of 62.5% during a 3-year period (i.e., maximum compensation increased from \$200,000 to \$325,000 excluding land). As long as there are fragmented responsibilities between different levels of government, it will be challenging to implement new adaptation options, such as managed retreat, without an aligned and coordinated approach to FRM.

5.3 Practical Contributions

Given that climate-induced disasters have emerged as a priority item in Canada's policy agenda, this dissertation seeks to advance Canada's understanding and practice of managed retreat. Despite managed retreat being a highly contentious and complex adaptation option, the research revealed that municipal and provincial governments in Canada are cautiously optimistic about the use of buyouts as a post-disaster risk reduction mechanism. All three studies found ample evidence of institutional support in favor of managed retreat policies with communities even advocating for policy reform. By documenting the post-disaster recovery processes in Canadian communities and evaluating the types of policy options considered by decision-makers, this dissertation provides two practical contributions.

5.3.1 Effective policy development

Despite the growing body of literature on disaster recovery and buyout implementation in international contexts, empirical research on managed retreat practice in Canada is limited due to the lack of retreat policies themselves. This can be attributed to a lack of funding to support such programs, an unsupportive political environment, and a general lack of awareness amongst policymakers. As governments in Canada consider the use of buyouts as a flood risk reduction tool, there is an urgent need to develop new and evaluate existing policies that support the use and implementation of managed retreat. This dissertation seeks to bridge the gap between research, policy and practice – specifically using case

study analysis to explore the range of policy options and solutions that are available to address public policy problems (e.g., climate-induced disasters). Particularly, all three studies outline the policy development process for managed retreat policy in British Columbia and Quebec.

Study 1 assesses the policy climate in BC after the flood disaster and documents the process by which information was shared with policymakers about the different flood mitigation options (e.g., buyouts, flood protection via dikes) (Brehaut & Juzwishin, 2005). In a similar vein, study 2 explores the different policy options through a provincial lens, assesses the institutional planning of programs, identifies the fragmentation of policy goals and compares the benefits and consequences of certain policy pathways. Study 3 assesses the policy climate in Quebec after the implementation of a certain policy action (i.e., buyouts) and evaluates whether the original goals of the policy were achieved. By documenting the different stages of policy development, as exemplified by the different case studies, this research aims to identify potential policy failures caused by discrepancies in government expectations and actual on-the-ground conditions (Howlett, 2009). An objective of this dissertation was to provide decision-makers with the research evidence to make informed policy decisions. This research aimed to address the knowledge/policy gap, provide tangible solutions to better align existing inter-jurisdictional policies, and enhance the scholarly community's understanding of the intricacies and nuances in managed retreat policy development.

5.3.2 Evidence informed decision-making and practical guidance

The bulk of this research details the complex decision-making process for communities considering the use of buyouts to address climate risks. Given that municipalities have limited resources and short timeframes to make decisions post-disaster, there is a need for applied research that factors in local context, community/political preferences, political landscape, and resource capacity to inform their decision-making. One of the most striking findings of this dissertation is that there is an impetus from communities in Canada to design and implement post-disaster voluntary buyout programs to advance flood mitigation. As a result, municipalities are inclined to learn from other jurisdictions about the challenges and opportunities in pursuing non-traditional approaches. This form of intercommunity learning promotes better decision-making and in turn provides practical guidance on how to help communities adapt and recover more effectively.

Given BC's motivation to develop a province-wide flood strategy that includes community-led managed retreat, study 1 and study 2 are intended to inform public policy decisions by providing key insights and data to help the provincial government formulate effective policies. Similarly, study 3

evaluates existing managed retreat policies in Quebec and helps to refine and improve current practice. By engaging a variety of stakeholders and governing groups, researchers were able to better understand the various aspects of the decision-making process, including settings where buyout policies were active and in communities where buyouts were still a hypothetical option. Ultimately, these contributions are intended to advance Canada's understanding and potential development of property buyout programs as a risk reduction tool.

5.4 Conclusions and Opportunities for Future Research

Managed retreat is increasingly gaining traction in the wider policy arena, with many governments actively considering its use within broader climate change adaptation and disaster risk reduction plans. As climate impacts increase, policies that enable the use of managed retreat will also need to be further developed alongside other risk reduction measures (Birch et al., 2024). The use of retreat is an influential adaptation that has the ability to empower homeowners, communities and governments if executed correctly. Despite the negative perceptions around the abandonment of developed floodplains, the reality is that the many places across Canada will experience some form of flooding and will require robust strategies and plans to manage these risks collectively.

Discussions on not if, but how retreat will transpire are needed in advance of disasters to avoid the challenges that arise during the chaos of post-disaster recovery and buyout implementation. Sound leadership and coordinated responsibility between different stakeholders is integral to the effectiveness and continuation of managed retreat practices (Siders, 2019). Although managed retreat does not inherently lead to societal transformation, the development of provincial policies that support the use of retreat illustrate incremental adaptation which can lead to system wide changes (Siders, Ajibade & Casagrande, 2021). By exploring improved policy pathways forward, this dissertation provides policymakers with an understanding of the successes, challenges, and opportunities associated with managed retreat to build climate resilience in Canada. Based on the results of this dissertation, there are several directions for future research:

1. **Comparison of a standalone buyout program that is solely developed for the purpose of flood mitigation vs. a rolling standard provincial buyout program:** A complimentary study to this research would be to conduct a comparative analysis on an existing provincial buyout policy such as Quebec and compare it to a standalone community targeted land acquisition program such as Grand Forks or Merritt to better understand the differences in program design elements (e.g., compensation,

incentives, administration structure, timelines, land tenure, legal expenses, post-buyout land use etc.). Given that targeted buyout programs are developed with the goal of 100% buyout participation, there are key distinctions in how governments design programs to make them more appealing, either through incentivization, behavioural nudging or community engagement strategies. Sample research questions could include: How do the program design components differ? How does the public perceive these programs? For targeted land acquisition programs, who owns the program? What challenges might arise for wider provincial policy development for jurisdictions that fund and implement targeted land acquisition programs? What are the advantages and limitations of a blanket/ 'one-size fits all' provincial program compared to a targeted program and vice versa?

2. **Conducting a longitudinal study on buyout participants and assessing the impact on receiving communities:** One of the primary gaps in the literature continues to be the buyout participants' journey post-retreat. Given the nature of Canadian buyout programs, governments do not track where buyout participants relocate after, and little is known about the impacts on receiving communities (i.e. host communities that absorb relocated residents). As exhibited in this dissertation, buyouts are largely viewed as a one-time transaction rather than an iterative process even after individuals retreat from the area. By analyzing a community that is undergoing retreat, researchers could map out a buyout participants' journeys and assess the long-term social, psychological and economic impacts the process has on residents. Sample research questions could include: Where are buyout participants relocating to and why? What is the degree of choice that residents have in deciding where they can relocate to? Do determinants such as accessibility, affordability, housing, social connections and neighbourhood amenities play a role in the decision-making process? What supports are offered by governments and receiving communities to absorb new residents? Are buyout participants offered an 'equivalent to stay' compensation package and what is the impact of that on home ownership? What market trends are visible when it comes to properties who were not bought out but instead put up for sale?
3. **Exploring residents' perceptions and willingness to participate in leaseback/rentback schemes post-buyout:** One question that persists for local governments is how to solve the housing vacancy crisis in a post-buyout environment. Researchers could conduct an exploratory study that surveys the Gatineau residents about their willingness to participate in a rentback scheme that would permit buyout participants to reside in their home (though the property is legally owned by the municipality) until the next flood disaster. Given that Pointe Gatineau is a partially retreated neighbourhood, this

would serve as the ideal community to test out this exploratory concept. By targeting the remaining residents, proactively purchasing properties, and allowing homeowners to stay in their properties, this approach buys the government time to develop a future land use plan whilst keeping homeowners temporarily satisfied. Sample research questions include: How do rentback schemes benefit local governments? Are rentback programs complimentary to buyout programs? Which government authority would assume ownership over the program? What program design considerations would need to be included in the rentback program to incentivize participation? What legal amendments or regulatory tools would need to be adopted alongside a rentback program? How does the public perceive buyout rentback programs?

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Appendix A

Recruitment Letter

Date: [day | month | 2022]

Dear

We came across your contact from public websites (e.g., Merritt Flood Recovery Facebook group) outlining your role in Merritt's flood recovery strategy.

I am contacting you in the hopes that you [or someone else from Organization if this is an institutional interviewee] will agree to a brief interview related to our research project entitled "How disaster recovery decision-making unfolds: Investigating how managed retreat and property buyouts emerge as options for post-disaster recovery". This project is funded by the Institute for Catastrophic Loss Reduction (ICLR) under its "Quick Response Program for 2021 Fraser Valley Flooding".

This project is also carried out under the auspices of the Department of Geography & Environmental Management at the University of Waterloo, Ontario. Ethics clearance for this project has been obtained (ORE #44298).

The research questions guiding the project include:

- What adaptation options or policy instruments are considered in the immediate post-flood environment, and how do these evolve during the post-recovery period? (e.g., lifetime limits to disaster aid, buyout compensation, regulations prohibiting development in high-risk areas)
- How do residents receive these mechanisms, particularly in relation to existing private insurance and location relative to the inundation zone?

We expect our research will shed light on the factors which lead governments to consider retreat or property buyouts in communities that are at high risk of flooding. We expect Provincial and possibly Federal Government buyout and compensation policies, either informal or formal, to be a key component of these decisions, and for insurance and Red Cross assistance to also play a role. Thus, we expect to document how major decisions regarding post disaster recovery unfold in Merritt.

The team that has been assembled for this research includes:

- Dr. Johanna Wandel (Team Lead/PI, Associate Professor, University of Waterloo Geography and Environmental Management): jwandel@uwaterloo.ca
- Ms. Shaieree Cottar (PhD Candidate, University of Waterloo Geography and Environmental Management): scottar@uwaterloo.ca

We are contacting you [your Organization] in order to invite you to participate in a short semi-structured interview of approximately 30-45 minutes in length, to be conducted in-person, over the phone, or using an online platform such as Zoom/Skype. Examples of themes we may explore in the interview include the following:

- Awareness of and details about home buyout or flood damage compensation programs that might lead to non-rebuilding in Merritt, British Columbia
- Factors that influence governments to pursue buyouts/ non-rebuilding
- Opinions about programs needed in the future/under future climate change scenarios
- Role of policy windows in decision making processes

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

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

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board (REB # 44298). If you have any questions for the Board, contact the Office of Research Ethics at 1-519-888-4567 ext. 36005 or reb@uwaterloo.ca.

If you [or a representative from your organization] are interested in participating, please reply to this email. If you would like additional information to assist you in reaching a decision about your [Organization's] participation, please contact me at [519-888-4567 x.33384] or by email at jwandel@uwaterloo.ca. We hope that the results of our research study will be beneficial to the scientific and scholarly communities, and disaster recovery agencies. We very much look forward to speaking with you.

Yours sincerely,

Dr. Johanna Wandel, Associate Professor
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Appendix B

Homeowner Recruitment Letter

Date: [day | month | 2022]

Dear _____:

I came across your contact online from a public website (e.g., Merritt Flood Recovery Facebook group).

I am contacting you in the hopes that you will agree to a brief interview related to our research project entitled “How disaster recovery decision-making unfolds: Investigating how managed retreat and property buyouts emerge as options for post-disaster recovery”. This project is funded by the Institute for Catastrophic Loss Reduction (ICLR) under its “Quick Response Program for 2021 Fraser Valley Flooding”. This project is also carried out under the auspices of the Department of Geography & Environmental Management at the University of Waterloo, Ontario. Ethics clearance for this project has been obtained (ORE #44298).

The research questions guiding the project include:

- What recovery options (i.e., rebuild or retreat) are considered by homeowners in a post flood environment? And why?
- What are the challenges that homeowners face during the post-disaster recovery phase?
- What adaptation options or policy instruments are considered in the immediate post-flood environment, and how do these evolve during the post-recovery period? (e.g., lifetime limits to disaster aid, buyout compensation, regulations prohibiting development in high-risk areas)
- How do homeowners receive these mechanisms, particularly in relation to existing private insurance and location relative to the inundation zone?

We expect our research will shed light on the factors which lead governments to consider retreat or property buyouts in communities that are at high risk of flooding. We expect Provincial and possibly Federal Government buyout and compensation policies, either informal or formal, to be a key component of these decisions, and for insurance and Red Cross assistance to also play a role. Thus, we expect to document how major decisions regarding post disaster recovery unfold in Merritt from both the homeowner and government perspective.

The team that has been assembled for this research includes:

- Dr. Johanna Wandel (Team Lead/PI, Associate Professor, University of Waterloo Geography and Environmental Management): jwandel@uwaterloo.ca
- Ms. Shaieree Cottar (PhD Candidate, University of Waterloo Geography and Environmental Management): scottar@uwaterloo.ca

We are contacting you in order to invite you to participate in a short semi-structured interview of approximately 30-45 minutes in length, to be conducted in-person, over the phone, or using an online platform such as Zoom/Skype. Examples of themes we may explore in the interview include the following:

- Awareness of and details about home buyout or flood damage compensation programs that might lead to non-rebuilding in Merritt, British Columbia
- Factors that influence governments to pursue buyouts/ non-rebuilding
- Opinions about programs needed in the future/under future climate change scenarios
- Role of policy windows in decision making processes

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

At the end of this project, our research team will generate a report consisting of interview opinions, overall results and our conclusions. If you would like a copy of this report, please let us know either during the interview or via email. This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board (REB # 44298). If you have any questions for the Board, contact the Office of Research Ethics at 1-519-888-4567 ext. 36005 or reb@uwaterloo.ca.

If you are interested in participating, please reply to this email. If you would like additional information to assist you in reaching a decision about your participation, please contact me at [519-888-4567 x.33384] or by email at jwandel@uwaterloo.ca. We hope that the results of our research study will be beneficial to the scientific and scholarly communities, and disaster recovery agencies. We very much look forward to speaking with you.

Yours sincerely,
Dr. Johanna Wandel, Associate Professor
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Appendix C

Information and Consent Letter

Date

Dear (*insert participant's name*):

Project Description: In response to an anticipated 250mm of rainfall and its potentially devastating consequences the City of Merritt in British Columbia issued an evacuation order for over 7000 residents on Nov. 15. Over the following 24 hours, low-lying areas of the city including the wastewater treatment were inundated and critical transportation infrastructure including bridges and highways failed due to washouts and mudslides (CBC News, 2021). Early rapid damage assessments of buildings suggest that several homes in the flood inundation zone (Fig. 1) have become uninhabitable, while numerous others are heavily damaged and may or may not be repairable. These include residential areas within the 1:200-year flood elevation. Climate change is expected to lead to more frequent and extreme precipitation events, with recurrence intervals of devastating flooding becoming far more frequent than 200 years. Given probable repeated flooding under climate change and the complete failure of the wastewater treatment plant (The Globe & Mail, 2021), Merritt and its residents are facing difficult decisions about whether to rebuild or not. Deliberate abandonment of flood-prone infrastructure (e.g., private property, critical infrastructure systems), also known as managed retreat, has been gaining increased momentum in Canada (Cottar et al., 2021; Doberstein et al., 2018) and we propose to research how this adaptation option emerges in a post-disaster context.

The BC government typically deploys disaster financial assistance (DFA) to flood victims who are uninsured or are unable to obtain insurance to cover disaster-related losses. Conventional insurance in many cases requires rebuilding in place and thus facilitates repeated exposure to flooding. One adaptation option that has gained attention in communities (e.g., Grand Forks, Gatineau) that are prone to recurrent flooding is the use of managed retreat (i.e., planned relocation or strategic retreat). Climate induced managed retreat can be defined as “the purposeful, coordinated movement of people and assets out of harm’s way” (Siders, 2019). Most of the managed retreat research takes place after a formal decision has been made by governments to sponsor relocation and/or buyout programs (Siders, 2019). The emerging situation in Merritt provides a unique opportunity to explore how the possible adaptation options (i.e., investments in climate resilient infrastructure, rebuild/elevate properties, buyouts) are considered by policymakers before deciding on the retreat/buyout course of action.

Given the regional scale of flood impacts, coupled with anticipated recurrence under climate change, it is likely that the municipality will need to consider a variety of adaptation options such as protect (e.g., dikes, berms), accommodate (e.g., elevating properties, floodproofing) and retreat (e.g., property buyouts) to mitigate future flood risk. Documenting the conversations and adaptation options that are being considered by policymakers in advance of final decisions will help researchers assess the factors that lead governments to decide on retreat/buyout options instead of rebuilding strategies in high-risk areas. We will examine the factors that lead governments to implement a retreat or rebuild decision in areas that have recently sustained significant damage, and evaluate the types of considerations (e.g., Cost benefit analysis of payouts vs. disaster aid) that guide decision making by different levels of governments about post-disaster recovery. Examples of potential interview questions include:

- What adaptation options or policy instruments are considered in the immediate post-flood environment, and how do these evolve during the post-recovery period? (e.g., lifetime limits to disaster aid, buyout compensation, regulations prohibiting development in high-risk areas)
- How do residents receive these mechanisms, particularly in relation to existing private insurance and location relative to the inundation zone?

Your participation in this study would entail a short semi-structured interview of approximately 30-45 minutes in length, to be conducted in-person, over the phone, or using an online platform such as Zoom/Skype. Examples of themes we may explore in the interview include the following:

- Awareness of and details about home buyout or flood damage compensation programs that might lead to non-rebuilding in Merritt, British Columbia
- Factors that influence governments to pursue buyouts/ non-rebuilding
- Opinions about programs needed in the future/under future climate change scenarios

Participation in this study is voluntary, and you may decline to answer any of the interview questions if you so wish or end the interview session at any time by communicating this decision to the researcher. With your verbal permission, the interview will be recorded to facilitate accurate collection of data, and later transcribed for analysis. The interview will be conducted over Zoom. Zoom has implemented technical, administrative, and physical safeguards to protect the information provided via the Services from loss, misuse, and unauthorized access, disclosure, alteration, or destruction. However, no Internet transmission is ever fully secure or error free. After the interview has been completed, you may request a copy of the transcript to give you an opportunity to confirm the accuracy of our transcription, and to add or clarify any points that you wish. You may decline to have your interview recorded if you wish.

Your participation will be considered confidential and neither your name nor your organization's name will appear in any paper or publication resulting from this study. However, with your permission, anonymous quotations from your interview may be used and you will only be referenced by a coded interviewee number whether you belong to a public, private or local resident group (e.g., "Interviewee #5, Community Representative").

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

The team that has been assembled for this research includes:

- Dr. Johanna Wandel (Principal Investigator, Associate Professor, University of Waterloo Geography and Environmental Management): jwandel@uwaterloo.ca
- Ms. Shaieree Cottar (PhD Candidate, University of Waterloo Geography and Environmental Management): scottar@uwaterloo.ca

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board (REB # 44298). If you have questions for the Board, contact the Office of Research Ethics, at 1-519-888-4567 ext. 36005 or reb@uwaterloo.ca.

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

Yours Sincerely,

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Appendix D

Semi-Structured Interview Themes/ Questions:

Project: How disaster recovery decision-making unfolds: Investigating how managed retreat and property buyouts emerge as options for post-disaster recovery

Preamble: The following research questions will be used to guide the case study analysis. These are not to be interpreted as interview questions. The themes outlined below will be used to answer these questions later on in coding and analysis.

1. What factors lead governments to implement a retreat or rebuild decision in areas that have recently sustained significant damage?
2. What types of considerations (e.g., Cost benefit analysis of payouts vs. disaster aid) guide decision making by different levels of governments about post-disaster recovery?
3. What adaptation options or policy instruments are considered in the immediate post-flood environment, and how do these evolve during the post-recovery period? (e.g., lifetime limits to disaster aid, buyout compensation, regulations prohibiting development in high-risk areas)
4. How do residents receive these mechanisms, particularly in relation to existing private insurance and location relative to the inundation zone?
5. What role do policy windows and focus events play in lowering barriers and creating opportunities for managed retreat?

Themes:

The following themes will be explored during the semi-structured interviews with key informants. These will be used as prompts to help guide the natural flow of conversation between the project investigators and key informants.

- Recount the BC/Merritt 2021 flood disaster, initial recovery efforts, emergency management procedures, disaster impact on Merritt
 - Probe: details of which streets were impacted, temporary housing, long term options considered by the municipality etc.
- Opinions and information about existing disaster recovery programs/policies in interviewee's province/jurisdiction
- Awareness of and details about disaster recovery compensation programs that might lead to rebuilding or retreat in case study sites
 - Probes: Details of these programs, agencies involved, program requirements, restrictions, caps on payouts, etc.
 - If buyout programs are lacking, opinions on why these programs do not exist
- Role of various agencies in buyout programs:
 - Municipal Government
 - Provincial Government
 - Federal Government
 - Insurance Companies
 - Community Organizations
 - Advocacy /Special Interest Groups
 - Other?
- Role of policy windows and focus events on government decision making

- Factors that lead government to implement a retreat or rebuild decision
 - Disaster declaration (i.e., some programs only kick in once a disaster has been declared by a Provincial or Federal authority)
 - Cost-benefit analysis of payouts vs. disaster aid
 - Behaviour of others in the community/ neighbouring municipalities
 - Risk perceptions
 - Previous experience with flooding/flood damages
 - Other
- Opinions about programs needed in the future/under future climate change scenarios
- Availability of funding (e.g., Disaster mitigation and adaptation fund [DMAF]) to support buyout/disaster compensation programming

Appendix E

Verbal Consent Script

Project:

How disaster recovery decision-making unfolds: Investigating how managed retreat and property buyouts emerge as options for post-disaster recovery

This script should always be used in conjunction with a Letter of Information when obtaining oral consent. Remember when seeking oral consent, your Letter of Information/Consent does not need signature lines.

Introduction:

Hello. I'm Shaierree Cottar I am conducting research about post-disaster recovery decision making in Merritt following the 2021 British Columbia flood disaster. This interview is part of my PhD research at the University of Waterloo's, Department of Geography and Environmental Management in Waterloo, Ontario. I'm working under the supervision of Dr. Johanna Wandel of the University of Waterloo's Department of Geography and Environmental Management.

Thank you for your interest in participating in my research.

[If the LOI was provided in advance]

Have you had time to read the Letter of Information I sent you?

[If the LOI was provided in advance and the participant responds that they have read the LOI]

Great, then I would like to take a moment to review some main points from the Letter of Information before we continue. *[Proceed to review the highlights of the LOI, be sure to include risks and what will happen with their data and confirm the important points about voluntary participation and withdrawal listed below.]*

[If it is not possible to give an LOI to the participant, or if the LOI was not sent in advance, or the participant responds that they did not read the LOI in advance, then proceed to go through the full LOI in detail with the participant and confirm the important points about voluntary participation and withdrawal listed below.]

Confirm the following to the participant:

- Your participation in this study is voluntary.
- If you do not want to answer some of the questions you do not have to, but you can still be in the study.
- You can decide to stop at any time, even part-way through the interview for whatever reason.
- If you decide to stop during the interview, we will ask you how you would like us to handle the data collected up to that point, whether returning it to you, destroying it or using the data collected up to that point.

- You can ask to remove your data from the study up until approximately **October 31st, 2022**.
- Your data is being collected without any identifying information
- After the interview, you may request a copy of the transcript to give you an opportunity to confirm the accuracy of our transcription, and to add or clarify any points that you wish.
- This study has been reviewed and received ethics clearance from a Research Ethics Board at the University of Waterloo.

Do you have any questions or want me to go over any study details again?

Consent questions:

Do you agree to participate in this study?

If yes,

- Would you like a copy of the summary report at the completion of the study? If yes, where should we send them (email)?
- Do you agree to audio and video recording?
- Do you agree to allow your anonymized interview data to be used and shared with the research community through seminars, conferences, presentations and journal articles?

If no, "Thank you for your time."

Appendix F

Feedback and Appreciation Letter

University of Waterloo

Date

Dear (*Insert Name of Participant*),

I would like to thank you for your participation in this study entitled “How disaster recovery decision making unfolds: Investigating how managed retreat and property buyouts emerge as options for post disaster recovery”, funded by the Institute for Catastrophic Loss Reduction (ICLR). If you wish to receive a transcript of your interview, please feel free to contact any member of the research team by email.

As a reminder, the purpose of this study is to explore post-disaster recovery efforts in Merritt and which possible adaptation options (i.e., investments in climate resilient infrastructure, rebuild/elevate properties, dykes, zoning, buyouts) are considered by policymakers before deciding on the retreat/buyout course of action. The research will provide insights into both the factors that influence post-disaster recovery decisions, including managed retreat decisions by government authorities.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board (REB #44298). If you have questions for the Board contact the Office of Research Ethics at 1-519-888-4567 ext. 36005 or reb@uwaterloo.ca. For all other questions contact Dr. Johanna Wandel at jwandel@uwaterloo.ca or 519-888-4567 x48669.

Please remember that your identity will be kept confidential. Once all the data is collected and analyzed for this project, I plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. If you are interested in receiving more information regarding the results of this study, or would like a summary of the results, please provide your email address, and when the study is completed, anticipated by Aug 31, 2023. I will send you the information. In the meantime, if you have any questions about the study, please do not hesitate to contact me by email or telephone as noted.

Yours sincerely,

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