

RESILIENT RECOVERY

A systems analysis of disaster recovery in Canada



BY CARLY BENSON

Submitted to OCAD University in
partial fulfillment of the requirements
for the degree of Master of Design in
Strategic Foresight and Innovation.

Toronto, Ontario, Canada
2022

Resilient Recovery

A systems analysis of disaster recovery in Canada

Creative Commons Copyright Notice

Resilient Recovery: A systems analysis of disaster recovery in Canada © 2022 by Carly Benson is licensed under the Creative Commons AttributionNonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) 2.5 Canada License. <https://creativecommons.org/licenses/by-nc-sa/4.0/legalcode>



You are free to:

- **Share** – copy and redistribute the material in any medium of format
- **Adapt** – remix, transform, and build upon the material

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following conditions:

ATTRIBUTION – You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable

manner, but not in any way that suggests the licensor endorses you or your use.

NONCOMMERCIAL – You may not use the material for commercial purposes.

SHAREALIKE – If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.

No Additional Restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

With the understanding that:

You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation.

No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material.

Cover image: Adobe Stock

ABSTRACT

The frequency and severity of disasters caused by natural hazards and extreme weather is increasing across Canada. Each year, more communities face devastation, disruption, and the difficult task of rebuilding. However, the process by which communities pick up the pieces – disaster recovery – is currently failing to deliver more resilient communities. In Canada, disaster recovery prioritizes the rapid return to pre-disaster conditions without consideration for the changing risk environment and the ways in which recovery can enable communities to better prepare for the future.

Our commitment to this failing system has long-term consequences. With the cost of disasters dramatically increasing, how we rebuild communities contributes to their vulnerability or resilience in the future. Because of the static nature of physical structures, with building and infrastructure lifespans of more than fifty years, recovery locks in the risk profile of a community's built environment for generations.

This project examines the barriers and opportunities for municipalities, the level of government closest to the individuals and businesses devastated by disaster, to integrate systematic disaster risk reduction into recovery and thereby rebuild more resilient communities. Using systems thinking informed by foresight and human-centered design research methods, this study aims to identify the constraints and leverage points for changing our approach to recovery in Canada so it prioritizes resilience to future risks instead of recreating the past.

Resilient Recovery: A systems analysis begins by describing disaster trends in Canada and the factors increasing disaster risk, then traces of evolution of the disaster recovery system and analyzes the dynamics at play in the current system. It explores emerging forces of change and the implications these emergent issues may have for recovery, then concludes with an analysis of the system's leverage points, considerations for how foresight could enhance the process, and a proposed pathway towards transformational change.

ACKNOWLEDGEMENTS

This research has been a personal and professional journey to improve how communities rebuild after disaster. My interest in recovery originates from the inspiring yet painful stories of the 2004 Indian Ocean tsunami that claimed more than 220,000 lives. For all the suffering they cause, disasters also offer an opportunity to experience a collective solidarity and outpouring of community spirit that is increasingly rare in modern society.

In my ten-year career in emergency management, I have been involved in three major disasters: the 2013 High River flood, the 2016 Fort McMurray wildfire, and the first wave of the 2020 COVID-19 pandemic in Vancouver. These experiences left me with the sense that our myopic focus of alleviating immediate needs during response and early recovery comes at significant cost to the future resilience of communities. That said, I have seen many inspiring examples of risk reduction during recovery, from the flood plain buyouts and dike construction in High River to networks of emergency support services built and strengthened, which prove it is possible to invest in future resilience during recovery.

This project is an attempt to understand how we might build systems that intentionally foster resilience so it becomes the predictable outcome of recovery instead of a celebrated anomaly. This research would not have been possible without the support and guidance of an incredible group of teachers, classmates, colleagues, mentors, friends, and family.

I am extremely grateful to my academic advisor, Helen Kerr, for her encouragement, advice, and support. You challenged me to think deeply about a subject I thought

I knew well and helped me to stretch beyond my comfort zone. It has been incredible to work with you.

A huge, heartfelt thank you to all the practitioners, academics, and futures thinkers who gave so generously of their time and expertise to participate in this research. You both inspired and challenged me to think about disasters in new ways, and this project literally could not have happened without you.

To the emergency management friends and colleagues I have had over the years, thank you for all that you do. So much of your work, passion, and dedication happens outside the spotlight, but it is essential to the safety and well-being of our communities. Thank you.

Thank you to my friends and colleagues at Policy Horizons Canada. My time at Policy Horizons opened me up to new ways of thinking and seeing the world. Thank you for being so generous with your expertise, for your mentorship, and for your encouragement.

To my family, friends, and dog Clio, thank you for your unfailing support, your patience, your encouragement, and your willingness to listen. You probably learned more about disaster recovery than you ever wished to know.

And finally, thank you to the staff, leaders, and residents of the Town of High River. You are a constant source of inspiration that disaster recovery can create more resilient communities – although it was not without struggle, pain, heartbreak, and sacrifice. Thank you for your dedication to your town and your determination to meet the substantial challenges of disaster recovery head on and rebuild a thriving community.

TABLE OF CONTENTS

Creative Commons Copyright Notice

Abstract

Acknowledgements

List of Figures

List of Tables

Key Terms

ii

iii

iv

vi

vii

vii

Chapter 1: Introduction

Chapter 2: Methodology

Chapter 3: Constructing an Emergency Management System

Chapter 4: System Dynamics in Municipal Disaster Recovery

Chapter 5: Forces of Disruptive Change

Chapter 6: Leverage Points Analysis

Chapter 7: Discussion

Chapter 8: A Way Forward

9

19

25

39

63

83

91

97

Appendices

Appendix A: Interview Guide

Appendix B: List of Policy Documents

Appendix C: Policy Analysis

Appendix D: A Not So Short History of Emergency Management in Canada

Appendix E: Recovery System Stakeholders

Appendix F: Revisiting Policy Assumptions

Appendix G: Full System Intervention Map

References

107

108

110

116

122

124

126

128

LIST OF FIGURES

Figure 1: Emergency management cycle	9
Figure 2: Disaster recovery timeline	9
Figure 3: Number of disasters 1940-2019	12
Figure 4: Elements of disaster risk	12
Figure 5: Occurrence of disasters	13
Figure 6: Literature review sources	20
Figure 7: Three horizons diagram	21
Figure 8: Causal layered analysis	22
Figure 9: Timeline of disaster events	26
Figure 10: Causal layered analysis of disaster recovery system in Canada	35
Figure 11: Construction process	42
Figure 12: Community reactions to disaster	44
Figure 13: Stakeholder matrix	46
Figure 14: Performance cycle	50
Figure 15: Attractiveness Principle	51
Figure 16: Shifting the Burden	52
Figure 17: Accidental Adversaries	53
Figure 18: Success to the Successful (insurance)	55
Figure 19: Success to the Successful (contractors)	56
Figure 20: Futures cone	63
Figure 21: Population growth projection	64
Figure 22: Leverage points	83
Figure 23: Leverage points diagram for disaster recovery	84
Figure 24: Reinforcing loop of response	86
Figure 25: Reinforcing loop of contracting	86
Figure 26: Balancing loop for local contracting targets	86
Figure 27: Pathway to transformation	99

LIST OF TABLES

Table 1: Requirements for recovery planning in Canadian jurisdictions	11
Table 2: Study design	19
Table 3: Federal policies analyzed	31
Table 4: 2022 DFAA cost-share formula	48
Table 5: Rise of the city-state	67
Table 6: Ripe for financial revolution	69
Table 7: Diminishing resilience reserves	71
Table 8: Financial hot potato	73
Table 9: Fractured reality	75
Table 10: Radical transparency	77
Table 11: New frontiers for universal rights	78

KEY TERMS

Disaster: A social phenomenon that results when a hazard exceeds or overwhelms a community’s ability to cope and may cause serious harm to human safety, health, welfare, property or environment (Public Safety Canada, 2017a); disasters exist at a larger scale than emergencies, which can typically be handled by the resources within a community. This research focuses on disasters triggered by natural hazards and extreme weather.

Disaster risk reduction: The prevention of new and reduction of existing disaster risk and the management of residual risk, all of which contribute to strengthening resilience and sustainable development (United Nations Office for Disaster Risk Reduction [UNDRR], 2022).

Emergency management: The management of emergencies, including activities and risk management measures related to prevention and mitigation, preparedness, response, and recovery (Public Safety Canada, 2017a).

Foresight or Strategic Foresight: See *futures thinking* (used synonymously in this paper).

Futures thinking: A creative and exploratory process that identifies drivers of change and uses divergent thinking to identify many possible futures and explore the implications to potential futures on decision-making today (Government of New Zealand, 2021). In this paper, futures thinking refers to a mindset and approach to problem-solving and decision-making rather than a specific set of methods, techniques, or outcomes.

Recovery: The repair or restoration of conditions to an acceptable level after a disaster. Recovery programs provide a valuable opportunity to develop and implement measures to strengthen resilience, including by building back better. Recovery efforts should be conducted with a view towards disaster risk reduction (Public Safety Canada, 2017a).

Recovery includes *physical* recovery (the built environment), *natural* recovery (restoring damaged ecosystems), *economic* recovery (repairing businesses and renewing economic activity), and *social* recovery (renewing social connections and systems). Taken together, these aspects comprise holistic community recovery.

Resilience: The capacity of a system, community or society to adapt to disturbances resulting from hazards by persevering, recuperating or changing to reach and maintain an acceptable level of functioning (Public Safety Canada, 2017a).

Response: Actions taken during or immediately before a disaster to manage its consequences (Public Safety Canada, 2017a).

Risk (or **disaster risk**): The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, and vulnerability (UNDRR, 2022).

System: An interdependent set of items defined by its function as a whole. Every system has at least two essential parts; each essential part affects the behaviour of the whole. No single part can carry out the function of the entire system on its own (Ackoff & Gharajedaghi, 2003).

Systems thinking: The art and science of handling interdependent sets of variables (contrasted with analytical thinking, the science of independent variables) (Gharajedaghi, 2004). *Systems thinking* challenges reductionism, the belief everything can be reduced to individual parts, and the linear connection between cause and effect, because a system can always be a sub-system to a larger one (Ackoff & Gharajedaghi, 2003).

“

These sagas [of disaster recovery] are largely ones of missed opportunities. Time after time, local leaders failed to take advantage of the recovery period to reshape their devastated communities in a way that would improve their ability to withstand future disasters.

– Denis Mileti

CHAPTER 1

INTRODUCTION

Disasters are complex socio-economic phenomena that disrupt many elements of modern society. They have the potential to leave deep scars on individuals and communities and can substantially undermine or reverse gains across social, economic, and sustainable development domains. For example, the Global Gender Gap Index found that the COVID-19 pandemic had added *four decades* to the timeline for achieving gender parity (World Economic Forum, 2021).

However, disasters can also “open up societies to change, accelerate change that was underway, or break the hold of whatever was preventing change” (Solnit, 2009, Chapter 2). They are profound moments of societal reckoning that can bring people together, focus public and political attention, and provide a forum for conversation about the future we collectively desire.

This study examines the system of disaster recovery in Canada and considers how futures thinking might enhance municipal decision-making during recovery.

Emergency management in Canada

In Canada, *emergency management* describes the activities associated with reducing the impacts of disasters on society. Emergency management involves action across four functional areas, often described as the emergency management cycle (see Figure 1).

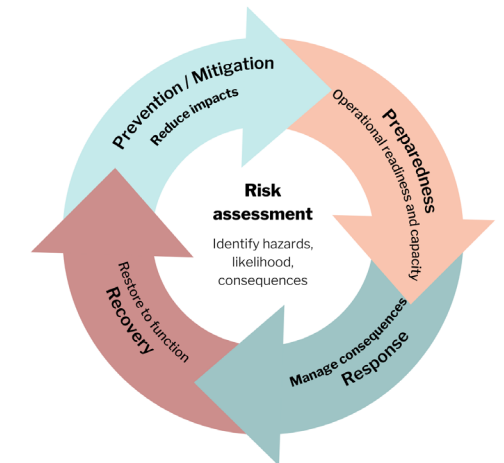


Figure 1: Emergency management cycle, adapted from Public Safety Canada (2010).

Risk assessment: Identification of sources of risk and a quantitative or qualitative assessment of the likelihood and consequences.

Prevention and mitigation: Actions taken to prevent a risk from materializing or to reduce its impact.

Preparedness: Developing capacity to respond to and recover from emergencies through planning and training.

Response: Action taken during a disaster to protect lives, property, and the environment, and to manage consequences such as supporting displaced people.

Recovery: Activities undertaken to repair or restore conditions to an acceptable level. Recovery is divided into short, medium, and long-term phases based on timelines and general activities, as depicted in Figure 2.

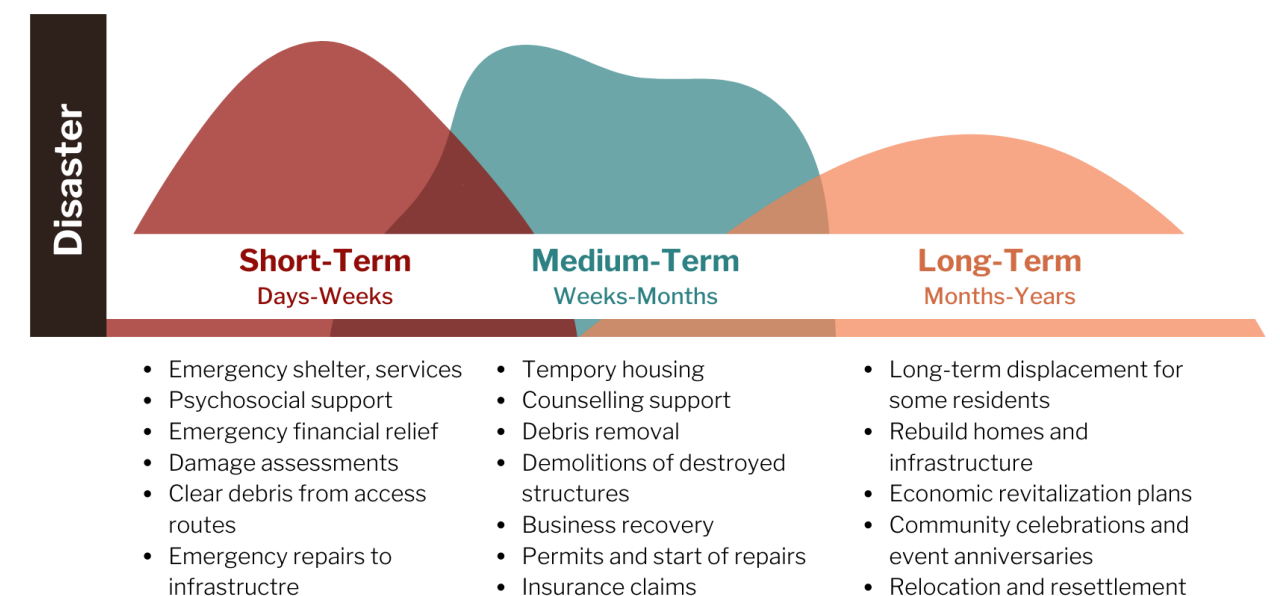


Figure 2: Disaster recovery timeline (Federal Emergency Management Agency [FEMA], 2016a).

Although emergencies exist at many scales, from individual to business to industry to societal, disasters cause significant disruption to entire communities and are largely the domain of governments. In Canada, the *Emergency Management Framework* describes the foundational principles and governance mechanisms to coordinate emergency management activities across the country. The framework establishes resilience as the overarching goal of emergency management, which requires coordination and collaboration across the whole of society (Public Safety Canada, 2017a).

Resilience: Though resilience has many meanings, this report uses the definition from the *Emergency Management Framework*: “Resilience is the capacity of a system, community or society to adapt to disturbances resulting from hazards by persevering, recuperating or changing to reach and maintain an acceptable level of functioning” (Public Safety Canada, 2017a, p. 22).

Jurisdictional authorities

The *Constitution Act*, which divides legislative authority between provinces and the federal government, does not specifically address emergency management. This gap enables provinces and the federal government to define their roles (Raikes & McBean, 2016). However, the *Emergency Management Act* of Canada and multi-jurisdictional policies such as the *Emergency Management Framework* recognize provinces as having authority for emergency management, except where the federal government has jurisdiction (such as national parks) and First Nations reserves, which are responsible for their own emergency management with support from Indigenous Services Canada. Public Safety Canada coordinates emergency management activities across the federal government and interfaces with provincial and territorial governments on emergency management initiatives. Provinces delegate responsibility for emergency management to local governments while maintaining overall authority.

Under provincial legislation, local governments are required to plan for and manage emergencies within their boundaries, with other levels of government assisting upon request once a disaster has exceeded local capacity (Public Safety Canada, 2017a). This cascading failure model for provincial and federal involvement means support mechanisms are inherently reactive and not generally available to mitigate damage

1 This report only examined provincial legislation and policy and did not look at the three northern territories. However, in the context of jurisdictional authorities, the term *provincial* should be understood to include territories.

before it occurs. While municipalities work on the front lines to repair damage, restore services, and support impacted populations, they usually have the least fiscal and resource capacity to do so and rely heavily on other levels of government to provide funding and support for recovery (Bumsted, 1987; Hamideh, 2020; Thistlethwaite & Henstra, 2017).

Response-centric legislative landscape

Because emergency management falls under provincial¹ purview, there are regional differences across the country. Each province has established its own legislation and associated regulations for emergency management. The geographic, demographic, industrial, cultural, and political differences create unique environments within and between provinces, which influence their approach towards and capacity for managing disaster risk and impacts. This analysis does not intend to minimize these differences; however, when viewed comparatively, emergency management across Canada has much more in common than not. Each province has a statute governing emergency management that requires provincial ministries and municipalities to prepare for disasters. Without exception, all provincial legislation includes the following:

- the authorities and responsibilities of the minister to prepare for emergencies,
- the requirement for local authorities to prepare for emergencies,
- the process and extraordinary powers available under a state of emergency for sudden on-set responses to protect life, property, and the environment, and
- issues of liability and compensation, penalties for non-compliance, and administrative details.

The policy landscape for disasters nucleates around response. While the requirements for governments to conduct response planning and training appear across all jurisdictions, recovery planning does not (see Table 1). Only Quebec includes mitigation and risk reduction in its emergency management statute and requires regions to develop risk-based civil protection plans.

Even where legislation or regulations require municipalities and provincial entities to engage in

Table 1: Requirements for recovery planning in Canadian jurisdictions

Required in Act	Required in Regulations	Not Required
British Columbia	Alberta	Saskatchewan
Manitoba	Ontario	Nova Scotia
Quebec		New Brunswick
Newfoundland		Prince Edward Island
		Canada

recovery planning, specific standards and criteria do not exist for what elements must be included in these plans (Raikes & McBean, 2016).

Conceptually, the legislative landscape across Canada treats recovery as the “after response” period where the primary consideration is financial compensation, as if response is the only phase of a disaster that may require extraordinary authorities and feats of coordination. Where a state of emergency provides the means to deal with threats to life and property during the early stages of a disaster, no such policy tools exist for recovery, although some jurisdictions establish multi-departmental recovery teams and committees to coordinate across government and with partners². Likewise, where incident command systems³ across the country identify the priorities and goals for response, no equivalent guidance exists for recovery except in British Columbia⁴. This reveals the implicit assumption that the goal of recovery is to return to a pre-disaster state and day-to-day government processes are sufficient to meet the demands of recovery, despite the ongoing disruptions to utilities, infrastructure, supply chains, and community functions, and the resource shortages that often characterize the early recovery environment.

Reactive funding

Governments have long recognized the importance of pre-disaster investments in mitigation and risk reduction.

2 For example, see Alberta’s Provincial Recovery Framework (2021).

3 Many provinces in Canada use the international Incident Command System, or a variation of it, as the basis for emergency response. The Incident Command System establishes three priorities for response: protect life safety, stabilize the incident, and protect property and the environment.

4 British Columbia establishes an overarching goal for recovery in its *Interim Provincial Disaster Recovery Framework*, which states the vision for recovery is the “re-established social, cultural, physical, economic, personal and community well-being through inclusive measures that reduce vulnerability to disaster, while enhancing sustainability and resilience” (Emergency Management British Columbia, 2019, p. 9).

One of the most celebrated examples of mitigation in Canada, the Red River Floodway around Winnipeg, cost \$63 million to build and by some estimates saved over \$8 billion in avoided flood damage costs in 2008 alone (Auditor General of Canada, 2016). While different hazards and mitigation interventions have varying benefit-cost ratios, studies have found that every dollar spent on mitigation saves \$4-14 dollars on response and recovery (see Council of Canadian Academies, 2022; Multi-Hazard Mitigation Council, 2019).

Despite the established business case for pre-disaster investment, emergency management funding primarily flows reactively, to response and recovery. A 2016 analysis by the Auditor General of Canada found that between 2011 and 2016, three federal programs made \$253 million available to provinces and territories for mitigation, of which only \$111 million was applied for and only \$25 million actually paid out (p. 14). Over the same period, the federal government provided more than \$1.84 billion to provinces and territories for disaster response and recovery costs (Public Safety Canada, 2017b).

Reactive funding means that the most substantial investments in emergency management currently happen after a disaster. Consequently, how we spend recovery dollars plays a significant role in disaster risk reduction and preparedness for future events, especially as disaster impacts in Canada continue to rise.

Disaster trends in Canada

Disasters in Canada are becoming more frequent, more severe, and more expensive (Office of the Parliamentary Budget Officer [PBO], 2016; Warren & Lulham, 2021). On a positive note, fatalities from most weather-related disasters have decreased over time, with the exception of heat waves, which will likely get worse as temperatures warm due to climate change (British Columbia Coroners Services, 2021). Across economic dimensions, however, disaster impacts have grown significantly. From 1983 to 2007, the annual average insured loss from disasters was \$400 million (2018 dollars); since 2008, it has risen to \$1.9 billion (Insurance Bureau of Canada [IBC], 2018).

The Canadian Disaster Database tracks disaster events that meet specific criteria: 10 or more people killed; more than 100 people affected, displaced, or injured; an appeal for national or international assistance; the event had historical significance; and/or the event caused significant damage/interruption to normal processes such that the affected community could not recover on its own (Public Safety Canada, 2021a). Currently, the database lists over 1,100 disasters since 1940. It also shows an increasing number of disasters caused by natural hazards over time (Figure 3).

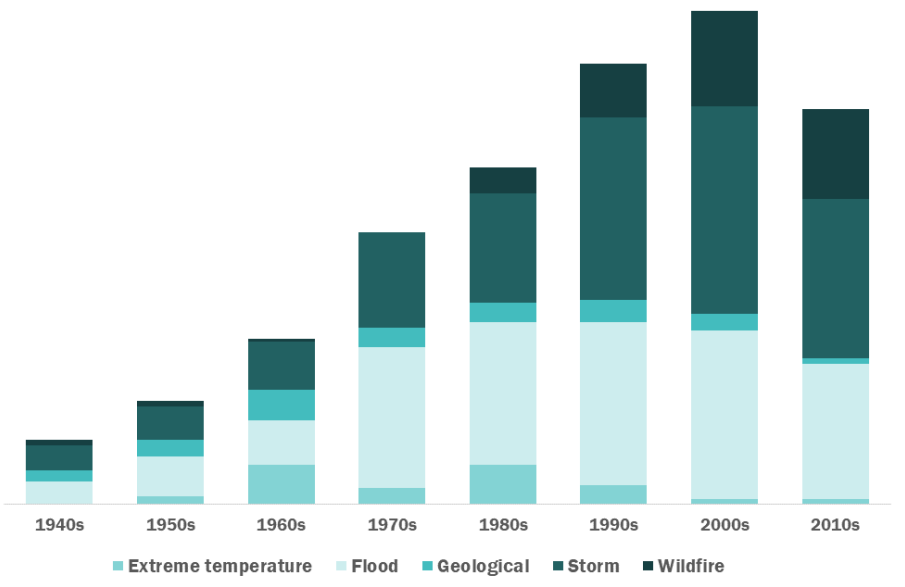


Figure 3: Number of disasters caused by natural hazards, 1940-2019, according to the Canadian Disaster Database (Public Safety Canada, 2021a).

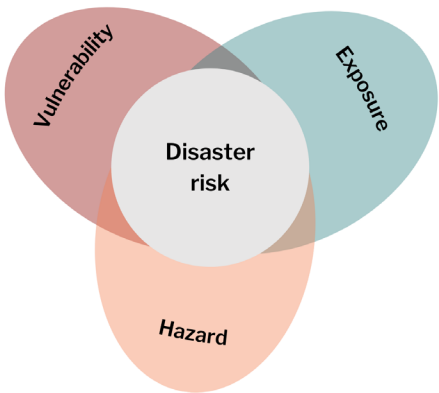


Figure 4: Elements of disaster risk.

Factors increasing disaster risk

Several factors contribute to disaster risk, which occurs at the intersection of three dynamic elements: hazard, exposure, and vulnerability (Global Facility for Disaster Reduction and Recovery [GFDRR], 2016; Riddell et al., 2020). Disaster risk is complex and dynamic; no single factor increases risk. Rather, it is a function of the interaction between a changing environment, societal developments, and human decisions (Riddell et al., 2020).

Hazard refers to a source of risk, which may be a natural phenomenon or human activity, such as a fire, flood, or chemical spill. **Exposure** describes the extent to which people or assets may be subjected to the hazard. **Vulnerability** indicates the conditions which increase the potential impact of a hazard, such as social or environmental factors.

Hazards

Climate change projections forecast warming temperatures and increasing hydrometeorological risks, such as severe weather, sea level rise, and extreme temperatures (Bush & Lemmen, 2019). The frequency of extreme weather events increased approximately 7% annually from 1983 to 2018 (Warren & Lulham, 2021). As a result of climate change, hazards such as heatwaves, droughts, and extreme rainfall will likely become more frequent and more intense. Changes to temperature and precipitation can act as accelerators for other hazards, including wildfires, droughts, storm surges, and riverine flooding. According to the Intergovernmental Panel on Climate Change, “A changing climate leads to changes in the frequency, intensity, spatial extent, duration and timing of extreme weather and climate events, and can result in unprecedented extremes” (2012, p. 111).

Canada faces other natural hazards too, such as *seismic risk*. More than 40% of Canada’s population lives in seismic zones (the coast of British Columbia and the Quebec City-Montreal-Ottawa corridor). There is a 30% risk of a major earthquake in British Columbia and a 5-15% chance of one in central Canada in the next 50 years (IBC, 2013).

Because the Canadian Disaster Database does not reliably track health-related hazards, they were not included in this analysis. However, international research suggests the likelihood of *pandemics* is increasing (Penn, 2021). In part, this risk is driven by human development and biodiversity loss that helps animals more likely to carry deadly pathogens, such as rats and bats, come into closer contact with human populations (Tollefson, 2020).

Although no cyberattack in Canada has resulted in a disaster yet, the threat of *cyberattacks* has grown exponentially and international incidents such as Colonial Pipeline ransomware attack in the United States (Associated Press, 2021) have demonstrated the risk to critical systems and the potential for such attacks to cause widespread disruption.

Other types of hazards have not shown the same dramatic increase in frequency or severity as weather-related events (see Figure 5) in the data tracked by the

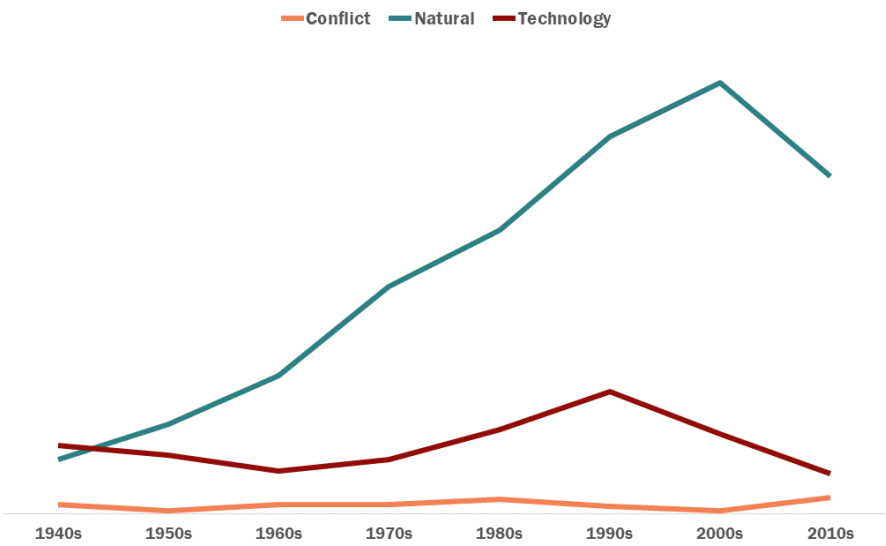


Figure 5: Occurrence of different types of disasters from 1940-2019. *Conflict* includes international human actions such as terrorism, riots, arson, etc. *Natural* disasters include hydrological, meteorological, geological, and biological events. *Technology* includes unintentional events such as structure fires, explosions, accidents, and infrastructure failure (Public Safety Canada, 2021a).

Canadian Disaster Database (Public Safety Canada, 2021a), but continue to cause disasters and claim lives. This includes technological hazards such as transportation disasters, industrial accidents, and explosions; terror-related incidents; and civil unrest.

Exposure

Socio-economic forces are the greatest drivers of disaster exposure (GFDRR, 2016). *Population growth* and increased *economic development* mean a single event may affect more people and assets. Within these broad categories, several key trends contribute to rising disaster losses in Canada.

Urbanization and densification create “concentrated locations of exposure” (GFDRR, 2016, p. 24) in cities, which historically have been built near waterways and railways for transportation and close to industrial sites for economic opportunities. Approximately 84% of Canada’s population – just over 32 million people – currently live in urban centers (Statistics Canada, 2021). Population projections estimate that by 2050, an additional 5 to 17 million Canadians could live in urban areas (Statistics Canada, 2019).

Growing cities increase the *wildland/urban interface* and encroach on natural habitats, which may lead to developments in flood plains, near forested areas, on unstable slopes, or on reclaimed land. These practices increase exposure by positioning more people and assets in the path of natural phenomena such as rivers, tides, and wildfires (GFDRR, 2016). Draining wetlands and replacing natural ground with impermeable surfaces like concrete or pavement limits the ability of the local ecosystem to absorb water, increasing exposure to pluvial and overland flooding. Upstream developments and industrial practices, such as logging or mining, can cause *environmental degradation* that increases risk exposure by reducing the carrying capacities of the environment (for example, forestry practices have been causally linked to fires and flooding in British Columbia [Cecco, 2021]).

Rising property and infrastructure values contribute to disaster exposure by increasing the replacement costs for damage following a disaster (Ewert, 2021).

The *global movement of goods and people* drives exposure to infectious agents, such as diseases or invasive species, or security risks from ideologically-motivated extremists.

Vulnerability

Aging infrastructure is more vulnerable to natural hazards due to deterioration from weather and usage as well as the lack of evolution to changing environmental conditions (Riddell et al., 2020). Much of Canada’s infrastructure was built in the 1950s and 1960s and is operating beyond its expected lifecycle (Warren & Lulham, 2021). This vulnerability not only affects the governments responsible for replacing it, but can cause widespread disruption to the movement of goods and people when it fails.

More than 60% of Canada’s housing was built prior to 1990 (Natural Resources Canada, 2018) and while building codes and design criteria have evolved, this *dated building stock* has not. The static nature of the built environment heightens its vulnerability to environmental conditions, which are changing faster than the replacement rate for buildings and sufficient investments are not being made to maintain, upgrade, and retrofit existing structures.

The *growing connectivity* and *interdependencies of supply chains and infrastructure* have amplified disaster risk because a localized event can have regional or even national repercussions, as highlighted by the supply chain disruptions exacerbated by the 2021 atmospheric river flooding in British Columbia (Parker, 2021).

Accelerating *digitization*, increasing *technological change*, and the growing *opacity* of technological systems due to layers of complexity, reduced human oversight, and limited transparency of algorithms and supply chains have also increased exposure, particularly of critical infrastructure (World Economic Forum, 2020).

Socio-economic vulnerabilities are extremely important considerations in understanding the differential impacts of disasters. Although vulnerability evolves over time and is not the same for every hazard, factors such as income level, age, health, gender, education, and housing situation can all influence vulnerability (GFDRR, 2016).

Building back better and missed opportunities

In 2015, Canada and 185 other countries adopted the *Sendai Framework for Disaster Risk Reduction* to address the rising global impacts of disasters. This framework aims to reduce disaster mortality, the number of people affected by disasters, economic losses from disasters relative to GDP, and the damage to critical infrastructure by 2030 (UNDRR, 2015). To do so, the Sendai Framework has identified four priority action areas:

- Understanding disaster risk across the dimensions of hazard, vulnerability, and exposure;
- Strengthening disaster risk governance;
- Investing in disaster risk reduction; and
- Enhancing disaster preparedness for effective response, and to *build back better* in recovery, rehabilitation, and reconstruction (UNDRR, 2015).

In this context, *build back better* means integrating “disaster risk management into post-disaster recovery and rehabilitation processes, [to] facilitate the link between relief, rehabilitation, and development, [and to] use opportunities during the recovery phase to develop capacities that reduce disaster risk in the short, medium, and long term” (UNDRR, 2015, p. 21).

Unfortunately, in Canada we often fall short of this goal. Despite ad hoc investments in mitigation and risk reduction during recovery (such as the dikes built and property buy-outs in High River following the 2013 flood), at a macro scale communities largely rebuild in the same hazardous areas (Bumsted, 1987; Mileti, 1999; Bodgan et al., 2020), fail to consider hazards beyond the one they just experienced (Bogdan et al., 2020a), lose affordable housing stock and further marginalize vulnerable populations (Van Zandt, 2022), and in general end up with the same built environment (McDonald, 2004; Mileti, 1999).

Problem statement

While Canada urgently needs a paradigm shift to pre-disaster investments to slow the rising impacts of disasters on communities, disasters continue to cause devastation. Much like the domain of health, shifting focus to preventative health does not preclude the need for emergency medicine. For this reason, disaster recovery will continue to play a significant role in establishing resilience to future risks.

Disaster recovery and reconstruction have been quite aptly described as a set of processes in search of a policy.

– Denis Mileti

Unlike response, recovery lacks policy guidance, standards, activation thresholds, coordination mechanisms, plans, and common terminology. Aside from encouraging the practice of forward-looking recovery in the *Emergency Management Framework for Canada*, senior governments have not established recovery goals, objectives, or targets⁵. Where incident management systems across the country clearly outline roles and responsibilities in response, no such structures align expectations and practice for recovery. In the absence of strategic guidance and enabling policies based on the principles of disaster risk reduction and resilience, *funding mechanisms* largely shape municipal recovery.

Five primary financing mechanisms exist for local governments to fund recovery: charitable donations, re-allocation of operating and capital funds, fiscal reserves, insurance, and disaster financial assistance. Of these, charitable donations primarily address the “unmet needs” of vulnerable populations who do not qualify for or fall through the gaps in government programs. Re-allocation of operating funds and fiscal reserves offer municipalities the greatest freedom in establishing their own recovery priorities and vision for the long-term; however, there is significant variation in the fiscal capacity of municipalities across the country. Most provinces do not establish requirements for the amount municipalities should hold in reserve for long-term capital investments and emergency expenditures, but they do restrict the amount of debt municipalities can incur and prohibit municipal operational deficits (Tassonyi & Conger, 2015). Depending on the extent and severity of damage during a disaster, operating funds and reserves may not be sufficient for response and recovery costs, much less additional considerations about broader risk reduction measures. Municipalities are often reluctant to tap into their existing finances early on because of the uncertainty about how much support they will receive from other sources.

5 Alberta and British Columbia have each developed a Recovery Framework/Policy to address this gap. However, the Alberta policy focuses on provincial coordination with limited guidance for municipalities. The BC policy is highly prescriptive and establishes significant top-down control over recovery planning in contrast to its stated objective of locally-led recovery.

6 Although this study only examined provinces, territories can also access federal disaster financial assistance.

Insurance and disaster financial assistance provide funding for the repair and replacement of lost or damaged assets to pre-disaster conditions.

Disaster Financial Assistance: Disaster financial assistance refers to public sector funding for disaster response and recovery costs. In Canada, this exists at two levels: federal and provincial. The federal Disaster Financial Assistance Arrangements (DFAA) establish a cost-sharing mechanism between the federal and provincial⁶ governments for eligible, uninsurable disaster losses that reach a specific per capita threshold. Provinces develop their own disaster financial assistance programs to support communities, individuals, and small businesses based on maximizing reimbursement under the DFAA. This means the federal program, although it does not fund municipalities directly, plays a substantial role in defining the parameters for disaster recovery through its eligibility criteria. The DFAA emphasizes a return to pre-disaster conditions (at least up to code, which allows for incremental improvements especially for older buildings), with 15% of the total recovery funding available for mitigation to reduce risk (Public Safety Canada, 2007).

Of the 222 events that received DFAA funding from 1970 to 2015, 56% were floods, 36% were atmospheric events (storms, tornadoes, hurricanes, etc.), 5% were fires, 2% were geological (landslides, earthquakes, etc.), and 1% were “other” (PBO, 2015).

Although funding plays a significant role in recovery, other challenges exist for municipalities looking to incorporate risk reduction into this process. The urgent demands of human suffering, the impacts of stress on decision-making, pressure from industries to restart economic activity, and demands from citizens for a rapid return to normal all contribute to the difficulties of incorporating long-term risk reduction into disaster recovery (MacDonald, 2004; Rouhanizadeh et al., 2020; United Nations Development Programme [UNDP], 2017).

Despite these challenges, recovery offers an important entry point to disaster risk reduction. The public and political attention, availability of substantial funding, and salience of the issue – factors often lacking before a disaster – align for a few short weeks or months to

create a window of opportunity to make significant investments in disaster risk reduction. As more communities across Canada suffer greater impacts from disasters, improving recovery outcomes is necessary to build collective resilience.

Purpose of this study

This study has two goals. First, it seeks to identify and understand the barriers and opportunities for integrating systemic disaster risk reduction into municipal disaster recovery from a systems perspective. It incorporates concepts from human-centered design and strategic foresight to deepen the analysis and explore not only the current state of disaster recovery in Canada but potential forces of disruptive change and how these may create new opportunities or challenges in the future. Second, the study considers how futures thinking might support greater integration of medium and long-term planning horizons to improve risk reduction investments during recovery.

Scope

This analysis focuses on the role, opportunities, and constraints of municipal governments in early post-disaster recovery (the first few weeks and months after a disaster), because the decisions made during this period shape the overall trajectory of recovery. Although the important roles of other stakeholders, particularly provincial and federal governments, are considered, it is from the perspective of their influence on municipal decision-making.

Because funding plays such a defining role in recovery, the study only looks at disasters eligible for Disaster Financial Assistance Arrangements (DFAA) funding, which excludes economic disasters affecting a single sector; chronic or pandemic health emergencies; public order, civil disorder, criminal and terrorist acts; and armed conflict (Public Safety Canada, 2007). Overwhelmingly, the DFAA applies to weather-related events.

Although policies from all ten provinces and the federal

government were included in this analysis, many interview participants and case studies examples come from Alberta and British Columbia because of the professional background of the researcher.

Limitations

Time and resource constraints: The first phase of this research is to understand the system of disaster recovery, identify barriers and opportunities for integrating systemic disaster risk reduction, and consider future trends and implications. Understanding the system enables the identification of design constraints and leverage points for instituting change. The second phase involves designing specific interventions to enhance futures thinking during municipal recovery planning and decision-making. Due to time and resource limitations, this study covers the first phase only.

Additionally, many interview participants were based in Western Canada. The study could have benefitted from more practitioner interviews from Central and Eastern Canada.

Territories: Canada’s North faces unique and substantial challenges with disaster recovery owing to its remoteness, sparse population, extreme temperatures, requirements for special types of buildings, and short construction seasons (Government of Canada, 2019). Because of their distinctive environments, the three Northern territories were not included in this study.

Indigenous perspectives: This study focused on the experience of municipal governments and did not include an analysis of Indigenous communities, which operate under different legislation. In Canada, Indigenous communities are disproportionately vulnerable to and affected by disasters due to the legacy and ongoing effect of colonialism, displacement from traditional lands, relative remoteness, inadequate housing, and limited access to emergency services (Standing Committee on Indigenous and Northern Affairs, 2018). Further research should be conducted in partnership with Indigenous communities, with the aim of improving resilience and self-determination.

Areas of inquiry

Within the scope outline above, this study focuses on the following areas of inquiry:

Assumptions shaping the current system

Understanding the historical policy developments and underlying assumptions embedded in and shaping the existing disaster recovery policy landscape in Canada.

System analysis

Using systems thinking to understand the current system, how it works, sources of tension and paradox, stakeholder roles and influences, and identifying barriers and leverage points for enabling the systemic integration of disaster risk reduction into recovery.

Sensemaking in disasters

Considering the sensemaking frames through which municipalities experience and derive meaning from disasters, and examining the role of stress, cognitive biases, and trauma on individual and collective decision-making in crisis.

Disruptive forces of change

Exploring how current trends and emerging issues could disrupt the existing system of disaster recovery and the implications for the future.

Research question

This research was guided by the following question:

How might futures thinking enable greater integration of systemic disaster risk reduction into municipal decision-making during disaster recovery?

Futures thinking: Using creative, divergent thinking to explore many possibilities and acknowledge uncertainty across longer-term time horizons (Government of New Zealand, 2021).

Systemic disaster risk reduction: Incorporating widespread disaster risk reduction into recovery decisions to reduce short, medium, and long-term risk and enhance resilience to future disasters (UNDRR, 2015).

Two additional questions further refined the research scope:

What barriers and enablers to futures thinking exist in the current system of disaster recovery? In other words, can futures thinking be practiced by local governments during early disaster recovery?

What emerging trends might disrupt the existing approach to recovery and to what extent can our system of disaster recovery adapt to potential disruptions?

Report structure

The report is structured as follows:

Chapter 2: Methodology describes the primary and secondary data sources for the report and the analytical framework that informed its development.

Chapter 3: Constructing an Emergency Management System tracks the evolution of federal emergency management policy in Canada since the Second World War and its underlying assumptions, demonstrating how these ideas continue to exert significant influence on disaster recovery today and deconstructing the forces that hold it in place.

Chapter 4: System Dynamics of Municipal Disaster Recovery explores the existing system of disaster recovery from a municipal lens, using systems diagrams to highlight conflicting policies, stakeholder tensions, and barriers and enablers for change.

Chapter 5: Forces of Disruptive Change examines emerging and established societal trends that have the power to disrupt the existing system of disaster recovery and explores how these trends may play out in the future.

Chapter 6: Leverage Points analyzes the barriers and opportunities for change identified throughout the report based on the potential power they have to create systemic change using system intervention points.

Chapter 7: Discussion summarizes the key findings of the report, the barriers to risk reduction during recovery, and offers how foresight might enhance recovery discussions.

Section 8: A Way Forward outlines a high-level roadmap for transforming the existing system of recovery.

“

A system is never the sum of its parts; it’s the product of their interaction.

– Russell Ackoff

CHAPTER 2

METHODOLOGY

This study subscribes to a critical theory inquiry paradigm, which is based on the belief that “reality” is constructed over time by social, political, cultural, economic, ethnic, and gender factors (Guba & Lincoln, 1994). Probing the complexities of socio-cultural phenomena requires more than an analytical framework of cause and effect; it requires systems thinking, the examination of the emergent properties of self-organizing and evolving systems that are more than the sum of their parts (Gharajedaghi, 2004). Within this ontological framework, the researcher plays the role of advocate, offering a critique of the current system and insights into potential pathways for transformation (Guba & Lincoln, 1994).

Design of research study

This project follows the double diamond design methodology, iterating between divergent thinking and convergent analysis (Design Council, 2007). Although primarily a systems analysis, it integrates methods from foresight and human-centered design, each guided by specific questions as outlined in the table below (Table 2). Insights and outputs from each phase informed the development of the subsequent phase.

Table 2: Study design using systems analysis and futures thinking

	Guiding Questions	Inputs	Outputs
Systems analysis	Discover	What is the state of disaster recovery in Canada and how did we get here?	<ul style="list-style-type: none">Disaster contextTimelineCausal layered analysisPolicy assumptions
	Define	What assumptions are embedded in the system?	
Future trends		How does the system of disaster recovery work at the municipal level?	<ul style="list-style-type: none">Stakeholder mapSystem diagrams and dynamicsLeverage points diagram
		What barriers and leverage points exist in the system?	
	Explore	What trends and emerging issues may shape the future of disaster recovery?	<ul style="list-style-type: none">Change driversEmerging issuesImplicationsReassess policy assumptions
	Refine	What is a potential pathway to transformation?	<ul style="list-style-type: none">Three Horizons pathwayRecommendations and further research

* A total of 20 expert interviews were conducted. 16 interviewees were asked about the current state of disaster recovery and future trends; 2 interviews focused only on the current state; and 2 interviews focused only on future trends.

Data collection

Expert interviews

Semi-structured interviews are useful for exploring particular aspects of a phenomenon based on an existing understanding of it (Zhang & Wildemuth, 2017), allowing sufficient freedom in the conversation to probe unique insights. Of the 30 experts I reached out to, 20 agreed to participate in this study (see Appendix A for an example of the interview guide), which included the following demographics:

- 60% women and 40% men, and
- 70% practitioners and 30% academics.

To protect participant confidentiality, the organizations of the participants are not included, but break down into the following high-level categories:

- 20% non-profit organizations,
- 30% research institutions,
- 10% consultants, and
- 40% government.

Of the participants from government (8 in total):

- 50% worked at a municipal level,
- 38% worked at a provincial level, and
- 13% worked at the federal level.

The interview participants also varied in their roles:

- 33% senior managers,
- 21% frontline staff,
- 25% consultants for governments, and
- 21% researchers or professors.

Interview participants were selected using a purposive sampling technique (Lune & Berg, 2017): leveraging my professional networks, I approached practitioners and academics with diverse perspectives and experiences in disaster recovery. In some instances, I used a snowball technique to ask for recommendations of other people to speak to, and I reached out to several academics whose research I encountered during my literature review.

Literature review

I conducted a literature review to broaden and deepen my understanding of disaster recovery and strategic foresight, using both academic literature from peer-reviewed journals and practitioner literature from government and intergovernmental sources. This review focused on the following domains:

- disaster recovery, resilience, and disaster risk reduction,
- strategic foresight and futures thinking, and
- crisis sensemaking, trauma, and cognitive biases.

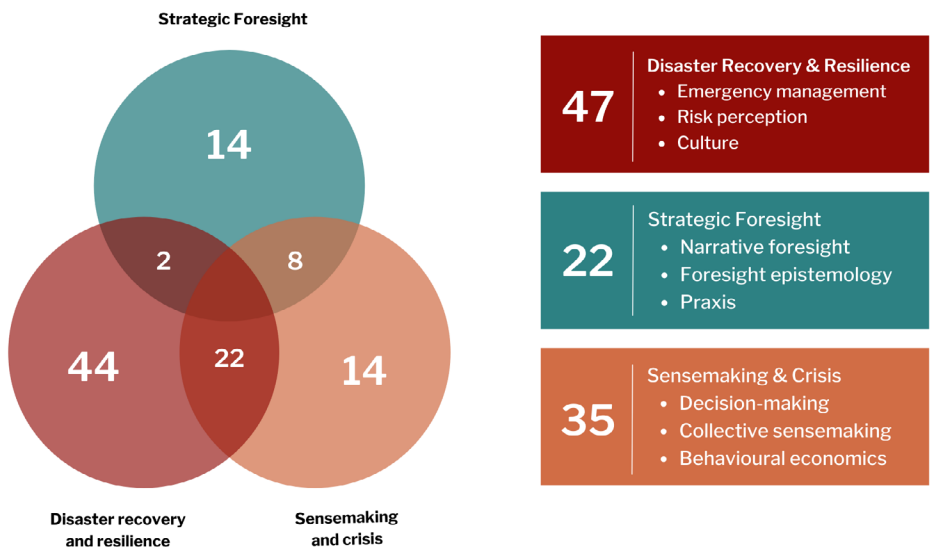


Figure 6: Venn diagram of literature review sources.

Policy review

To understand the policy landscape, I reviewed federal and provincial emergency management and recovery policies, which included the following (see full list in Appendix B):

- **24 federal** policy documents, including the Disaster Financial Assistance Arrangements Guidelines and explanatory bulletins, emergency management legislation, frameworks, and strategy, and the federal emergency response plan.
- **30 provincial** policy documents, including emergency management legislation, associated regulations (if any), and eligibility criteria for disaster recovery programs. I also reviewed the

disaster recovery policy frameworks for Alberta and British Columbia, the only provinces with dedicated recovery frameworks.

- **4 program evaluations** for the federal DFAA program and the Natural Disaster Mitigation Fund.

Horizon scan

Horizon scanning involves searching for new developments, emerging issues, and weak signals that could indicate disruptive change is possible or already underway (Policy Horizons Canada, 2018). In this study, scanning conducted over five months and supplemented by insights from interview participants identified over 200 scan hits, which I synthesized into *five* change drivers and *seven* emerging issues with the potential to disrupt the existing system of disaster recovery (see Chapter 5).

Analysis

To conduct a comprehensive systems analysis, this study drew upon analytical methods from foresight and systems thinking to explore three primary dimensions: time, depth, and leverage points.

Time: Past, Present, Futures

Past

Chapter 3 this report includes a *longitudinal policy analysis* of how the existing system of emergency management and disaster recovery emerged. Because policy development is often incremental, with new policies layered on to previous ones in an increasingly complex and opaque web of legislation, programs, and practice, a longitudinal perspective offers insights into the historical patterns of development (Henstra, 2011). I explored the history of emergency management in Canada to identify the most influential policy documents and trace their evolution over time.

Based on this review, I looked in detail at 16 influential federal policies (Appendix C) to identify underlying assumptions about disasters and the role of governments that continue to shape the field of emergency management across the country.

Present

Chapter 4 examines how the system of disaster recovery

currently works at the municipal government level. It incorporates several systems analysis techniques.

Stakeholder map. A tool to identify power dynamics and relational connections in a system, focusing on stakeholders who hold the most influence and stakeholders most affected by a system (Martin & Hanington, 2017). This study uses a power/influence and interest diagram to map stakeholder roles and relationships.

System mapping. In mapping the system, I used archetypes and causal loop diagrams to explain patterns of behaviour that consistently occur in disaster recovery (Braun, 2002) and provided a narrative depiction of other fundamental system forces that emerged through the data.

Futures

The futures lens appears in Chapter 5, which identifies emerging forces of change, and Chapter 8, which outlines a potential roadmap for integrating systemic disaster risk reduction into recovery. These analyses employed the following foresight techniques:

STEEG-V Horizon Scan. I used a STEEG-V taxonomy to categorize the scan hits from the horizon scan based on which elements of the system they might disrupt. STEEG-V stands for Social, Technological, Environmental, Economic, Governance, and Values, and is a common taxonomy for horizon scanning to consider the broad societal context of change (Policy Horizons, 2018).

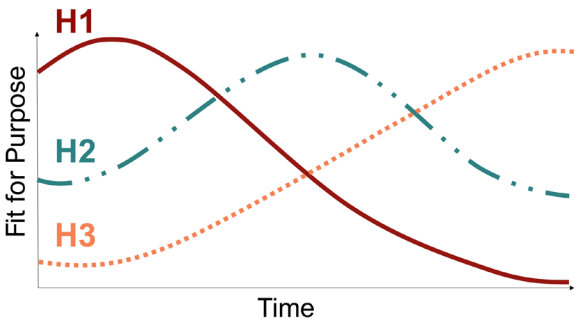


Figure 7: Three horizons diagram, adapted from Curry & Hodgson, 2008

Three Horizons. The study concludes with a series of recommendations for how we might undertake transformational change to improve disaster recovery outcomes. The Three Horizons method (Curry & Hodgson, 2008) identifies the existing system that is

in decline (Horizon 1), the ideal transformative future (Horizon 3), and the messy and challenging transition period (Horizon 2) where new ideas and ways of doing things clash with dominant forces struggling to stay relevant. Using this method, I identified a high-level roadmap towards a future in which disasters no longer wreak havoc on communities.

Depth: Causal layered analysis

A causal layered analysis is an analytical method for studying how language constructs social reality and for deconstructing ways of thinking (Heinonen et al., 2017). It was developed by Sohail Inayatullah to deepen understanding of the vertical dimensions of a system “based on the assumption that the way in which one frames a problem changes the policy solutions and actors responsible for creating transformation” (2005, p. 6). This technique fits well within a critical theory paradigm because it deconstructs the social, political, and cultural factors that have shaped emergency management in Canada.

A causal layered analysis consists of four layers, each representing a deeper and more pervasive level of the system that require increasingly longer timespans to change (Inayatullah, 2004):

- **Litany:** How the problem is framed day-to-day and how it appears in public discourse. The litany describes the headlines, trends, and quantitative depictions of the issue.
- **Causes:** The social, economic, environmental, political, and historical factors contributing to the issue. This is typically the domain of policy and academic research, providing technical explanations based on quantitative data as to the cause(s) of the issue.
- **Worldview:** The deeper social and cultural ideologies at play and the way in which these beliefs about how the world should work enable the structural causes.
- **Myth/metaphor:** The collective narrative beneath the worldview, the unconscious values often evoked through visual imagery. It explores the emotional, gut-level framing of the issue.

This study uses a causal layered analysis in Chapter 3 to deconstruct the fundamental policy assumptions that built and continue to shape disaster recovery in Canada. Throughout subsequent chapters, an *iceberg icon* indicates the system level(s) being analyzed in each section. The ongoing assessment of the vertical layers at which key system elements function reveals how deeply embedded elements are in Canadian society and suggests how long – and potentially how difficult – it may be to enact systemic change.

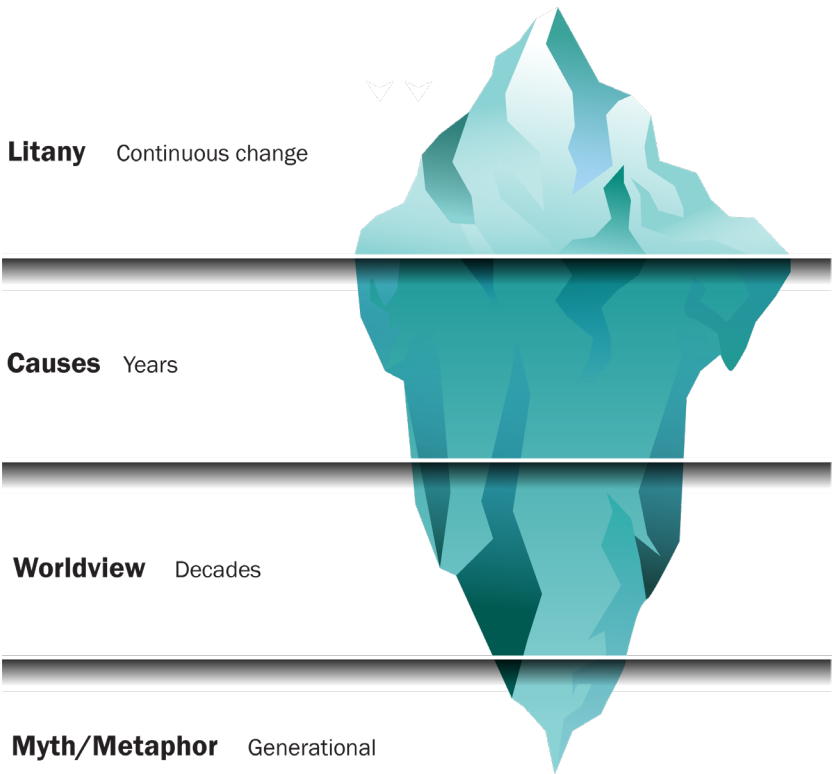
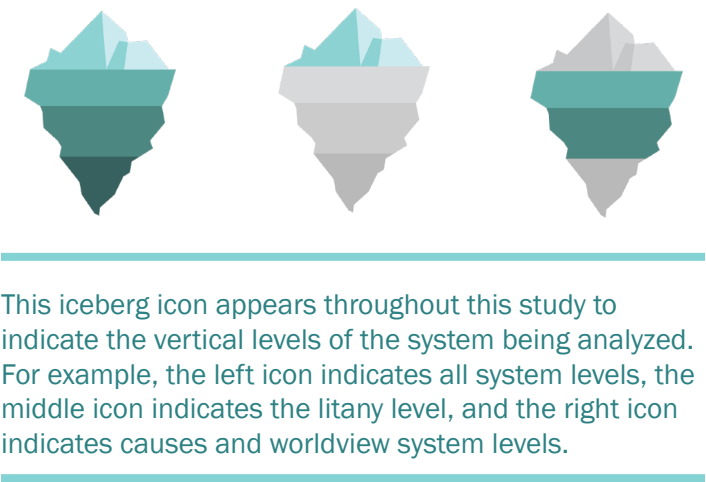


Figure 8: Causal layered analysis indicating time scales for change at different levels of the system, adapted from Inayatullah (2004).

Leverage points

Based on the work of renowned systems thinker Donella Meadows (1999), leverage points describe mechanisms to intervene in a system and the relative power of different interventions in creating change. Each section of this report includes a summary of the leverage points that may serve as barriers or opportunities for change.

These findings are synthesized in Chapter 6, which provides an analysis of the power of key opportunities and barriers to create change using a leverage points map.

Discussion and recommendations

The report concludes with a discussion of the key findings around how the current system works, the barriers to and enablers of change, and how foresight might be used during disaster recovery. The final chapter outlines a potential way forward, using the Three Horizons foresight technique, to a future-ready disaster recovery system.

“

The national emergency measures program is unique in Canada because [it incorporates] the emergency of the federal government, of all the provincial and territorial governments, of every municipality in Canada, and of every Canadian citizen, be he in his public or private capacity.

– Project Phoenix Report on emergency preparedness in Canada, 1968

CHAPTER 3

CONSTRUCTING AN EMERGENCY MANAGEMENT SYSTEM

This chapter examines the historical evolution of emergency management in Canada to understand the context, assumptions, and governmental priorities that built our emergency management system and continue to influence it today. Because recovery lacks a dedicated framework, this analysis focuses on broader emergency management policy. Data sources include interview data, academic literature, a timeline of major focusing events, and 22 key federal policies (see Appendix C). Although emergency management falls under provincial jurisdiction, this exploration focuses on developments at the federal level as the common foundation and enabling environment for provincial programs.

The chapter begins with a summary of general policy influences and a timeline of key domestic and international events. The most influential policies, as revealed through the historical analysis, are examined in more detail to uncover the underlying policy assumptions. These assumptions are then deconstructed using a causal layered analysis to identify the forces holding the system in place. Finally, the section concludes with the implications of these policy assumptions on emergency management and its ability to integrate disaster risk reduction into recovery.

Policy influences

Emergency management in Canada has developed organically in reaction to perceived or realized threats in the national and international context. Political scientist Peter May distinguishes between “policies with publics”, where vested interests and lobbying significantly shape policy considerations, and “policies without publics”, which are primarily the domain of technical experts (1991, p. 190). Falling into the latter camp, emergency management is “dominated by a relatively small, specialized subsystem of government practitioners, policy analysts, private-sector consultants, academics, and nongovernmental agencies” (Henstra, 2011, p. 401). The field experiences substantial public and political apathy, except during a crisis. Consequently, the policy subsystem acts as an echo chamber to reinforce dominant assumptions and viewpoints,

creating a relatively static policy domain that resists change (Henstra, 2011). However, two significant forces influence emergency management policy evolution: government fiscal priorities and focusing events.

Austerity

Because emergency management primarily operates outside the spotlight and deals with concepts that resist quantitative measurement, such as resilience and preparedness, it is highly vulnerable to austerity measures. The hidden nature of the work makes it difficult to prove value relative to more salient and politically popular domains such as health or education, and there is no core demographic to “mobilize in its defense” when threatened with budget cuts (Henstra, 2011, p. 403). Government reports have consistently flagged funding shortfalls and the lack of political support for emergency management as key weaknesses, going back almost as early as the field itself (see Auditor General of Canada, 2016; McConnell, 1998). Thus, the history of emergency management in Canada is one of defunding and obscurity, punctuated by brief, disaster-driven periods of growth. Haphazard investment has contributed to the messy, reactive trajectory of emergency management that sees us preparing for the past instead of the future (Riddell et al., 2020).

Focusing events

Focusing events provide the major impetus for policy development in emergency management. These are moments in which public or political perception of threats, realized or not, shine a spotlight on emergency management. During these periods of heightened attention, policy direction may come from the top (e.g., from political leaders) or from within the policy subsystem (e.g., through after-action reports), although the latter more often results in process optimization instead of substantial policy change (Henstra, 2011). Disasters and existential threats do not automatically trigger policy evolution, but few major developments in Canada have occurred without one (Henstra, 2011; McConnell, 1998).

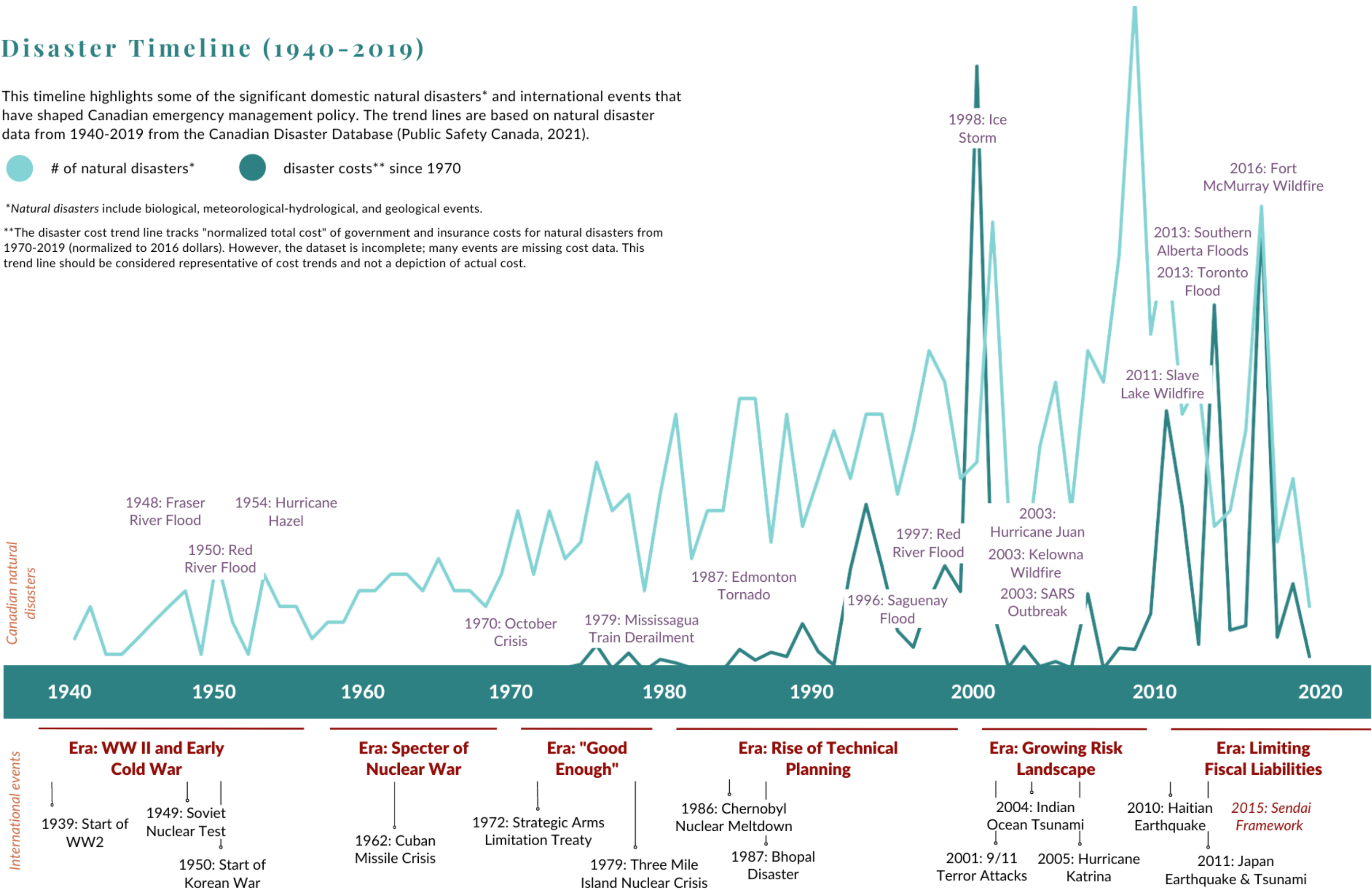
Disaster Timeline (1940-2019)

This timeline highlights some of the significant domestic natural disasters* and international events that have shaped Canadian emergency management policy. The trend lines are based on natural disaster data from 1940-2019 from the Canadian Disaster Database (Public Safety Canada, 2021).

 # of natural disasters*  disaster costs** since 1970

*Natural disasters include biological, meteorological-hydrological, and geological events.

**The disaster cost trend line tracks "normalized total cost" of government and insurance costs for natural disasters from 1970-2019 (normalized to 2016 dollars). However, the dataset is incomplete; many events are missing cost data. This trend line should be considered representative of cost trends and not a depiction of actual cost.



Timeline

This section provides an overview of the key focusing events and emergency management policy developments in Canada, roughly organized into the major eras of emergency management defined by Henstra (2011) and McConnell (1998). See Appendix D for a more detailed narrative of the history of emergency management in Canada.

Second World War & Early Cold War (1940s to 1950s)

Key Events: World War II, Cold War, Soviet nuclear capability, 1948 Fraser River flood, 1950 Red River flood, 1954 Hurricane Hazel

Major Policies: Federal Damage Commissions (1948, 1950, 1954)

The formative period of emergency management was characterized by a federally coordinated, whole-of-society mentality in mobilizing for war.

The federal government supported provinces in establishing voluntary Civil Defence Organizations to handle the local impacts of an air attack on a civilian population. Volunteers were trained as auxiliary firefighters, public utility workers, first aid attendants, and auxiliary police (McConnell, 1998). Three major disasters – the Fraser River flood, Red River flood, and Hurricane Hazel – prompted federal involvement in funding disaster recovery.

Lens on recovery

Federal planners assumed communities would take the lead on their own response and recovery following an air raid, relying on the principle of self-help (McConnell, 1998). The federally-appointed commissions to conduct damage assessments from the Fraser River flood, Red River flood, and Hurricane Hazel and determine federal funding contributions established the early foundation for disaster financial assistance in Canada.

Specter of Nuclear War (1960s)

Key Events: Creation of the hydrogen bomb, creation of intercontinental ballistic missiles

Major Policies: Federal-Provincial Conferences (1959-1962)

This era was characterized by a greater degree of centralized emergency planning and closer alignment with the Department of National Defence in preparation for nuclear war.

The creation of the hydrogen bomb and intercontinental ballistic missiles challenged previous assumptions about the localized impacts of an air raid and posed an existential threat to Canada. To prepare, the federal government assumed greater responsibility for civil defence and created the Emergency Measures Organization in the Privy Council Office to strengthen emergency planning, with a focus on preparing for the continuity of government (McConnell, 1998).

Lens on recovery

Clarifications between the federal government and the provinces on the latter’s role for emergency management crystallized the focus of government activities during recovery. Provinces agreed to manage reception services for evacuated populations, clear and repair highways and road infrastructure, repair damage to municipal water and wastewater systems, repair electrical utilities, and organize debris removal (McConnell, 1998, p. 54). These activities still form the primary governmental considerations for recovery activities, with a particular focus on infrastructure restoration.

Planning is “Good Enough” (1970s)

Key Events: Strategic Arms Limitation Treaty I (1972), October Crisis (1970), economic recession (1974-75)

Key Policies: Disaster Financial Assistance Arrangements (1970), Flood Damage Reduction Program (1975)

This era was characterized by relative global peace and a growing disarmament movement, anti-war and civil rights protests, economic recession, and the rising importance of natural disasters and domestic threats.

In the late 1960s, the Emergency Measures Organization was transferred to the Department of National Defence as cooling international tensions reduced the imminent risk of nuclear war. The federal government’s interest in emergency preparedness waned. Provinces reduced their emergency planning capabilities too, with Ontario going as far as to disband its Emergency Measures Organization (Henstra, 2011). During the October Crisis, the Prime Minister invoked the War Measures Act at the request of Quebec (Lindsay, 2009), and

later commissioned a report to examine its ability to respond to such events in the future. However, the short-lived nature of the crisis and an economic recession soon after reduced the political will for major change (McConnell, 1998).

“The making of plans is not an expensive process. As sound planning is the beginning of all emergency preparations there is, therefore, no reason why we cannot make significant headway with the development of competent and professional plans.”

- Minister of National Defence Léo Cadieux, after the federal government significantly reduced funding for emergency management in 1969.

Lens on recovery

This era saw the development of the Disaster Financial Assistance Arrangements (DFAA), which formalized the cost-sharing formula between federal and provincial governments for eligible disaster response and recovery costs. These arrangements are still in place today, with few alterations, and form the primary policy framework for disaster recovery.

The Rise of Technical Planning (1980s and 1990s)

Key Events: Three Mile Island accident (1979), Mississauga train derailment (1979), Bhopal chemical disaster (1984), Chernobyl nuclear disaster (1986), Saguenay floods (1996), Red River flood (1997), Central Canada ice storm (1998)

Key Policies: Joint Emergency Preparedness Program (1980), Emergency Preparedness Act (1988), Emergencies Act (1988), Federal Policy for Emergencies (1995, 2009)

This era was characterized by a series of technological disasters that once again brought emergency planning into political and public focus, expanding the scope of emergency planning to include more technical hazards.

The partial meltdown of the nuclear facility at Three Mile Island and a train derailment prompting Mississauga to evacuate more than 200,000 people renewed public interest in emergencies (Lindsay, 2009). Federal and provincial governments revitalized emergency planning, which expanded to include more technological hazards and new partnerships between provincial ministries, local governments, and industry (McConnell, 1998).

Three large disasters struck in the late 1990s: the Saguenay flood, the Red River flood, and the 1998 Central Canada ice storm. The ice storm in particular revealed several weaknesses in Canada’s ability to coordinate an effective response to a large-scale disaster (Lindsay, 2009). Before any substantial policy shifts occurred at the federal level, these events were overshadowed by the 9/11 terrorist attacks and the dawning of the “war on terror”.

Lens on recovery

The Emergency Preparedness Act of 1988 represented a step backwards for recovery. Earlier civil defence mandates included planning considerations for the aftermath of a disaster (McConnell, 1998), what we now call the ‘early recovery period’. This new legislation contained no mention of nor consideration for post-event activities (Emergency Preparedness Act, 1985). Instead, it focused on the dual purposes of planning for civil defence during wartime and for responding to domestic disasters as needed, crystallizing the preparedness and response focus of the growing profession of emergency management.

A Growing Risk Landscape (2000s)

Key Events: Y2K, 9/11 terrorist attack (2001) and the War on Terror, SARS outbreak (2003), Kelowna wildfire (2003), Indian Ocean tsunami (2004), Hurricane Katrina (2005)

Key Policies: Public Safety and Emergency Preparedness Act (2003), Emergency Management Framework for Canada (2007, 2011, 2017), Disaster Financial Assistance Arrangements update (2008)

This era was characterized by the increasing specialization of planning for certain hazards, from terrorism to public health, in response to the growing complexity of risks. Boundaries between public health, border security, anti-terrorism, crime prevention, and emergency management blurred, complicating accountability for “all-hazard” emergency management.

Several incidents in the early part of the decade redefined the nature of risk and led to significant change, including Y2K, the 9/11 terrorist attacks, and the 2003 SARS outbreak in Toronto. Internationally, the shocking devastation of the 2004 Indian Ocean tsunami and Hurricane Katrina kept emergency management in the headlines and on political radars.

In response, the federal government created the Department of Public Safety and Emergency Preparedness to strengthen coordination across border security, criminal intelligence, and emergency management and provide a permanent home for the federal emergency management function (Public Safety Canada, 2020).

Lens on recovery

In 2008, the federal government made the first substantial updates to the Disaster Financial Assistance Program since 1970. It restricted eligibility criteria to disasters caused by natural phenomena only and established a mechanism to include “mitigation enhancements” of up to 15% of the reconstruction cost to pre-disaster conditions (Public Safety Canada, 2007). This represented the growing recognition that the DFAA program contributed to the re-creation of disaster risk by only funding replacement to pre-disaster conditions.

Limiting Fiscal Liabilities (2010s and 2020s)

Key Events: Great Recession (2008-09) Southern Alberta and Toronto floods (2013), Fort McMurray wildfire (2016), COVID-19 global pandemic (2020), British Columbia atmospheric river flooding (2021)

Key Policies: DFAA Info Bulletins (2015), Federal Emergency Response Plan (2011), National Disaster Mitigation Program (2015), Disaster Adaptation and Mitigation Fund (2018), Emergency Management Strategy (2019)

This era was characterized by rapidly increasing disaster costs, as years with billion-dollar losses became the norm rather than the exception (IBC, 2021).

The 2008 global financial downturn brought in a new era of fiscal austerity, which significantly affected emergency management and ended initiatives such as the Joint Emergency Preparedness Program. In 2013, the Southern Alberta floods cost the federal government over \$1 billion in DFAA funding (Public Safety Canada, 2021a) and provided additional incentive for the government to limit its fiscal liabilities for disasters. As the costs to recover from disasters continued to mount, governments more seriously turned their attention to mitigation and risk reduction.




Lens on recovery

Recovery costs rose sharply over the past decade and are projected to continue rising without significant investments in climate adaptation and disaster risk reduction (Warren & Lulham, 2021). If current trends continue, Canada may face direct disaster damages averaging \$15.3 billion per year by 2030 (Godsoe et al., 2019). While some government actions have shifted financial liability to lower levels of government or onto individuals and businesses through the privatization of risk, governments have also renewed interest and investment in mitigation.

Policy assumptions

While the preceding section traced the construction of Canada’s emergency management system through key policy developments (see Appendix D for a more detailed history), this section analyzes the fundamental assumptions embedded in those policies. Policy assumptions are the manifestations of institutional beliefs about the world and the future, shaped by experience, ideology, and cultural norms at the time the policies were created (Policy Horizons, 2018). Incremental or “layered on” policy changes rarely alter the underlying assumptions. Although individuals continuously and often unconsciously update their assumptions about the world based on new information and experiences, policy assumptions remain relatively static. As such, the policy assumptions described in this section may no longer reflect how we think or talk about emergency management in Canada, but they continue to define and shape the disaster recovery system.

The policies have been categorized as follows to indicate their relative influence:

-  **Statute:** Legislation governing the system, the highest level of direct influence (although statutes alone may not ensure compliance).
-  **Funding:** Programs that transfer/flow money to other governments, the highest level of indirect influence (often more effective than coercion).
-  **Plans:** Outline roles, responsibilities, and coordination structures, describing how the government intends to act, a type of direct influence over other federal departments (with

weaker accountability than statutes).






Guidance: Aspirational frameworks describing how partners want to work together, a type of indirect influence because compliance is voluntary and lacks accountability structures.

The policies below were analyzed to identify underlying policy assumptions shaping the emergency management system in Canada.

Table 3: Federal policies analyzed for policy assumptions

Statues	Funding	Plans	Guidance
Emergency Preparedness Act	Federal Commissions (1948, 1950, 1954)	Federal Policy for Emergencies	Federal-Provincial Conferences (1959-1962)
Emergencies Act	Disaster Financial Assistance Program and Info Bulletins	Federal Emergency Response Plan	Emergency Management Framework
Public Safety and Emergency Preparedness Act	Flood Damage Reduction Program		Emergency Management Strategy
Emergency Management Act	Joint Emergency Preparedness Program		
	National Disaster Mitigation Program		
	Disaster Mitigation and Adaptation Fund		

This analysis found **seven** fundamental assumptions that emerged in many policy documents, especially polices with the greatest influence over the system (statutes and funding). The section below describes how these dominant, recurrent assumptions appear in policy (Appendix C contains a detailed analysis of each policy). Because the system is not static, the following analysis also identifies emerging language and issue framing that has not yet permeated the subsystems of recovery but may signal the potential for broader change.

1. Nature can cause disasters and we should be ready to act.   




 - Governments have responsibilities for addressing

the damage caused by disasters.

- Defensive orientation – we are not the cause of disasters but should be prepared to react once they happen.

How this assumption appears in policy: Policies speak to readiness and preparedness, characterizing disasters as external threats to our communities. Budgeted emergency management funding has gone towards preparedness, the act of being ready for what might happen through planning, training, and purchasing equipment to support response. Recovery, which carries a bigger price tag, comes from contingency funding (Labine, 2021).

Emergent assumptions: Recent policies have recognized the socio-economic causes of disasters and how actions to reduce risk are the most effective type of emergency management. The National Disaster Mitigation Program and Disaster Mitigation and Adaptation Fund are two recent cost-share programs providing money for proactive disaster mitigation after the federal government ended the Flood Damage Reduction Program.




2. Disasters have definitive boundaries, starts and ends, areas of impact, and causal links between hazards and damage.   

 - Disasters emerge from outside the community and cause rapid, quantifiable damage to a defined area.
 - A disaster begins with the initial impact to a community and ends once visible damage has been repaired.
 - Responsibilities for damage and recovery generally align with jurisdictional authorities.

How this assumption appears in policy: Statutes and plans emphasize the role of the federal government in supporting provinces upon request and require each minister to prepare for how to deliver support when asked and to ensure the continuity their institutions’ operations (Emergency Management Act, 2008). This framing relies on disasters having definitive boundaries and overlooks issues of cascading impacts, disruption beyond the geographical impact area, and multi-jurisdictional domains such as the economy, affordable housing, and waterways and ecosystems.

The DFAA program takes this further and identifies the start of a disaster as the point at which “danger to life and property is imminent” and public authorities have directed people to act (2007, 3.2). It further defines response as up to six months after the end of the disaster – without clarifying what the “end” of a disaster looks like – and gives provinces five years to submit all costs. Additionally, the DFAA program excludes expenses that a province might receive from another federal program, whether or not the province accessed the funding (2007, 3.1.2), reinforcing the notion that disaster damages occur and should be repaired in a linear process without consideration for the broader context.

3. All disasters are local.






- Disasters may overwhelm local capabilities.
- Senior governments are available to assist once this happens, a wait-to-be-asked model of support.
- Support from senior governments is available once a specific damage threshold or failure level has been reached (e.g., once a community has been overwhelmed).

How this assumption appears in policy: Federal legislation and response plans describe the role of the federal government in assisting upon request. The expectation is that lower levels of government handle emergencies within their jurisdictions until the scale of impact overwhelms them.

Emergent assumptions: Recent guidance documents refer to the disruptive potential of disasters beyond the impact area (e.g., Federal Policy for Emergencies and the Emergency Management Framework). Even in 1948, the Prime Minister declared the Fraser River flood a disaster of “national interest” because of the disruption it caused to supply chains (Bumsted, 1987). However, policies such as the DFAA are restricted to the area of

direct damage and ignore the far-reaching impacts of disasters.

4. Disasters threaten life and property, and the restoration of property restores the economy and community.





- The preservation of human life is the top priority; governments have a role in protecting human life from threats posed by disasters.
- Losses from disasters are visible, tangible, and quantifiable in economic terms.
- Restoring infrastructure and property enables the community and local economy to sustain through and recover from a disaster.
- There is a linear relationship between cause and effect, between a disaster and the damage it causes (e.g., hail punches holes in a roof).

How this assumption appears in policy: Policy acknowledges the threats disasters pose to life and property. The eligibility requirements in the DFAA program itemize the different types of losses and damage that qualify for reimbursement, requiring a clear link between the disaster as the cause of damage and the financial cost to repair it (even quantifying the time a homeowner might spend on repairs). What is and is not funded reveals the conditions governments believe necessary for recovery. The DFAA also establishes timelines for response and recovery (up to six months for response and up to five years to submit all costs) based on the assumption that recovery work will have finished within that time.

Emergent assumptions: Some recent guidance documents describe the health and social impacts of disasters beyond damage to property. The 2008 update to the DFAA program expanded eligible response costs to include the provision of financial counselling and mental and physical health counselling, recognizing some of the intangible impacts of disasters.

5. Governments should ensure basic needs are met.






- Governments should restore primary residences (i.e., shelter) to basic levels.
- Individuals and entities should not profit or derive a net benefit from recovery.

How this assumption appears in policy: The DFAA program is intended to support provinces “in providing or reinstating the necessities of life to individuals, including help to repair and restore damaged homes” (2007, p. 5). It uses language such as “essential” and “basic” to describe eligible expenses, explicitly excluding items that are “non-basic” or “luxury”.

For the public sector, the DFAA program excludes expenses for upgrading infrastructure during its repair (e.g., from a one-lane to two-lane bridge) so governments do not benefit from recovery dollars, covering only the cost of returning it to a pre-disaster state with up to 15% additional funding for mitigation enhancements.

6. Standardization is required for fairness and efficiency in delivering service.





- Humans have the same basic needs.
- Government should treat people the same, with few exceptions.
- Emergency management systems should be based on a common standard.

How this assumption appears in policy: The stated intention of the original Emergency Management Framework was to “enhance the emergency response framework in order to harmonize the federal system so that it complements each provincial and territorial system” (2007, p. 2). Reflecting the response-centric orientation that prioritizes interoperability and efficiency, emergency management plans value standardization, often imposed as a top-down, command and control hierarchy. The DFAA also emphasizes standardization: “Rulings on the eligibility of specific individual cases will not be made” (p. 9).

Emergent assumptions: The federal government has used gender-based analysis plus (GBA+) as an analytical tool since 1995 in recognition that policies do not impact all populations equally (Government of Canada, 2021). However, a GBA+ lens does not currently appear in the key federal policies analyzed for this study.

7. Individuals are responsible for their welfare and have the freedom to choose whether to protect their property.



- Insurance is a core responsibility of owning property.

- Individuals exercise freedom of choice in where to live and whether to prepare.
- Individuals have some responsibility for their own recovery.

How this assumption appears in policy: The DFAA program only covers losses which were not insurable, where insurable means “insurance coverage for a specific hazard...was available in the area at a reasonable cost” (2007, p. 14), clearly establishing individual responsibility for purchasing insurance if possible. The guidelines further exclude costs related to lost production, productivity, or wages, reflecting individual responsibility for their own recovery.

Deconstructing the emergency management system: Causal layered analysis

While the preceding analysis outlined the policy construct of emergency management in Canada, this section deconstructs the policy system to reveal the historical structures, power dynamics, and worldviews that contributed to the development of the recovery system and work to keep it in place (Inayatullah, 2005). A causal layered analysis, shown in Figure 10, maps system forces into four vertical layers to deepen understanding about how and why the system functions as it does and to indicate the potential timescales for change. Deeper system levels are more firmly entrenched and complexly entwined with other systems and structures in Canadian society, making them more difficult to change.

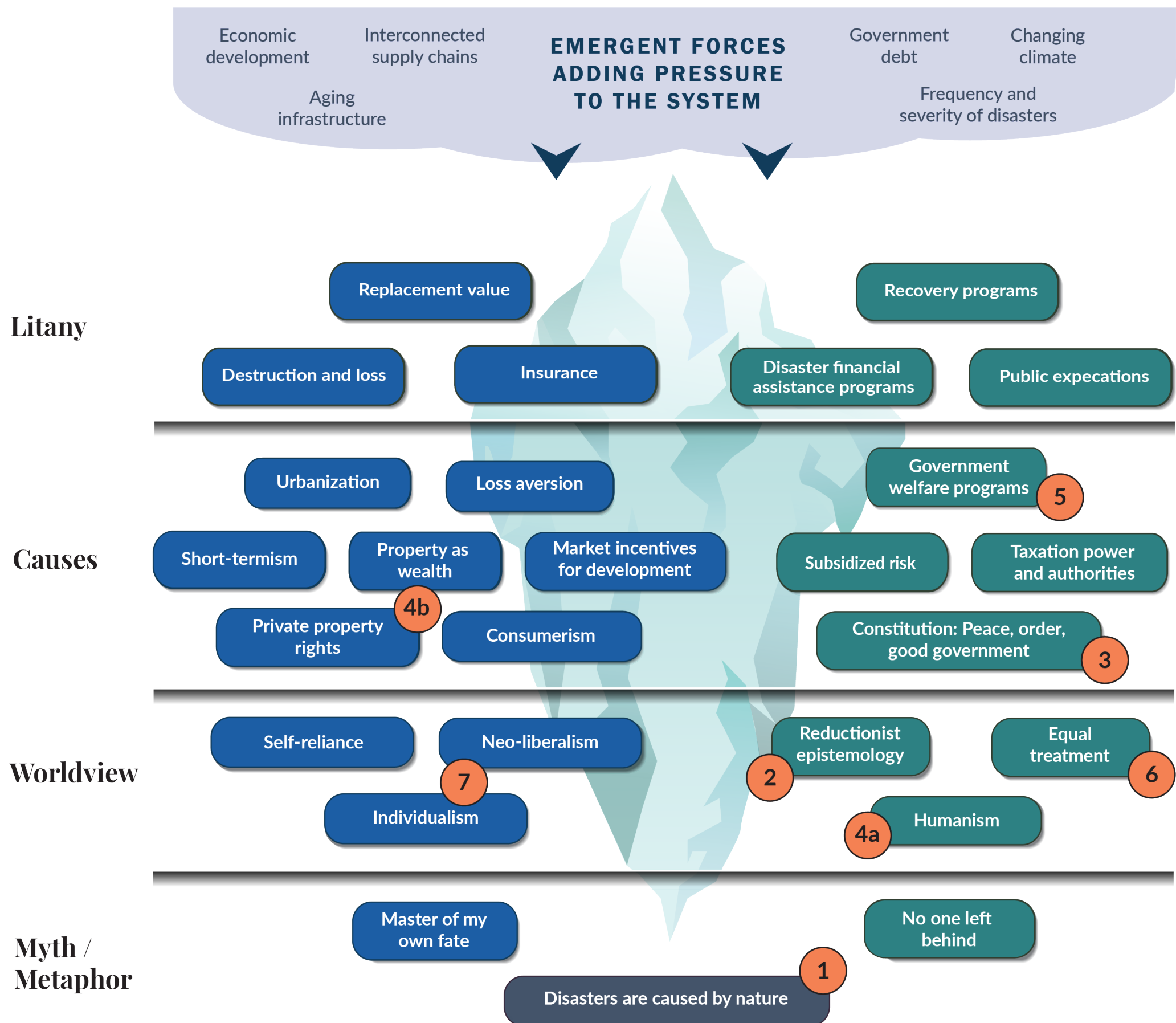
Litany: The “visible” layer of the system as it shows up in official documents, media reports, and public discourse.

Causes: The political, economic, historical, cultural, and social structures and relationships between structures, often the subject of social science and scientific analysis.

Worldview: Cultural and social values and ideologies that frame the language used to describe the system.

Myth/metaphor: The collective archetypes and emotional responses at the societal level.

In addition to identifying the key forces at each system level, Figure 10 maps the dominant recovery policy assumptions to the system level and forces that shaped them.



Policy assumptions at system levels

- 1 Nature can cause disasters and we should be ready to act
- 2 Disasters have definitive boundaries
- 3 All disasters are local
- 4a Disasters are a threat to life
- 4b Disasters are a threat to property and restoring it restores the community and economy
- 5 The role of government is to meet basic needs
- 6 Standardization is required for fairness and efficiency
- 7 Individuals are responsible for protecting their property

Figure 10: Causal layered analysis of disaster recovery system in Canada, including dominant policy assumptions.

Unpacking the causal layered analysis

This section describes each system level, beginning at the bottom.

Myth / metaphor: The dominant myth in our society is that disasters are destructive acts of nature. This myth has shaped Western civilization’s framing of disasters since the Enlightenment and the emergence of the scientific method, which slowly replaced the myth that disasters are acts of God or gods (Manyena et al., 2011). Within this framing of disasters, two competing metaphors shape our societal narrative of the role of governments versus individuals in disasters:

- The *individual* metaphor that has strongly influenced our cultural and economic systems is *Master of my own fate*.
- The *collective* metaphor that has strongly informed our social norms and systems of governance is *No one left behind*.

The co-evolution of competing metaphors has given rise to worldviews and systemic forces sometimes at odds, creating an ongoing tension between our notions of collective solidarity and individual freedom of choice that has characterized the policy construct of emergency management and its paradoxical goals and outcomes.

The reactive orientation of emergency management originates at this system level through the policy assumption that we must be ready to respond to destructive acts of nature.

Worldview: Moving up a level, a neoliberal worldview builds off the *master of my fate* metaphor and advocates for few government constraints on market forces, promoting consumerism and freedom of choice as necessary for economic growth and prosperity (Blake et al., 2017). This worldview reinforces and is reinforced by the notion of individualism, which venerates the role of the individual in choosing their own path and being responsible for their decisions. Both ideas internalize a humanist philosophy that elevates humanity above nature and incorporates a fundamental belief in science, reason, and human ingenuity. Humanism also promotes equality, somewhat constraining pure free-market capitalism to ensure the protection of universal human rights, building off our collectivist metaphor to *leave no one behind*. The public sector has enshrined this philosophy through its dedication to fairness and equality – the importance of treating everyone the same (Treasury Board Secretariat, 2011).

The belief in reason and science relies on a reductionist epistemology that breaks problems down into component parts to better understand and find solutions for each issue, and searches for direct links between cause and effect. Bureaucracies reflect a reductionist view of society through specialized departments which each handle different aspects of a problem (e.g., infrastructure, health, environment, and public safety are all separate departments).

Many policy assumptions arise from this system level, particularly from the collectivist ideas about human rights, equal treatment, and the imperative to protect human life.

Causes: Neoliberal and individual worldviews have shaped many of our economic and governance structures. The importance of private property for individual wealth and sense of freedom has fueled rapid urbanization, placing people and assets in at-risk areas, driven by market forces optimized for short-term consumption. Short-termism also defines political cycles and priorities, which in turn are based on our notions of the role of government to provide peace, order, good government (Centre for Constitutional Studies, 2019), and to protect private property rights. To keep peace and order, governments step in during the chaos of disasters to save lives, clean up the damage, and support populations affected. The primary focus is to protect human life; emergency legislation and response has been optimized to support this objective. Good government includes responsible stewardship of taxpayer funds (Treasury Board Secretariat, 2011), which contributes to the governmental approach of providing basic support only and attempting to limit its fiscal liabilities through financial risk transfer. This fiscal approach can fail to meet the expectations of people reeling from disaster and suffering the deep, psychological effects of loss (Kahneman, 2011). In protecting property, governments help restore property to basic levels after a disaster and can be reluctant to impose restrictions on what people can and cannot build on private land.

The Constitution establishes jurisdictional responsibilities and powers of taxation. Subsidiarity, a related principle in the interpretation of Canadian law, holds that decision-making authority should be as close as possible to those affected by the decisions, which contributes to the local-first approach of emergency management (Brouillet, 2011; Hebb, 2021). As a result, municipalities – which have the least taxation power

and financial capacities – are on the front lines of emergencies.

Policy assumptions about the importance of restoring property, the local nature of disasters, and the limits of government support to basic needs originate from the economic and governance structures at this level.

Litany: The prominent stories we see during recovery emphasize losses, human impacts, and the financial mechanisms such as disaster financial assistance and insurance to support people affected by disaster. Media reports quickly focus on quantifying disaster losses at a macro and individual scale, discussing the amount of money governments are spending and people who fall through policy cracks (see Miller, 2019 or Laanela, 2018) or for whom funding was not sufficient to cover their losses (see Piovesana, 2013). These same stories frame disaster events as “unprecedented” or “unforeseen” (see McSheffrey, 2021, or Peters, 2021) and show clear expectation that governments will support people affected by the crisis. More recently, media stories have begun to link disasters to climate change and warn there is worse to come as Canada’s climate warms.

The visible layer of recovery focusing on dramatic images of destruction, damage, rescue, human survival, and government support is the manifestation of the underlying structures, worldviews, and metaphors. Disaster recovery policy assumptions connect to deeper, less visible forces such as humanism, equality, and neoliberalism, which can make them difficult to change even when policy language evolves to focus on the human causes of disasters and the importance of resilience. The dominant metaphor of *natural* disasters and our competing individual versus collective response to them continue to define the system.

Emergent forces: The emergency management system was constructed over decades, with many fundamental policies developed in the 1950s, 1970s, and 1980s. New systemic forces have emerged and are adding considerable pressure to the existing policy construct. These forces include the effect of economic development and globalization on the interconnectedness of supply chains, where the impacts of a disaster may be felt far outside the damage zone, and the aging transportation and utility infrastructure growing more vulnerable to a changing climate. Government debt levels have risen and are a topic of public discourse in the face of the increasing frequency and severity of disasters.

Leverage points

The emergency management policy construct reveals the following barriers and opportunities to integrating systemic risk reduction during recovery:

Barriers

- The market rewards short-term urban developments and deregulation.
- The goal of the federal and provincial financial assistance programs is a rapid return to pre-disaster conditions.
- Rigid eligibility criteria established at the federal level and reinforced through provincial programs discourage local autonomy in setting priorities for their recovery.
- The failure-based model dependent on lower levels of government reaching capacity before senior governments provide support keeps the system in a reactive mode.

Opportunities

- Emergent assumptions are challenging the rhetoric of disasters as forces of nature rather than socio-economic phenomena and identifying the unequal impacts of disasters on different populations.
- Canadians perceive a strong role for government in recovery and look to government for support and leadership.
- During the early civil defence era, Canadians accepted the whole-of-society approach to surviving war and that everyone had to do their part in recovery.

Implications

This section analyzed the federal policy construct of emergency management in Canada, which establishes the enabling environment for provincial and municipal programs. It revealed the prevailing policy assumptions underpinning the current practice of emergency management and how these arose from and are supported by dominant societal views about the role of governments and individuals, and the values upon which our economic and governance systems are built.

The next chapter explores how the disaster recovery construct functions at a municipal level during disaster recovery.

“

The bureaucratic framework is one of the worst things to have at the time of disasters.

– Enrico Quarantelli

Invention, it must be humbly admitted, does not consist in creating out of void but out of chaos.

– Mary Wollstonecraft Shelley

CHAPTER 4

SYSTEM DYNAMICS IN MUNICIPAL DISASTER RECOVERY

This chapter explores the current system dynamics of disaster recovery at a municipal level to identify the barriers and opportunities for integrating disaster risk reduction. Using systems analysis methodologies, I synthesized data from participant interviews and academic literature to understand and describe the multiplicity of forces, stakeholder power dynamics, competing priorities, and systemic barriers as municipalities navigate recovery.

Each subsection explains how different systemic forces manifest during recovery and the interactions between them. An *iceberg icon* indicates the vertical levels at which the system forces originate to ground this analysis in the emergency management construct described in Chapter 3. System levels indicate how deeply systemic forces are embedded in Canadian society.



First, this chapter begins by identifying the sensemaking frames through which we filter and interpret disaster narratives, deeply informed by our collective metaphor of disasters. It then unpacks the characteristics of municipal decision-making during recovery and the competing forces that challenge traditional decision-making processes. Next, it explores the key stakeholders in the disaster recovery system, considering their interest and financial stake in the system. The final segment uses causal loop diagrams to explain patterns of behaviour and describes underlying forces contributing to the status quo.

Sensemaking in disasters: Dominant frames

Sensemaking is the process through which people interpret their experiences by filtering new information through existing mental frames that shape our perception. The process occurs simultaneously at both

the individual and collective levels, a dynamic and ongoing interplay of action and interpretation that gives meaning to events (Comes, 2016). Shared meaning enables

collective action and cooperation across teams and organizations (Allard-Poesi, 2005); without it, challenges arise in determining appropriate actions to address the situation. Divergences in sensemaking can lead to conflict or decision paralysis during a crisis (Rubin & de Vries, 2020).

Mental frames, formed by experience and shaped by the parallel forces of identity and plausibility, are the lenses through which we filter information (Carrington et al., 2019; Mills & Weatherbee, 2007). Because of the deep connection of mental frames to our individual and collective identities, they resist change and provide a mechanism to rationalize our behaviour and experiences. Frames also help us hold contradictory ideas about the world by filtering out or rationalizing incompatible concepts.

Disasters disrupt our expectations and temporarily challenge our ability to make sense of a situation (Olcott & Oliver, 2014; Weick, 1993). We navigate this uncertainty by associating relevant information with existing mental frames about how the world should work, which shapes our perception of the problem and the possible actions to ameliorate the situation (Comes, 2016). These cognitive limitations are heightened under stress and push us towards decision-making shortcuts whereby we choose adequate rather than optimal pathways (Takeda et al., 2017), a phenomenon known as bounded rationality.

Bounded rationality: There are limits to rationality in decision-making because of cognitive limitations and a lack of data, so we make acceptable choices within the constraints of the information available based on our frames of reference (Takeda et al., 2017).

Perception is never free of preconceptions.

– Karl Weick

In a crisis, the pressure to act quickly but with conflicting data further hamper rational decision-making. Identifying the dominant frames through which we collectively interpret disasters in Canada can reveal the bounded rationality limiting individual and organizational action. As disaster narratives tend to reinforce dominant forces in society (Marchezini, 2019), they can be highly political and reflective of the power dynamics at play, and may reveal contradictory beliefs. These sensemaking frames are derived from the interview data and literature review.



Frame 1: Disasters are temporary, abnormal events

System levels: *Litany*

This dominant frame positions disasters as temporary, abnormal events rather than the predictable outcomes of building communities in flood plains, seismic zones, and forests without sufficient mitigation. In framing disasters as abnormal rather than eventual occurrences, we undermine the imperative to prepare and limit the power of anticipatory thinking (Klein et al., 2010). Although emergency management legislation across Canada requires communities to conduct risk assessments and develop emergency plans, its treatment of recovery as a process for financial reimbursement in rebuilding pre-disaster structures reinforces the notion of disasters as abnormal events.

Influence on bounded rationality

As a result of the *temporary and abnormal* disaster frame, we:

- Are surprised when disasters strike our communities. More importantly, we allow elected officials and senior policymakers to act surprised, using language such as “unprecedented” to excuse a lack of preparedness and investment in risk reduction, despite the fact governments are well aware of many risks (CBC, 2021; Commonwealth of Australia, 2020). This framing traps us in the cycle of respond-recover-respond-recover because we do not establish accountability for the decisions that heighten disaster vulnerability.
- Approach disaster recovery as a process to rapidly return to normal, to minimize disruption and get on with business as usual, rather than

as an opportunity to address the vulnerabilities and structural inequities of our urban design. The temporary frame narrows our perception to physical destruction instead of a more holistic view of tangible and intangible impacts, thereby limiting the opportunities we can see to build resilience to future disasters.

- Assume the problem is lack of data, which leads us to make substantial investments to improve risk assessments, sometimes in lieu of actually reducing risk. Although risk assessments are fundamental to effective risk reduction, in many cases, “this historical record of so-called surprises shows that in just about every case the data were available to anticipate the surprise. The decision makers explained away the data” (Klein et al., 2010, p. 4). Focusing on data can provide a convenient way to avoid more difficult discussions about accountability and the trade offs needed to reduce risk.



Frame 2: ‘Responsibilization’

System levels: *Worldview*

‘Responsibilization’ is “the process by which individuals are held disproportionately accountable for outcomes or conditions that they have limited or no power to control” (Horn, 2021, p. 1). It is a product of a neoliberalist social order that celebrates self-sufficiency, independence, and self-determinism to justify deregulation and the erosion of welfare support (Blake et al., 2017). This narrative purports to hold individuals accountable for the consequences of their decisions but overlooks systemic causes of inequality. In disasters, the frame of responsabilization runs parallel to and can contradict or complicate public discussion of collective support and government assistance, sometimes emerging in discourses of ‘resilience’ as a rationale for refusing help to communities or individuals in crisis in order to encourage self-sufficiency (Norris et al., 2008).

Influence on bounded rationality

As a result of the *responsibilization* disaster frame, we:

- Ignore structural causes of vulnerability and the power imbalances that privilege some members of society over others. This frame holds implicit assumptions about the extent of agency individuals can exercise over their risk exposure (Ewert, 2021).

- Place the responsibility for risk management and survival on individuals, neglecting the important roles of government decision-makers, institutions, and communities in establishing the conditions for individuals to thrive (Blake et al., 2017; Booth & Tranter, 2018; Horn, 2021).



Frame 3: Heroes and victims

System levels: *Metaphor*

This narrative frame assigns roles to some of the key players in disasters: the heroes and the victims. Heroes tend to be first responders and experts from outside the impacted community coming to the rescue of those left helpless by their desperate circumstances (Marchezini, 2019). The emphasis on and celebration of external sources of heroism reflects a paternalistic framing of response and recovery that sometimes hides an undercurrent of victim-blaming. The top-down approach can rationalize its dismissal of local knowledge and emergent voices by subtly pointing out ways in which the community is responsible for the disaster it now faces through land use policies and zoning decisions, lack of investment in preparedness and mitigation, and a sub par disaster response. Often perpetuated by media stories of heroic responders parachuting in to save the day, this frame overemphasizes the impact of trauma as a paralytic force and underestimates the resilience of the local community.

Trauma emanates from profound powerlessness.

– Australian Community Recovery Handbook

Influence on bounded rationality

As a result of the *heroes and victims* frame, we:

- Contribute to the trauma of disaster survivors by limiting their agency and focusing on their victimhood. Although disasters will likely always require some external support, how this support is integrated into the recovery process can either empower or disempower local communities (AIDR, 2018).
- Overlook community assets and sources of resilience. The asset-based approach to disaster recovery and community development has been employed for many years in the international humanitarian context as a mechanism to empower local communities.

- May trigger a dependency effect where the learned helplessness of the local community forces them to rely on external sources of aid and slows their path to self-sufficiency and recovery (Norris, et al., 2008).
- Cause conflict when the norms and values of external responders are incompatible with local customs, values, and beliefs. Because the discourse of outside salvation often reinforces hegemonic ideologies, this can further marginalize minority groups (Manyena, 2014; Marchezini, 2015; Paidakaki & Moulaert, 2018).
- Undervalue and underpay for the competencies essential to recovery (such as social work and community development), especially in contrast to the value placed on and compensation of response heroes and outside experts.



Frame 4: “Natural” disasters

System level: *Metaphor*

Despite long-standing recognition in academic literature and policy documents that disasters are socio-economic phenomena, the framing of disasters as products of the natural environment still dominates media, cultural, and political narratives (Bogdan et al., 2020b; Thistlethwaite et al., 2019). Using terminology such as “natural disaster” in public discourse reinforces the idea of nature as a source of destruction, downplaying the role – and responsibility – of human agency. This narrative pits natural forces against human ingenuity, allowing us to cast the floodwaters or flames as “evil” and cheer on the triumph of “good” human actors in overcoming such challenges (for example, the characterization of the Fort McMurray wildfire as “The Beast”).

Influence on bounded rationality

As a result of the *natural* disaster frame, we:

- Focus on interventions to control the natural environment, rather than adapting to it (Bogdan et al., 2020; Mileti, 1999). The reliance on control produces vulnerability when physical deterioration and natural forces cause those structures to fail (not an uncommon occurrence).
- Externalize the source of destruction and any perceived responsibility for it, thereby limiting the individual’s role in contributing to vulnerability. As a result, we expect governments to shoulder most

of the responsibility and cost of recovery (Henstra et al., 2017). Perceived responsibility shifts with perspective; people suffering disaster loss can rationalize why they did not adequately prepare and why governments should help them, whereas individuals who did not suffer loss or were fully insured are more likely to perceive those in need of help as irresponsible (Ewert, 2021).

Leverage points

The dominant disaster sensemaking frames reveal the following barriers and opportunities to integrating systemic risk reduction at the municipal level during recovery:

Barriers

- The paradigm of “natural” disaster limits incentives and accountability for reducing disaster risks.
- The framing of disasters as temporary setbacks discourages broader consideration for how to reduce vulnerabilities and exposures to risk and focuses our attention on a rapid return to normal.
- The reliance on and celebration of outside experts and heroes limits the agency of local actors, can contribute to trauma and feelings of powerlessness, and may limit opportunities and incentives to build local capacity.

Opportunities

- Encourage local responsibility by enabling local actors to self-organize, investing in their capacity, and valuing their leadership to reduce the effects of trauma and overcome the ‘victim’ framing.
- Use anticipatory language to improve how we talk about risk to encourage greater accountability for decisions that create or heighten risk.
- Focus media coverage on the underlying policy failures that enable disaster risk and the efficacy of potential solutions to bring disaster risk reduction into public discourse and influence policy (Thistlethwaite et al., 2019).

Characteristics of decision-making during disaster recovery

Disaster recovery presents extraordinary challenges in which compressed timelines, community need, intense media scrutiny, lack of local capacity and expertise, and resource coordination difficulties overwhelm government processes (Hamideh, 2020; Olshansky, Hopkins, & Johnson, 2012; UNDP, 2017). Against this backdrop, municipalities must balance supporting impacted populations, restarting economic activity, repairing damaged infrastructure, and mapping out the path to recovery, which may take years or even decades. The characteristics of the recovery environment deeply challenge municipal decision-making across multiple dimensions.



Insufficient time

System levels: Litany, causes, worldview

“The overwhelming pressure to act quickly, the tyranny of the urgent, arguably poses the greatest challenge to recovery decision-makers, planners and implementers” (International Recovery Platform, 2012).

Individuals, groups, and organizations make their own recovery decisions within days or weeks and require a degree of certainty about municipal reconstruction plans and timelines to enable those choices. Delays in policy decisions or changes in direction can have substantial cascading impacts on people trying to facilitate their own recovery. Many recovery activities are interdependent and must be conducted simultaneously, leaving little time to consider alternatives (Mileti, 1999; Rouhanizadeh et al., 2020). For instance, homeowners and businesses require road access, power, and utilities to repair damaged buildings; buildings house the workforce, goods, and services needed for recovery; workers require the availability of specific goods and services to do their jobs; and the movement of goods and services rely on sufficient access and power. The simultaneity of interconnected actions contrasts the traditional decision-making environment for local governments, which occurs in a relatively sequential order with approvals required at each stage (Figure 11).

Considerations during this process include not only risk assessments, but also land availability, existing infrastructure such as roads and utilities, competing investment interests, etc. As a result, municipal governments face substantial pressure to return the community to pre-disaster conditions, a decision-making shortcut that prioritizes stability and normalcy over considerations for improvement or transformation.



Differential impacts

System levels: Causes, worldview

Not everyone experiences the same impacts from a disaster, even neighbours living on the same street. Much of this stems from pre-existing conditions that can either exacerbate or reduce vulnerability, including differences in building design, style, and age; property-level mitigation efforts, such as sewage backflow preventers or fire-resistant shingles; the extent of insurance coverage for all inhabitants, including renters; the financial capacity and fiscal reserves of those affected; social capital and access to networks of social support; and physical and mental health, wellness, and mobility (AIDR, 2018; Ewert, 2021; Rouhanizadeh et al., 2020), but also from the randomness of natural forces. From the very beginning, these differences result in diverging trajectories for disaster survivors, which can challenge community solidarity and the sense of togetherness that often forms during response.

Entire neighbourhoods or sections of a municipality may be untouched by damage. Once evacuation orders and road closures end, many unaffected neighbourhoods want to resume business as usual. Municipal governments must balance the continuity of services and operations for unaffected areas while ramping up new support to neighbourhoods still suffering. The geospatial distribution of damage and percentage of a community it covers, the severity of destruction, and the relocation of evacuees all contribute to the pressures on local governments for where to dedicate the greatest time, energy, and resources.



Competing visions and priorities

System levels: Worldview, metaphor

The differential impacts of a disaster and diverse frames through which individuals and groups interpret the disaster lead to competing priorities. Norms and values, often deeply embedded in specific contexts, produce

diverging visions for the future. Meanwhile, normal government mechanisms to engage citizens and solicit input become more difficult in the early-disaster period when populations are still displaced and households are focused on cleaning up, repairing damage, and navigating the complexities of insurance and government assistance. Emotions run high, which can make it difficult to build consensus or to consider difficult tradeoffs that may be necessary to reduce future risks.



Dynamic context

System levels: Litany, causes

The recovery context changes constantly, especially during early recovery. Policies are developed on the fly, impact analysis data continue to evolve, new community leaders and organizations emerge in an already complex stakeholder landscape, and people experience extreme emotional highs and lows. All the challenges that existed before the disaster still exist – issues of poverty, homelessness, unemployment, or even unbridled growth – and are often made more complex because of the impacts of the disaster.

The context during which early decisions are made – when people are still displaced, structural damage provides constant visual reminders, the media runs continuous coverage, and senior governments pay close attention – changes rapidly over the following weeks and months. Media coverage fades, returning mostly for anniversary dates or particularly messy controversies, the political interests of other levels of government move on, and those best equipped to recover manage to do so. There is a societal sense of wanting to move past the disaster, despite many people still struggling to recover.

Mental health changes too (see Figure 12 on the following page). Disillusionment and exhaustion replace the hero phase of early response. The surge of support available in the immediate aftermath winds down, sometimes leaving a vacuum in its wake just as a new wave of need hits. One study of wildfire recovery in California noted gendered differences in the timing of when people seek mental health support, with women accessing services early on while men pushed through until they were completely exhausted, by which point assistance programs had ended (Ewert, 2021).

Decision-making in this rapidly shifting context involves prioritizing the allocation of dwindling recovery resources among increasingly desperate people.



Figure 11: General process for construction projects in municipalities (Canada Mortgage and Housing Corporation, 2020).

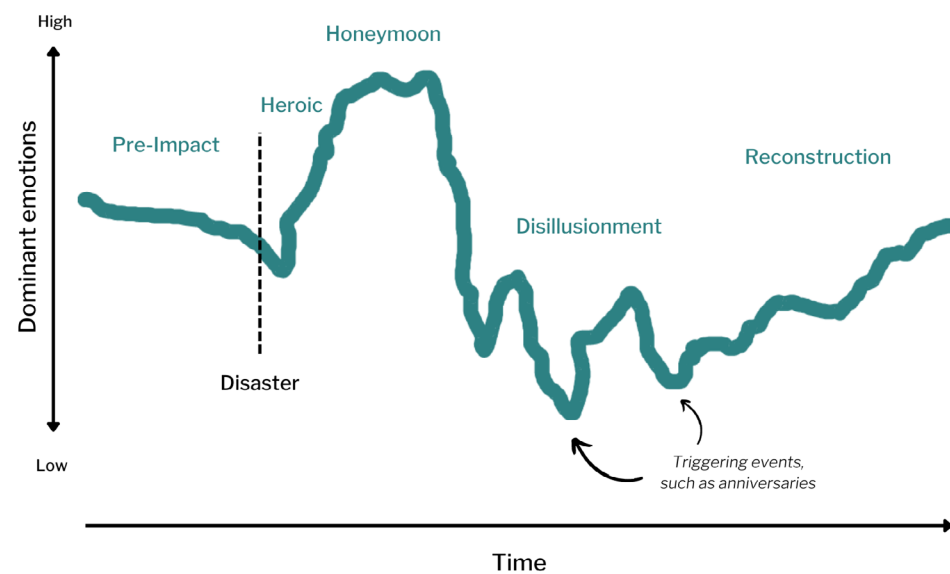


Figure 12: Typical community reactions to disaster, adapted from FEMA, 2016b.

on cognition. Cognitive effects can include impairments to concentration, decision-making ability, and memory; disbelief and confusion; nightmares; decreases to self-esteem and self-efficacy; and heightened worry, anxiety, self-blame; and experiences of dissociation (ACOEM, n.d.). When experiencing such effects, it can be challenging to advocate for oneself or for others, to understand highly technical language and policies, or to reason through complex tradeoffs and multifaceted decisions. These barriers contribute to the difficulty of decision-making during disaster recovery, both for decision-makers and for the publics they are trying to engage and support.



Impacts of stress and trauma

System levels: Causes, worldview

A substantial body of literature from the earliest days of disaster research confirms the resilience and pro-social behaviour of individuals who experience disasters (see AIDR, 2018; Mileti, 1999; Norris et al., 2008). In addition, stress provides the incentive for growth and evolution in organisms and is not universally detrimental (Horner, 2004). In her book *Paradise Built in Hell*, Rebecca Solnit follows instances of collective post-traumatic growth in disasters, where “that purposefulness and connectedness bring joy even amid death, chaos, fear, and loss” (2009, Prelude).

However, mental distress does increase after disasters. The World Health Organization estimates up to 20% of an affected population may experience mild or moderate mental disorders (as cited in AIDR, 2018, p. 27); a study of Fort McMurray residents following the 2016 wildfire had similar findings (Agyapong et al., 2018). Although each person experiences trauma differently, it can have emotional, physical, biological, cognitive, and interpersonal effects (American College of Occupational and Environmental Medicine [ACOEM], n.d.; Substance Abuse and Mental Health Services Administration [SAMHSA], 2014).

The highly bureaucratic system we have developed to manage disasters often overlooks the effect of trauma



Limitations of disaster financing mechanisms

System levels: Litany, causes, worldview

Municipalities have five primary options for funding disaster recovery: re-allocating operating or capital funds, financial reserves, charitable donations, insurance, and disaster financial assistance (administered by provinces). Depending on the fiscal situation of the municipality before the disaster and the extent of damage, the first two options may not be sufficient to pay for recovery. In addition, disasters cause significant disruption to the typical avenues of municipal revenue such as property taxes, user fees, and permits. Municipalities may even defer taxes for damaged homes or waive/reduce permit fees for rebuilding (see Calgary’s program for hail damaged houses in 2020 and Ottawa’s program for flooded homes in 2019). Charitable donations often fund unmet needs for vulnerable populations and fill gaps in government support, which can complement municipal recovery initiatives but cannot address recovery funding shortfalls.

Consequently, municipalities may rely heavily on disaster financial assistance to cover any uninsured loss, which constrains local decision-making and autonomy due to the eligibility criteria established by senior governments.

The most problematic constraint in the context of this study is the stipulation that financial assistance go towards reconstruction to “pre-disaster conditions”, with some mitigation enhancements to damaged structures eligible for reimbursement (Public Safety Canada, 2007). The second most obstructive barrier is the short timelines (five years under the DFAA program), which directly contradicts known time scales for recovery (see AIDR, 2018; FEMA, 2016a). These constraints limit the ability of municipalities to conduct public engagements, comprehensive needs assessments, feasibility studies for risk reduction, or more systematic considerations of how to reduce vulnerability and exposure to disaster risk.



Decision-making tensions

System levels: Litany, causes, worldview, metaphor

Insufficient time, differential impacts, competing visions and priorities, dynamic conditions, stress and trauma, and the limitations of disaster financing mechanisms collectively challenge municipal decision-making during recovery. Local authorities must navigate complex and competing forces in the face of overwhelming pressure to move quickly and yet find ways to “build back better”. Unlike response, where the fundamental challenge is mobilizing and coordinating sufficient resources to deal with the hazard and its consequences, recovery requires decision-makers to deliver programs to satisfy divergent and sometimes contradictory tensions.

Short term vs long term: The short-term decisions and coping mechanisms employed early in a disaster help to minimize disruption and restore a semblance of normality but can come at the expense of long-term mitigation and adaptation.

Restoration vs transformation: The quickest path to restart societal function is to follow the blueprint of what existed before the disaster, to rebuild the same structures in the same places. Transformation takes time, vision, and funding but can be a powerful source of hope, renewed economic activity, and future resilience.

Tangible vs intangible: Also framed as physical versus social recovery, this tension exists between recovery for that which can be touched and quantified versus that which cannot be easily measured, if at all. Physical destruction can pull focus from the invisible havoc disasters can wreak on people’s health and wellness, sense of identity, connection to place, social networks, economic prospects, and hope for the future.

Local vs external: Community-driven recovery prioritizes recovery benefits for local residents and businesses; however, local capacity is often insufficient to meet all the demands of recovery and requires some external support and expertise. This can cause conflict when local values and capabilities are overlooked, not respected, or are incompatible with those of external entities.

Hegemonic vs emergent: Dominant societal forces push recovery towards pro-growth, market-driven trajectories that privilege those in power while emergent forces offer new pathways based on alternative values and priorities.

The disaster recovery context poses significant challenges to municipal decision-making and difficult tradeoffs balancing the needs of people suffering in the moment with the long-term recovery and resilience of the community.

Leverage points

The characteristics of municipal decision-making during recovery reveal the following barriers and opportunities to integrating more systemic risk reduction:

Barriers

- Voters reward short-term solutions to immediate issues and the rapid return to normal.
- Rapid recovery is most easily achieved through reconstruction to pre-disaster conditions, which limits the consideration of disaster risk reduction.
- Senior governments play an important role in financing recovery, but impose a top-down framework through strict eligibility criteria. Municipalities face delays in funding and eligibility decisions for creative ideas on how to reduce risk.
- Stress and trauma affect cognitive processes.

Opportunities

- In disasters, most people exhibit collective pro-social behaviour on a societal scale, and new actors emerge in the system who may offer new ideas.
- Introduce accountability measures into the system for decisions that produce, or at the very least reproduce, known disaster risks.
- If necessity is the mother of invention, disasters provide opportunities for local businesses and entrepreneurs to find creative ways to address community needs.

Stakeholder dynamics

This section describes the key stakeholders in the recovery ecosystem through the lenses of power/influence, interest, and financial risks and rewards. Appendix E contains more details about the tools and levers each stakeholder has to influence other actors in the system.



Power and influence

System levels: Litany, causes, worldview

The matrix in Figure 13 reveals relative stakeholder positions in disaster recovery based on power and influence (mapped along the x-axis) and interest (mapped along the y-axis). In this context, influence indicates the ability of a stakeholder to change the behaviour of other actors or the system itself. Interest suggests the extent to which stakeholders become actively involved in recovery.

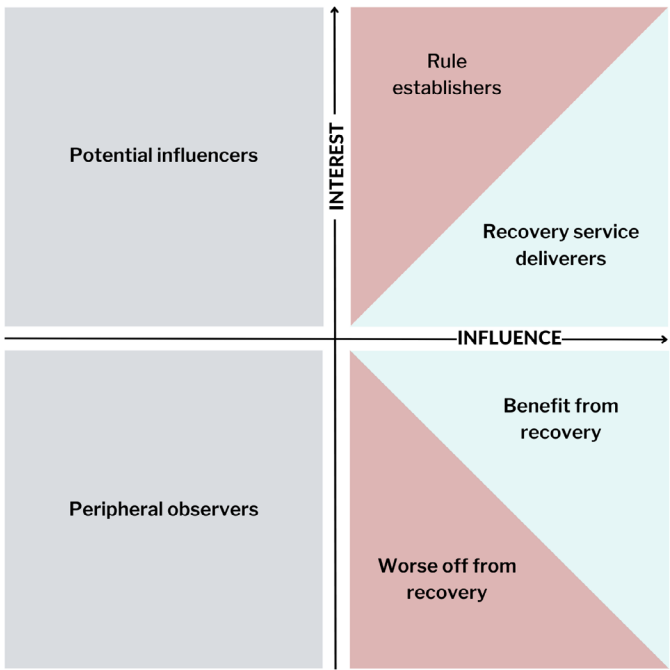


Figure 13: Stakeholder matrix for disaster recovery, adapted from Pacini, 2017.

Peripheral observers

Low interest | Low influence



This quadrant includes stakeholders that participate in the recovery ecosystem but have limited interest and

influence, such as neighbouring jurisdictions offering support to impacted municipalities.

Potential influencers

Low interest | High influence



This quadrant includes groups that do not currently exert significant influence over the system but control important leverage points and could become powerful actors for change.


Financial institutions. Financial institutions are highly risk-averse and actively limit their financial liabilities to disasters. Banks determine the level of insurance they require for real estate lending and set the conditions for loans that individuals, businesses, and other entities may seek to fund recovery, thereby influencing what and how stakeholders rebuild.

Media. The media can shape public and political perception of the causes and impacts of a disaster. If the media draws sustained attention to the policies that create or accelerate risk and offers insights for change, it can have a significant influence on policymakers.

Transportation sector. The transportation sector, which can suffer devastating effects from disasters, has significant economic and political clout. Where disasters have disrupted essential supply chains, the transportation sector has galvanized rapid reconstruction and recovery efforts (such as the Trans-Canada Highway reopening in Canmore in 2013 or the restoration of the rail lines after the 2021 atmospheric river in British Columbia). However, the sector does not play a significant role in pre-event risk reduction.

Power over system rules

Medium-high interest | High influence



This section includes the stakeholders that have the power to define the playing field for recovery and establish the rules of the system. They control or influence powerful system levers.

Provincial governments. Provinces arguably have the greatest power over recovery systems because of their jurisdictional authority and policy tools. They create municipalities and determine the rules for land development and financial planning; establish legislation and regulations for emergency planning and determine eligibility for disaster financial assistance for municipalities, small businesses, and individuals;


establish building codes and regulate construction and trades; and are the sources of important risk and hazard data such as flood maps. Unlike municipal governments, they can also run deficits and borrow significant sums of money to fund recovery.

Federal government. Though its role in recovery is limited primarily to financial support, the federal government establishes the rules for public sector recovery through the eligibility criteria for disaster financial assistance. It can also wield significant influence over other stakeholders through pre-disaster infrastructure, mitigation, and climate adaption funding programs.

Insurance industry. Although subject to federal and provincial regulations, the insurance industry also establishes the rules of recovery for municipalities, businesses, and individuals through the products it chooses to offer, the premiums it charges, and the process it creates for filing a claim and receiving payment. There is considerable variability within the insurance sector, with different companies offering different services. According to a recent study of disaster financing in Canada, the insurance industry pays the largest share of recovery expenditures compared to governments (the study did not look at out-of-pocket expenses for individuals and businesses) (Davies, 2020).

Deliver recovery programs and services

High interest | Medium-high influence



This section includes the stakeholders that deliver recovery programs and services on the ground to the communities affected by a disaster. These stakeholders have high interest because of their direct work with communities and have medium-high influence by establishing recovery programs and services and determining who can receive assistance.

Municipal governments. Municipalities develop recovery strategies and coordinate the many stakeholders and activities involved in recovery. They rebuild infrastructure such as water, sewer, and roads; control access to affected areas through road closures; deliver essential services such as waste pickup and debris removal; and control zoning decisions and issue permits for reconstruction. Local authorities also deliver emergency social services to meet the basic needs of displaced populations and can facilitate support to impacted communities through physical or virtual recovery centres where people can access all kinds of recovery services, including insurance, disaster assistance, charitable

support, mental health, financial counselling, etc.


Developers. Real estate developers have a high interest in recovery because of their role in reconstruction, especially in communities suffering significant devastation. Through existing relationships with and lobbying of municipal governments, developers can play a significant role in defining the recovery vision for the built environment. Developers may also buy up properties damaged by disaster at low prices and, as memory of the hazard fades, redevelop these areas for significant profits (Haney, 2021).

Charitable organizations. Established disaster charities play an essential role delivering services to individuals affected by disasters, and can help meet basic needs, connect individuals to other services, and offer various services and supports. Many of these organizations have pre-existing relationships with all orders of government and can exert influence through lobbying and advocacy for their clients.

Contractors. Construction contractors and trades interface directly with affected individuals and businesses and rebuild damaged structures.

Benefit from recovery

High interest | Medium-low influence



This section includes stakeholders who financially benefit from recovery.

Contractors. While they deliver recovery services, construction contractors and trades also benefit from the huge spike in demand for services following recovery. Although local contractors can face competition from outside firms converging on disaster-affected communities, in general they benefit from recovery. Supply chain constraints and rising costs for supplies due to high demand can cut into contractor profits.

Charitable organizations. Like contractors, charitable organizations deliver recovery services but also benefit financially when they receive substantial government funding and private donations to provide services and support to affected populations.

Fully insured individuals. Individuals with full insurance may profit from disasters as they replace lost and damaged household items, appliances, and vehicles with newer models and upgrade damaged homes.

Worse off from recovery

High interest | Low influence



This section includes stakeholders who usually end up worse off after a disaster and may take years to fully recover, if ever they ever do.

Community organizations. Community organizations often operate with small financial margins and are highly vulnerable to disasters, which can divert government funding and private donations to recovery efforts. Where community organizations do not offer recovery-related services, they may be forced to pivot their programming to initiatives related to recovery to try to secure some funding or face significant financial shortfalls.

Small businesses. While some small businesses may profit from recovery, many struggle to overcome the loss of inventory and customers and to repair damage to their facilities. Even when small businesses can continue to operate, they may face staffing shortages as employees take time off to deal with the personal impacts of the disaster (e.g., repairing homes, mental health challenges, childcare, etc.).

Under- or uninsured individuals. Individuals without adequate insurance, or without insurance at all, face significant challenges overcoming the impacts of a disaster. They may be unable to pay for repairs or to replace lost or damaged belongings, or may be forced to take on significant debt to restore their homes.



Risk and reward

System levels: Causes, worldview, metaphor

Because disasters happen infrequently, many stakeholders in the system minimize consideration of disaster risk in their routine decision-making or assume it will not happen to them. The more local the scale, the more this holds true: a municipality may only experience a disaster once a generation, while a province may deal with a disaster every four or five years. The terminology used to quantify disaster impacts through probabilistic return periods (e.g., a 1-in-100-year storm) contributes to this decision-making bias.

The pervasiveness of the roll-of-the-dice attitude arises from well-known cognitive shortcomings in humans (and therefore in human institutions): we are bad at understanding probability and even worse at incorporating it into decision-making (Kahneman, 2011; Klein et al., 2019; Roberts & Wernstedt, 2019).

Our perception of risk is coloured by both optimism and expectation: we judge the probability of desired outcomes unreasonably high (Comes, 2016; Kahneman, 2011). In the short-term, this gamble usually pays off. Short-term thinking also aligns well with the four-year election cycle that governs political priorities and spending.

This section considers the risk/reward calculation of key stakeholders before a disaster.

Uninsured individuals and small businesses

Individuals and small businesses without insurance (or without adequate insurance) take the biggest risk in the system because they stand to lose everything should a disaster strike, and will be forced to rely on government assistance, which is only available for uninsurable events, and charitable support. They gain savings in the pre-disaster scenario by not paying insurance premiums and not implementing property-level mitigation measures.

Governments

Governments do not share financial liabilities for disaster recovery equally. A sliding scale based on per capita cost determines the proportion of the disaster covered by the federal government (see Table 4).

Table 4: 2022 Disaster Financial Assistance Arrangements cost-share formula (Public Safety Canada, 2022).

Eligible provincial expenses (per capita)	Federal share (%)	Provincial thresholds for DFAA, low to high (sample)
First \$3.38	0	Prince Edward Island: \$560,000
Next \$6.78	50	Manitoba: \$4.7 million
Next \$6.78	75	British Columbia: \$17.7 million
Remainder	90	Quebec: \$29.2 million Ontario: \$50.4 million

Federal government. While the federal government pays the greatest share of eligible disaster costs in absolute terms, it also has the greatest fiscal capacity, revenue sources, tax base, and borrowing power, and therefore can absorb disaster losses more readily. Its gains in the

pre-disaster scenario come from the deferred costs of not investing more in mitigation, disaster risk reduction, emergency management, or infrastructure.⁷

Provincial government. Provinces hold much of the financial liability for disasters because they provide funding to municipalities long before they receive federal reimbursement. Audit requirements and bureaucratic processes mean federal repayments can take years and may involve disagreements about eligibility. According to the DFAA Guidelines, ultimate eligibility is determined at the final federal audit of the DFAA claim, long after the money has been spent (Public Safety Canada, 2007). Provincial gains in the system come from property taxes (Kitchen et al., 2019), licensing and royalties of resource development projects (that may contribute to disaster risk), and the deferred cost of not investing more in mitigation, disaster risk reduction, emergency management capabilities, or infrastructure upgrades.

Municipal governments. Under provincial disaster financial assistance programs, municipalities pay only a small portion of *eligible* disaster costs (from 0-20% of eligible costs depending on the jurisdiction), which is different from *total* disaster costs; total costs vary based on the situation⁸, making municipal losses difficult to quantify. They also own and operate approximately 60% of public infrastructure (Federation of Canadian Municipalities, n.d.), a growing liability as many of these aging assets were constructed under different environmental conditions and are approaching (or have exceeded) end-of-life. Municipal pre-disaster gains come from fees and property taxes for developments in hazardous areas, deferred capital costs to upgrade infrastructure, and deferred costs from not investing more in disaster risk reduction or emergency management.

Insurance

The insurance business model takes advantage of the low probability and localized impacts of disasters across a broad risk pool, providing them the greatest gains pre-disaster. While insurance losses from disasters have risen dramatically (Warren & Lulham, 2021), the industry has also taken steps to mitigate its losses by

raising premiums, denying coverage in high-risk areas, and leveraging the international reinsurance and catastrophic bond markets.

Insured individuals

Contrary to the other actors in the system, fully insured individuals actually lose in the pre-disaster scenario through payment of insurance premiums as a means to lower their disaster risk. This pays off in a disaster when they often come out financially ahead by replacing damaged assets with newer models (Ewert, 2021).

Large financial institutions

Financial institutions limit their financial exposure to disasters. For real estate lending, banks require proof of insurance to various hazards and are the first to be paid out by insurance companies on outstanding loans and mortgages. Mortgage holders are also required to rebuild structures of “like kind and quality” so banks do not lose the value of their security.

Developers

Developers have minimal risk in the system because they have few, if any, financial liabilities in a disaster. They profit from developments in the pre-disaster scenario and can play a substantial role in reconstruction where disasters cause widespread damage.

Who benefits from the status quo?

The stakeholders with the most power over the system – governments, insurance, and developers – derive significant economic gains in the pre-disaster scenario through profits, revenue generation, fees, and most importantly for government, deferred investment. The rising cost and frequency of disasters may begin to change this calculation, especially for jurisdictions suffering from recurrent disaster losses, but deep systemic change is needed to shift the economic gains and losses for key stakeholders.

7 The International Institute for Sustainable Development estimates Canada’s infrastructure deficit is \$150 billion to \$1 trillion based on climate projections, population growth projections, and existing infrastructure lifespan (IISD, 2021)

8 No entity or dataset in Canada reliably tracks total disaster losses. In the United States, overall losses from extreme weather events are double insured losses; if this trend holds true in Canada, the costs to individuals and municipalities are likely much higher than is generally considered (Warren & Lulham, 2021, p. 365).

Leverage points

This stakeholder analysis reveals the following barriers and opportunities to incorporate more systemic risk reduction during recovery:

Barriers

- Humans are challenged by probabilistic decision-making, yet information about disaster risk is often communicated in probabilistic terms (e.g., 1-in-100 year flood).
- In the short term, risky decisions often pay off and therefore reward political leaders and institutions prioritizing short-term investments. Deferring mitigation investments and infrastructure upgrades saves money in the short term at the expense of increasing disaster risk.
- Spending money on mitigation and long-term investments often costs political capital (Bogdan, 2020b).

Opportunities

- Many of the most powerful stakeholders in the system have a vested interest in reducing disaster risks, with growing alignment between the interests of governments, individuals, and industry.
- Given the potential losses they face, greater awareness for individuals and small businesses of what they stand to lose could motivate more protective actions.
- Stronger integration of disaster risk assessments into the rules governing land zoning, development, building materials, design, and construction could reduce the ability of decision-makers to make judgment calls or issue exceptions for individual projects where the incentives powerfully favour short-term risk-taking.

System dynamics: Behaviour patterns

Although policy language has begun to emphasize the importance of forward-looking disaster recovery, the outcomes of recovery have not substantively changed over the decades. Risk reduction measures, such as the FireSmart program⁹ or expanding green spaces to

9 FireSmart is a public awareness and risk reduction program for wildland urban interface fires.
10 The anchoring bias refers to the cognitive process where we interpret newer information from the reference point of our anchor (Kahneman, 2011). It fundamentally shifts our perspective.

make room for rivers, remain celebrated anomalies instead of normal practice. Why, when there seems to be a collective desire for change, do we keep getting the same results?

System archetypes are diagnostic tools for identifying and describing why the same patterns of behaviour repeat over time (Braun, 2002). Archetypes provide insights into underlying system dynamics through simplified models of complex realities. Although they cannot account for all the relevant variables, they reveal dynamic forces in the system that may be working counter to preferred policy outcomes. This section examines the archetypes at play in some of the most intransigent challenges of municipal disaster recovery.



From its earliest days, emergency management in Canada has suffered chronic underinvestment punctuated by short windows of growth in reaction to a disaster or threat (see Chapter 3). As a result of this investment paradigm, emergency management organizations must scale up quickly during a crisis, with the demands of the response anchoring¹⁰ the core competencies and performance goals of the organization.

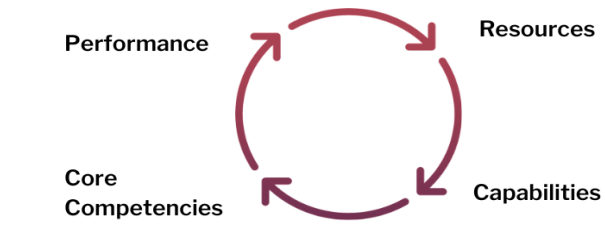


Figure 14: The performance cycle, adapted from Braun, 2002. Emergency management organizations (EMOs) kickstart performance during a crisis by hiring or deploying experienced response personnel, relying on response competencies to address recovery too. This dynamic appears most prominently at the provincial level, where EMOs are more likely to lead recovery efforts. At the municipal level, EMOs may not lead recovery because they are still involved in response. However, the response anchor of emergency management appears at all levels of government.

This means emergency management organizations tend to have staff with response backgrounds and expertise, which shapes how they perceive problems. Recovery requires skills in community development, collaboration, futures thinking, sustainability, and risk reduction, which are fundamentally different from response competencies.

This pattern is characteristic of the *Attractiveness Principle*, in which organizations must choose which capacities to invest in to meet performance goals and therefore underinvest in other areas. The strategy pays off in the short term, but over time results in declining competency across the spectrum of emergency management. As the causal loop diagram in Figure 15 demonstrates, response competencies take precedence over recovery competencies to meet urgent demands.

Not only does this define the skills of the people hired, it also shapes how organizations perceive the problems of a disaster. Response uses a highly structured and reductionist approach to problem-solving: identify a problem, find a strategy to solve the immediate consequences, assign specific resources, and then move onto the next problem.¹¹ This approach can be characterized as sense-categorize-respond (Snowden & Boone, 2007), where issues are identified (flood waters threaten life), categorized (move people out of harm’s way), and responded to using standard operating procedures (implement the evacuation plan). Applying such methods to recovery significantly narrows perception by looking at communities as individual problems (broken bridges, damaged water pipes, flooded houses) rather than an integrated whole.

11 Within the Incident Command System this linear problem-solving approach is called “PPOST”: Priorities (within this context, priorities are life safety, incident stabilization, and the protection of property and environment), problems, objectives, strategies, tactics.

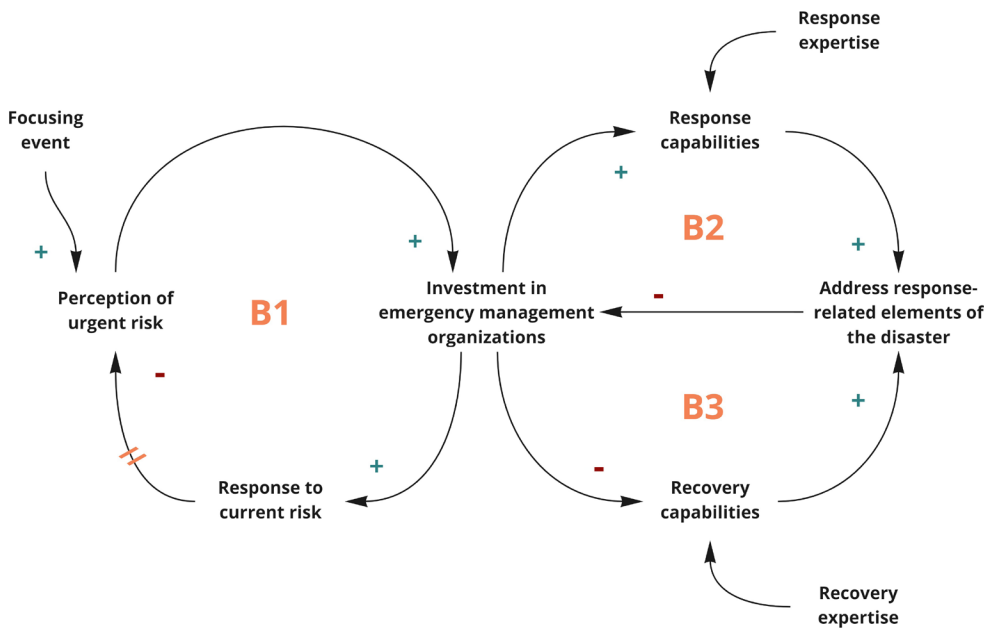


Figure 15: The Attractiveness Principle system archetype depicts how organizations must choose which capacities to invest in with limited funds.

Consequences of this dynamic

- Emergency management organizations are built around response competencies and have optimized their processes for response, which means a focus on standardization and interoperability, predictability, safety, and efficiency. The recovery environment is characterized by diverging priorities, emergent community actors, and requirements for long-term investments and solutions to underlying sources of vulnerability. These conditions do not integrate well into response-oriented processes even if the efficiencies introduced through consistency across phases ease the administrative burdens on government bureaucracies (for example, the recovery processes in the BC Interim Recovery Framework mirror those for response).
- Having response as the anchor for emergency management limits our perception of problems and constrains our ability to imagine potential solutions, because we interpret new information from the reference point of response.



From the earliest days of emergency management in Canada, senior levels of government have sought to limit their financial liabilities to disaster loss while offering a basic social safety net for individuals and municipalities overwhelmed by a disaster (Bumsted, 1987; Robinson & Cruikshank, 2006). In the face of rising economic losses, recent policy changes have signalled an increasing privatization of risk, shifting the burden of financial liabilities to individuals and businesses. Following the 2013 floods in Alberta, the federal government worked with the insurance industry to bring residential overland flood insurance to the Canadian market (Davies, 2020). Floods represent the greatest draw on disaster financial assistance, at 78% of total DFAA payouts from 1970-2014, (PBO, 2016, p. 19), so the existence of residential insurance allows governments to retreat from this space as many floods would no longer qualify as an uninsurable disaster.¹²

This pattern of behaviour characterizes the tension between treating the symptom of a problem – often more cheaply and efficiently – and addressing the underlying cause (Braun, 2002). The *Shifting the Burden* archetype demonstrates how short-term solutions come at the expense of long-term sustainability. In this case, governments are shifting the financial burden of recovery onto individuals and businesses to curb their losses while underinvesting in the much more difficult task of mitigation. The fundamental solution – disaster risk reduction – requires substantial up-front investment in time, resources, and capital, and does not offer much political payoff. Thus, governments have focused on the symptomatic solution of reducing their liabilities and holding individuals responsible for their own risk (Booth & Tranter, 2018).

In addition, the federal government has raised the financial threshold for reimbursement, several provinces have added restrictions to how many times a property can qualify for disaster assistance, and all provinces

52 Resilient Recovery: A systems analysis

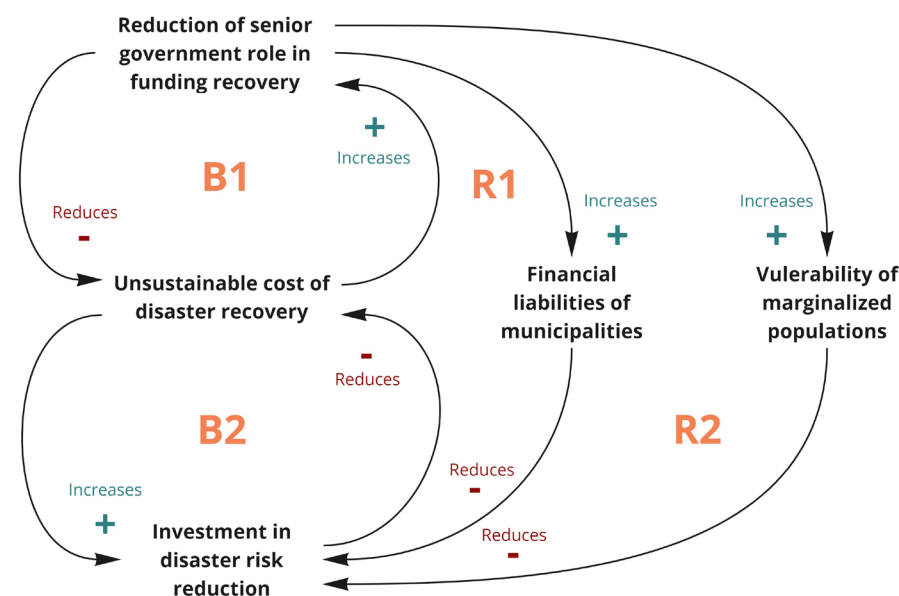


Figure 16: Shifting the Burden archetype where short-term solutions come at the expense of addressing the underlying problem and cause the problem to return.

- This approach provides short-term gains at the expense of long-term pain for governments and individuals.
- Public, media, and political pressure in the aftermath of a disaster may force governments to pay for recovery despite these policy changes, defeating the purpose of privatizing risk.
- Privatizing risk increases the vulnerability of already-marginalized populations, who may of fiscal or social necessity live in disaster-prone areas or more vulnerable structures.



Because of the complex nature of disaster risk and its interconnection to economic systems and market forces, social policy, and politics, some policy actions to reduce the risk to future disasters inadvertently heighten vulnerability, creating policy paradoxes.

Moral hazard. A moral hazard arises from the economic incentives of one actor to increase their exposure

to risk because they are not responsible for the full cost of doing so. In the context of disaster risk, the existence of the disaster financial assistance program as an economic backstop for recovery reduces the incentive for some actors to invest in risk reduction. For individuals, disaster assistance serves as a deterrent to purchasing insurance (Davies, 2020; Thistlethwaite, 2020). For developers, absent any bylaws restricting all development in hazardous areas, it is irrational not to pursue projects that fetch the highest prices (even in hazardous areas) because they have no responsibility or liability once the development is complete (Bogdan, 2019). For municipalities and provinces, disaster assistance can replace insurance for their assets and means they do not pay the full cost of liabilities for approving developments and building infrastructure in high-risk areas (Thistlethwaite & Henstra, 2017).

Levee effect. The levee effect refers to the phenomenon where the presence of mitigation measures (a dike or levee, a sea wall, etc.) reduces the perception of risk and can increase development in areas subject to known hazards (Bogdan et al., 2020b). It also limits the motivation to invest in property-level measures or purchase insurance because the area is “protected”. Unfortunately, while mitigation measures reduce the

impact of hazards based on their design standards, they do not eliminate the risk and require ongoing maintenance and monitoring. The “one and done” approach to hazard mitigation fails to recognize the dynamic and evolving nature of risk.

The existence of these policy paradoxes can have an eroding effect on the relationships between key actors in the recovery ecosystem. Figure 17 demonstrates the behavioural pattern known as *Accidental Adversaries*, in which two stakeholders work together to accomplish a set of goals by leveraging their respective strengths until the actions of one party unintentionally harms

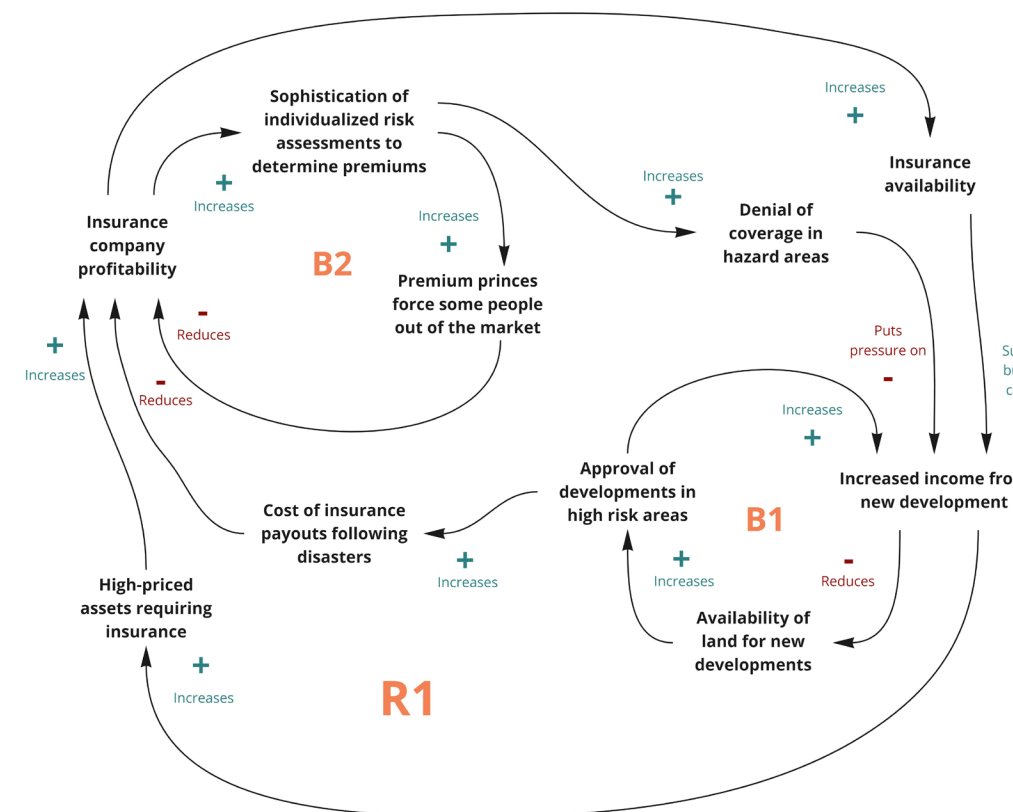


Figure 17: Accidental Adversaries archetype showing how municipalities and insurance share many goals but developments in high-risk areas puts them into an adversarial relationship.

the other, resulting in an adversarial relationship.

The relationship between local governments and insurance industries works well until a disaster strikes. Land use planning decisions that encourage new and higher priced developments increase the income for both municipalities, through development fees and property taxes, and insurance companies, through higher premiums for more expensive assets, but cost the insurance industry dearly following a disaster. With climate change altering the risk landscape and economic development increasing the costs for insurance companies, the dynamics have begun to change.

Insurance companies have invested heavily in sophisticated risk modelling that can provide individualized risk assessments as the basis for determining premiums. To cover costs, insurance companies raise premiums in hazardous areas or may choose not to offer coverage at all. Meanwhile, municipal governments often derive higher income from new or re-development in hazardous areas (or may have no other land available for development to meet the demands of growing populations), but face growing pressure from the insurance industry to limit such developments.

This dynamic leads to situations such as the 2020 flooding in Fort McMurray, Alberta, where many homes and an \$80-million condominium were ineligible for flood insurance because they were built in a designated flood plain (Bodgan et al., 2020b). Without insurance, governments and citizens bear the brunt of recovery costs, and senior levels of government are actively working to reduce their responsibility to fund recurring disaster payouts. As a result of this and other disasters, the province of Alberta changed its disaster funding regulations in 2021 to limit disaster payouts to one-time assistance per property and to require municipalities to cover at least 10% of eligible disaster costs (Government of Alberta, 2021). The shifting of liabilities creates an environment of accidental adversaries instead of collaborative partners.

Consequences of this dynamic

- This situation creates dangerous financial liabilities for municipalities, which have the least fiscal and resource capacity of all levels of government to pay the costs of recovery. Many municipalities have a historical legacy of existing development in high-risk areas, even if they have since updated land use policies to reduce risk.

- The information asymmetry between insurance companies and municipalities means each party makes decisions based on different data, which can cause confusion and frustration for individuals and businesses who are often surprised to find they cannot qualify for insurance.



Dynamic 4: Disasters increase inequality

System levels: Causes, worldview

The pattern of growing inequality following disasters has attracted attention from disaster scholars (see Howell & Elliot, 2019; Weber, 2017). Several factors contribute to this phenomenon. Disasters accelerate the process of gentrification as older buildings are destroyed and replaced with new designs geared to higher income populations (Stone, 2021). Social and low-income housing, often disproportionately affected by disasters because it tends to be located in more hazardous areas and built to lower or obsolete code standards, is not protected by reconstruction processes. Even if dedicated affordable housing is rebuilt, rents increase because the building and furnishings are new (Van Zandt, 2022). Neoliberalist and pro-growth opportunism may also co-opt recovery processes to accelerate deregulation and privatization, a process author Naomi Klein famously dubbed “disaster capitalism” (2007).

Capitalist market forces and pro-growth political forces are not the only contributors to the diverging wealth gap post-disaster. The preferred financing mechanism of recovery, insurance, privileges wealthy homeowners over other populations. This follows a *Success to the Successful* system archetype where successful people, who can afford full insurance, receive a greater share of resources after a disaster, which enables them to continue to succeed and secure even more resources.

For fully-insured homeowners, disasters can increase their wealth, a phenomenon sometimes called the “jacuzzi effect” to describe how people upgrade their homes, appliances, and belongings after a disaster, thus increasing their equity (see Ewert, 2021; Mutter, 2010; Pais & Elliot, 2008). Full insurance has social and psychological benefits as well, providing greater financial freedom, less stress, and a sense that the disaster has caused “a temporary setback ultimately leading to a brighter future” (Ewert, 2021, p. 29). It also confers social status, where people with full insurance are cast as responsible, upright members of society,

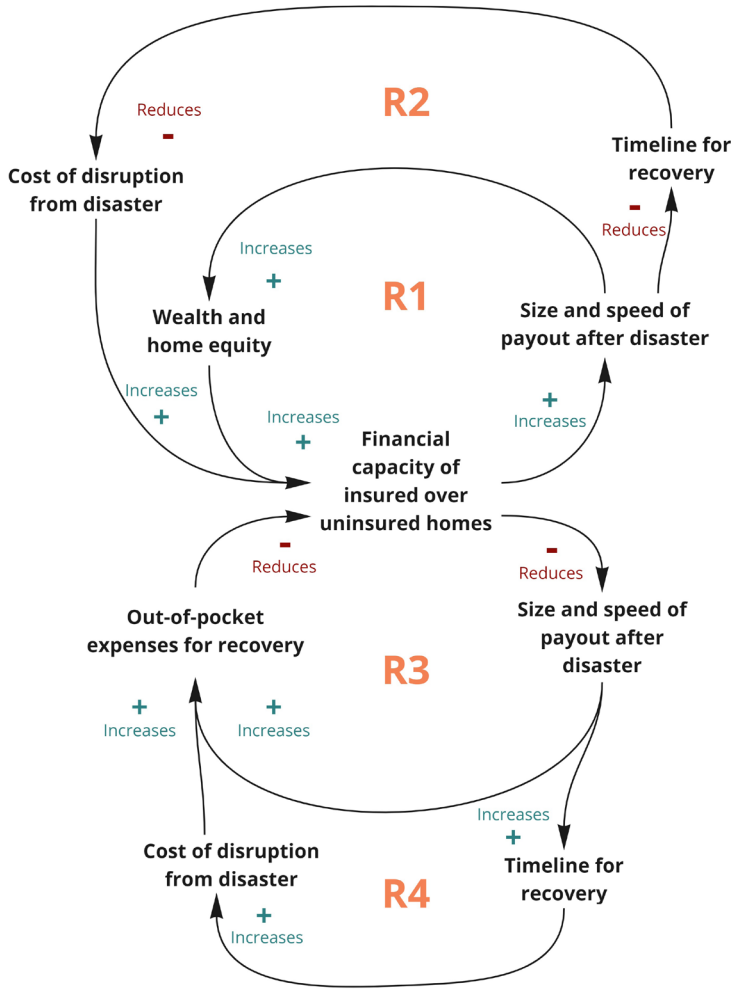


Figure 18: The *Success to the Successful* archetype describes the pattern in which successful people gain a greater share of resources, improving the likelihood of additional successes.

while people without are stigmatized as irresponsible or possibly even “negligent” with their finances and a drain on government and community resources (Ewert, 2021, p. 33). The benefits of all these successes – financial, psychological, social – enable the successful to recover faster and be better positioned for the next crisis.

Meanwhile, people who are under-insured or uninsured – which includes almost half (49%) of the more than 4 million renters in Canada (DiSabatino, 2022; Insurance Canada, 2018) – often struggle to recover from the financial setback of a disaster and suffer much more stress and anxiety as a result of financial uncertainty and the challenges of navigating complex government aid programs (Ewert, 2021). This depletes their resources and may leave them more vulnerable to future disasters.

Although the decision to purchase insurance may be

framed as a personal and civic responsibility – and sometimes even a moral one (Ewert, 2021) – interview participants in this study highlighted significant socio-economic discrepancies in who does and does not have insurance. Individuals who do not speak an official language, are newcomers to Canada, have less bureaucratic and financial literacy, have insecure or unaffordable housing situations, live in high-risk areas, and/or have less disposable income are all more likely to have insufficient insurance coverage. A recent study on underinsurance in Australia confirms these trends, finding that “underinsurance is (re)produced along socio-economic and geographical lines” (Booth & Tranter, 2018, p. 3145). The *Success to the Successful* archetype increases the vulnerability of many members of society and has broad consequences for the social and economic recovery of communities.

Consequences of this dynamic

- Disasters accelerate economic inequality and can wipe out affordable housing (Van Zandt, 2022).
- Community social fabric erodes through the stigmatization of those without insurance and growing inequalities.
- As insurance becomes more expensive, there is greater stratification in recovery outcomes based on pre-disaster socio-economic status.
- Inequality puts pressure on democratic governance through social unrest and the increasing polarization of society.



Dynamic 5: Concentrated expertise

System levels: Causes, worldview

The awarding of contracts during the early phases of recovery may also follow the *Success to the Successful* archetype. As governments seek to rapidly scale up services and capacity, they may hire larger organizations with the capacity and expertise to handle substantial pieces of work or turn to organizations they have worked with previously, even if this means hiring from outside the impacted community (Handmer & Hillman, 2004). This archetype affects smaller communities and rural areas in particular, as they may not have sufficient capacity in their business and social profit sectors to handle all the demands of recovery.

Consequences of this dynamic

- Successful organizations become go-to contractors in a disaster, regardless of the existing capacity within communities. Local organizations may lose customers, contracts, and resources, and end up worse off because their role has been supplanted by external organizations.
- Large contracts for external organizations reduce the resources available to build local capacity and invest recovery dollars back into the community (AIDR, 2018).
- Although contracts may be awarded quickly, it does not necessarily expedite recovery processes because external firms must build up capacity in local communities (finding office spaces, housing for temporary workers, etc.), competing with local organizations and people for limited resources.

Leverage points

This assessment of system patterns of behaviour reveals the following barriers and opportunities to incorporate more systemic risk reduction during recovery:

Barriers

- Underinvestment in disaster risk reduction exacerbates socio-economic inequality especially as governments increasingly privatize risk.
- The information asymmetry between insurance companies and municipalities results in different perceptions of risk.
- Anchoring emergency management in response continues to define the profession and results in a myopic focus on improving response capabilities rather than building capacity across all phases of emergency management.

Opportunities

- Expand access to insurance and invest in financial literacy to help more people recover more quickly after a disaster.
- Protect the existing stock of affordable housing and subsidize its reconstruction to preserve shelter capacity for lower-income households.
- Establish processes to involve local organizations and build capacity in communities to mitigate the accidental competition between external firms and local organizations and to funnel economic benefits back into the community.

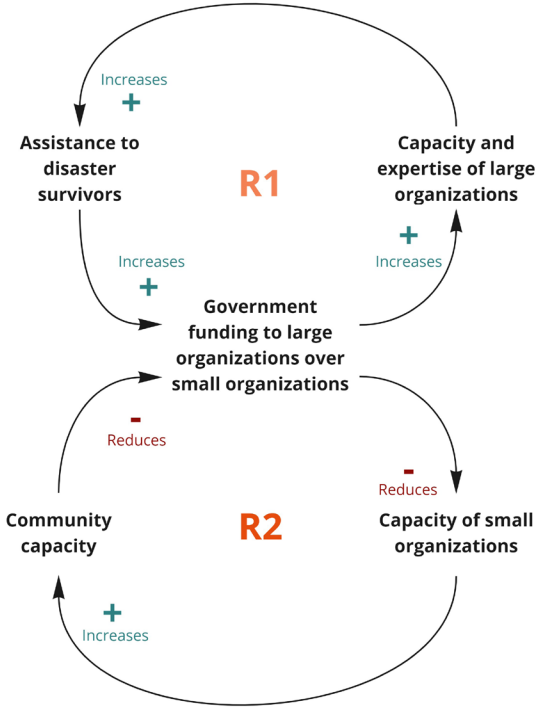


Figure 19: The Success to the Successful archetype shows how large organizations are more successful at securing government contracts, increasing their capacity and expertise and the likelihood they will be successful again in the future.

System dynamics: Underlying forces



Dynamic 6: Static built environment

System levels: Causes

Land-use planning decisions made decades ago substantially shape the risk profiles of municipalities today. The average Canadian building has a 50-60 year lifespan and infrastructure is typically designed to last 70 years or longer (Canada Senate, 2018). Because of these time horizons, urban development tends to happen through a piecemeal and opportunistic approach rather than according to a master design (McDonald, 2004). Like the slow rate of housing turnover in gentrifying neighbourhoods one house at a time, municipalities make incremental and opportunistic improvements to infrastructure and buildings through zoning and bylaws. Accelerating this process through

More than 60% of the projected building stock Canada will have in 2050 already exists.

– Senate Report, 2018

major structural mitigation projects or relocation programs requires enormous capital funding and even greater political will.

Disasters do not wipe the built environment clean; on the contrary, much of the urban form resists change even after a disaster. While disasters can accelerate existing urban plans that already have political and social buy-in, the opportunities to reinvent a city are limited (McDonald, 2004).

Consequences of this dynamic

- The urban built environment does not evolve as quickly as the environment and risk contexts are changing around it.
- Historical decisions and the “locked in” effect of the built environment have created significant financial liabilities for municipalities today and may limit options for relocation-based disaster risk reduction (e.g., the entirety of downtown Calgary or Fort McMurray cannot feasibly relocate off a flood plain nor can Vancouver or Montreal move away from fault lines contributing to seismic risk).



Dynamic 7: Reductionist framing

System levels: Worldview

Reductionism is an epistemological legacy of the Enlightenment quest to identify predictable laws of the natural world and has had a profound impact on Western worldviews. It posits that a complex system can be reduced to and understood through the examination of its component parts. Foundational in our education system, reductionism teaches us to analyze a problem by breaking it into smaller pieces and finding linear solutions to each part (Acaroglu, 2018). The approach works well for simple and complicated systems¹³ with predictable relationships between cause and effect but falls short for complex systems.

Complex systems exhibit emergent properties in which the interaction of component parts changes their behaviours and properties. As a result, if we try to tackle a problem by only looking at the parts, we miss the emergent characteristics. As described in Chapter 1, disaster risk is the complex dynamic at the intersection of hazard, exposure, and vulnerability, where the evolving relationships between all three factors change the

¹³ According to Snowden and Boone, simple and complicated systems have knowable relationships between cause and effect, unlike complex and chaotic systems which do not (2007).

nature and characteristics of risk (Riddell et al., 2020).

Reductionism characterizes our current approach to disaster recovery in Canada. We break recovery down into its component pieces: physical, infrastructure, economic, environmental, social, etc. and attempt to quantify loss in economic terms. This aligns well with how we organize bureaucracies and thus enables greater efficiency for recovery processes. However, at the strategic level, it can limit the ability of decision-makers to see communities in a holistic sense. Communities are not just a collection of functioning streets, bridges, and traffic lights, just as people are more than the sum of their physical and mental health, the livability of their homes, and their ability to work. When we address factors in isolation, we miss critical relationships within the complex system. For example, research has shown strong links between the availability of post-disaster affordable housing and economic recovery, especially in the service sector (Xiao & Van Zandt, 2012; Van Zandt, 2022). In a reductionist approach, separate teams oversee housing recovery and economic recovery, overlooking this critical linkage and slowing overall community recovery.

Consequences of this dynamic

- A reductionist approach can increase anxiety and trauma for individuals suffering from loss. Many disaster survivors describe the insurance claim process as the most stressful part of a disaster, not the evacuation or displacement (Ewert, 2021), because it cannot account for the sentimental value we attach to our belongings. This strictly rational approach clashes with the emotional and sometimes physical manifestations of grief we experience after a loss.
- Reductionism reinforces the emphasis of rationality in decision-making, despite the substantial body of behavioural economics research proving that humans are “predictably irrational” (Ariely, 2008). Recovery processes assume individuals and institutions will make rational decisions rather than adapting to the known and predictable ways humans behave, especially under stress and when dealing with loss.
- Many important dimensions of recovery fall under the mandates of senior governments,

such as healthcare and childcare (provincial) and mail services and social security (federal). Treating these issues in isolation or solely along jurisdictional lines can significantly disrupt or delay community recovery. One interview participant reiterated how the *whole of society* is required to support the *whole of recovery*. Reductionist approaches can hamper holistic efforts.

- Focusing on quantifiable damage and loss results in an emphasis on tangible recovery and the repair of property rather than a holistic view of recovery.



Dynamic 8: Property as a vehicle for economic wealth

System levels: Causes, worldview

Although the complex domains of housing, real estate markets, and affordability are outside the scope of this paper, an analysis of disaster recovery cannot overlook the importance of property to economic measures of individual and national wealth. As a sector, real estate is the biggest contributor to Canada's gross domestic product (Statista, 2021) and a significant driver of economic growth. Consequently, recovery efforts prioritize the repair and restoration of property.

Property constitutes the most expensive component of recovery and acts as a proxy for overall progress towards recovery because it is visible, valuable, and politically manageable (Handmer & Hillman, 2004). As such, property, especially housing, becomes the platform through which actors in the system articulate their visions for recovery: housing as a human right, housing as a vehicle for wealth accumulation and economic exchange, housing as an expression of community, or another alternative (Paidakaki & Moulaert, 2018).

Consequences of this dynamic

- Due to its importance across economic and wealth indicators, property is a central consideration in recovery. Visions for recovery nucleate around the role and replacement of property.
- The rapid restoration of property can create a façade of more holistic recovery. When seen as an indicator of progress, property restoration can be the trigger for winding down recovery support programs despite ongoing community, economic, and mental health needs. When there are no more startling images of damage to property to focus media and public attention, political priorities

can shift to other issues and prematurely declare recovery “complete”. Substantial academic research has shown many recovery programs end too soon (see Rouhanizadeh et al., 2020)



Dynamic 9: Legitimate victimhood

System levels: Litany, causes, worldview, metaphor

Within the dominant market-driven neoliberal system founded upon the primacy of self-determination and freedom of choice, the concept of individualism implies a degree of personal accountability. This worldview overlooks the role of privilege and structural inequalities yet is deeply pervasive in our cultural norms and values, and as such has been internalized by our institutions (Blake et al., 2017). Assumptions about personal accountability define our ideas of “legitimate” victimhood in disasters and these notions of deservedness form the bedrock of recovery programs and assistance.

For example, only “uninsurable” events qualify for disaster financial assistance. Individuals are expected to purchase insurance as a responsibility for owning or renting a home. From an institutional perspective, individuals without insurance *choose* to “self-insure”, exercising their freedom of choice, but consequently are ineligible for taxpayer-funded assistance. The notion of self-insurance also affects access to charitable support because tax laws in Canada limit how charitable donations can be used to generate individual wealth.

Because institutions are made up of people, the demographic composition of government workforces shapes how policies envision legitimate victimhood. If policymakers have never had to choose between paying for insurance or putting food on the table, they may not consider the circumstances that might lead to someone “choosing” to “self-insure”. When most policymakers have the same socio-economic, racial, gender, educational, and cultural background, we end up with policies reflecting of a narrow set of life experiences that tend to serve the most privileged populations, thus reinforcing the structural and cultural norms at the root of many social inequalities (Blake et al., 2017). One interview participant used the metaphor of an airplane: we design policies and programs for the people we can see. When institutions are mostly made up of people with first class or business class tickets, we fail to see all the people sitting in the economy section of the plane (or who could not afford a plane ticket at all).

Consequences of this dynamic

- Recovery programs may fail to recognize systemic causes of inequality, and as a result, may exclude or penalize the most vulnerable people.
- The “sameness” of political leaders and senior policymakers, the lack of diversity in socio-economic and cultural backgrounds, results in policies designed for a narrow segment of the population (Travers, 2021).
- Differences of opinion in who is a legitimate victim can cause social fragmentation, often along economic lines because the framing of victimhood tends to align with general relationships to property: home ownership and level of insurance. This can stigmatize those who “failed” to live up to normative expectations and discourage them from seeking assistance (Ewert, 2021). The pressures and anxieties associated with stigmatization and insufficient financial resources significantly contribute to negative mental health impacts among disaster survivors (Agyapong et al., 2018).
- Social fragmentation undermines collective action, challenging the creation of a holistic vision for recovery.



Dynamic 10: In between-ness

System levels: Causes

Early recovery begins during response. While first responders and emergency operations centres personnel concentrate on trying to contain the incident, protect property, support displaced populations, and conduct early damage assessments, senior officials and policymakers start to look at what happens next. Municipal leaders attempt to secure early funding commitments from senior governments to understand the fiscal constraints that establish the initial boundaries for recovery planning. Much of this activity happens under a state of local emergency, where many regular governmental processes around permitting, procurement, access to property, etc. can be suspended or fast-tracked. However, once the danger has passed, states of emergency are repealed and municipalities must navigate the ongoing complexities, time pressure, and dynamic environment using business-as-usual

processes. In addition, segments of the population may still be displaced and unable to return to damaged or destroyed homes, requiring greater support than a municipal government is resourced to supply.

Recovery exists in an awkward “in between” stage where many of the extraordinary powers available under a state of local emergency are neither necessary nor appropriate, yet the day-to-day processes of government cannot meet the demands for rapid and collaborative decision-making, ongoing support to affected populations, and reconstruction. To address these demands, municipalities may keep emergency centres activated for extended periods or renew states of emergency to try to leverage the streamlined processes of response for recovery, which works better than business-as-usual but presents new challenges around staffing and burnout, coordination among emergent organizational structures, insecure funding, and conflicting roles and responsibilities.

Consequences of this dynamic

- Decision-makers must adapt policy tools and mechanisms to the unique conditions of disaster recovery, rather than having access to tools designed for the recovery environment (the way states of emergency are designed for response).
- Recovery-specific processes that do exist (namely disaster financial assistance) are designed to meet the needs of senior governments, particularly around financial liabilities and timeframes, audit requirements, and paper trails. When new funding programs are announced, they require new applications and duplicated paperwork.
- The funding windows for recovery programs do not align with community recovery timelines. Augmented or dedicated mental health supports, for example, tend to end within two years, just as community needs begin to spike again.¹⁴ Similarly, claims for insurance and disaster financial assistance must be filed within 6-12 months, when the full extent of damage and cost of reconstruction may not yet be known.

¹⁴ There is an initial spike of mental health needs in the first few months after a disaster, then a second wave around the 18-24 month period as people are exhausted by the processes of working with insurance, government funding, reconstruction, and ongoing disruptions to their lives.

Leverage points

This assessment of underlying system forces reveals the following barriers and opportunities to integrate more systemic risk reduction during recovery:

Barriers

- The restoration of buildings to pre-disaster conditions not only reproduces disaster risk but locks in this risk for decades due to the lifespan of built structures.
- The lack of diversity in the ranks of elected officials and senior policymakers results in policies designed to serve a narrow segment of the population and privileges certain types of needs (such as property).

Opportunities

- Adopt future-oriented design standards, materials, and building codes that consider future risks (such as climate-driven extreme precipitation) to reduce the vulnerability of the built environment to disasters as the risk landscape continues to evolve.
- Center recovery on needs and assets, leveraging community development practices, instead of damage to enable more holistic recovery planning and prioritize reducing vulnerability over restoring pre-disaster conditions.
- Adopt new measurements that place wellness on par with economic metrics to redefine “success” in the context of recovery and enable new priorities for disaster recovery processes (Travers, 2021).
- Create recovery-specific legislation that considers the unique challenges and opportunities of recovery to enable more systematic reduction of disaster risk.
- Prioritize affordable housing recovery to accelerate economic recovery and the return of businesses post-disaster (Xiao & Van Zandt, 2012).

Implications

The systems analysis in this section has revealed the current context, power dynamics, and system patterns shaping disaster recovery for municipal governments. It identified several leverage points within the system that act as barriers to or opportunities for municipal governments to integrate more holistic risk reduction measures during recovery. However, change appears to be underway as the rising costs and impacts draw more sustained political and public attention. The following chapter explores existing and emerging forces of change and how they may provide new opportunities or create additional challenges to disaster recovery in Canada.

“

Even the most educated people today operate on the assumption that society is relatively static. At best they attempt to plan by making simple straight-line projections of present-day trends. The result is unreadiness to meet the future when it arrives. In short, future shock.

- Alvin Toffler

CHAPTER 5

FORCES OF DISRUPTIVE CHANGE

Amid the rising impacts of disasters, there are growing calls to change our emergency management system from a reactive, response-ready model to a more proactive, resilience-based approach (Public Safety Canada, 2019b). This section describes some of the forces of change that will likely have a significant influence over disaster recovery in the years to come. Although broadly based on a 15-year horizon, some of these change drivers will play out over much longer periods. Data in this section comes from research interviews and a five-month horizon scan, resulting in over 200 scan hits. The scan hits were distilled into seven emerging issues with the potential to disrupt the recovery system status quo.

Each change driver and emerging issue has an iceberg icon to indicate the vertical level(s) of the system it could disrupt.



The expected future

Studies in psychology have shown how human minds are wired to imagine the future as a continuation of the present, a phenomenon known in foresight literature

as the “expected future” (Policy Horizons, 2018). Even during periods of heightened uncertainty and disruption, we have a fundamental belief that the situation will return to “normal”, that disruptive change will not be permanent (McGonigal, 2017). This default setting leaves us vulnerable to change. Strategic foresight can add significant value to policy development by broadening our perspectives about alternative futures, identifying how forces of change may challenge institutions, and exploring emerging signals of change to mitigate “future shock”.

Perception of time: In Canada and the West, time is generally conceived as a linear progression towards progress and civilization (more liberal, more open, continued economic growth and global integration), with the potential for short-term disruptions and declines along the overall trajectory (Harari, 2014; Potter, 2021). Other cultures have different perspectives: time can be conceived as cyclical, where patterns repeat throughout history and the future, or a spiral, with some linear trends and others more cyclical (Inayatullah, 2008). Understanding different perspectives and archetypal images of the future is essential to constructive dialogue about change and desired futures (Clardy, 2011).

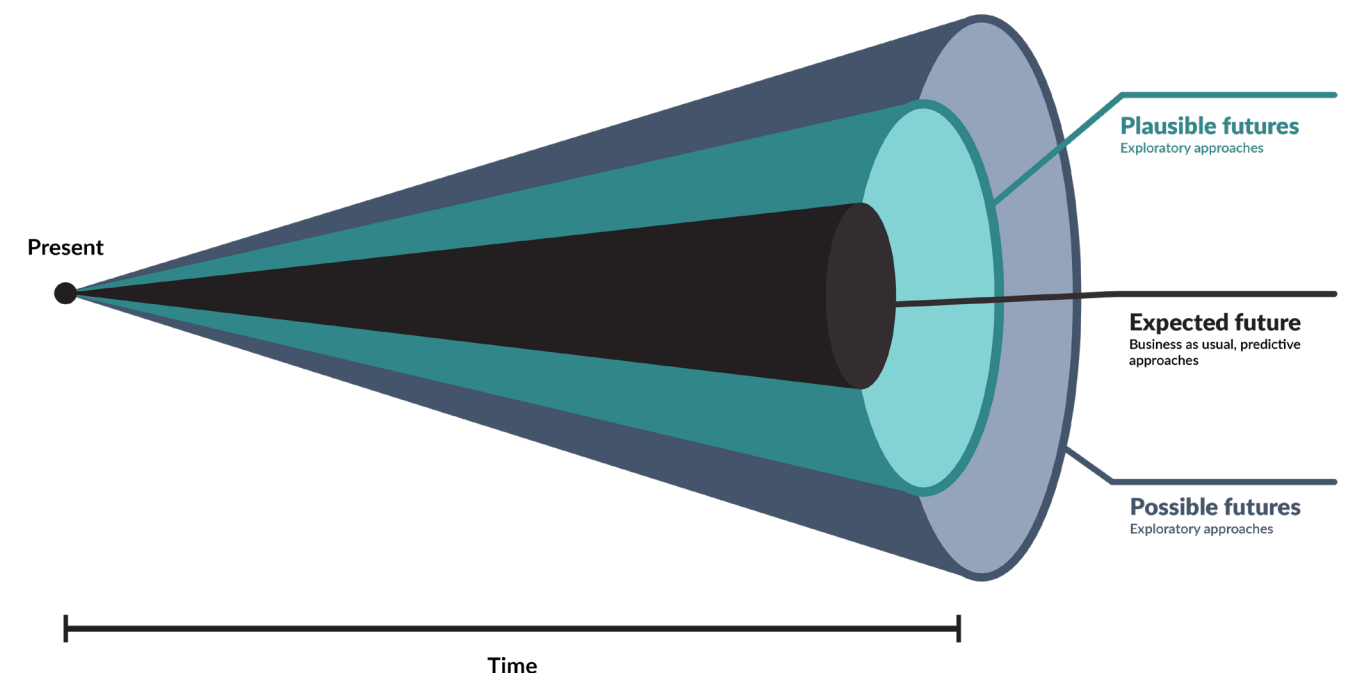


Figure 20: The futures cone showing the diverging range of alternatives from the expected future to plausible futures to possible futures. Adapted from Dorsser et al., 2018.

Drivers of change

Drivers of change are deep forces that shape change over long periods of time (KerrSmith Design, 2019). Because of their power to cause significant change and the timescale over which they play out, change drivers tend to be closely monitored by institutions, resulting in less uncertainty about their trajectories or immediate impacts. Policymakers, the media, and the public pay attention to these known stories of change, but may fail to consider the cascading impacts drivers cause over time and the surprising ways in which change drivers can interact with each other (Policy Horizons Canada, 2018).

Within the domain of disaster recovery in Canada, the following drivers of change have had, and will likely continue to exert, significant influence.



Demographic shifts

System levels: Litany, causes, worldview, metaphor

Aging population. Canada’s aging population will see more people leaving the workforce, increased demand for health care, and a greater number of people on pensions and other types of fixed income.

Urbanization. More than 80% of Canada’s population live in cities, which are growing faster than the national average (Statistics Canada, 2022). Cities concentrate high-value assets and people in small areas and are major drivers of the economy.

Immigration. Since 1999, Canada’s population growth has been driven primarily by immigration (Statistics Canada, 2018), leading to greater diversity and increasingly multicultural communities.



Climate change

System levels: Litany, causes, worldview

Warming temperatures. More extreme highs, more intense heat waves, and increasing risk for wildfires and droughts.

Shifting weather patterns. Seasonal changes increase hazard seasons for floods and fires, while shifts in precipitation can increase the risk for droughts and floods and accelerate the process of desertification.

Sea level rise. Approximately 6.5 million Canadians live along Canada’s coastlines and most face rising sea levels and increased risk of flooding and storm surges (Golnaraghi et al., 2020).

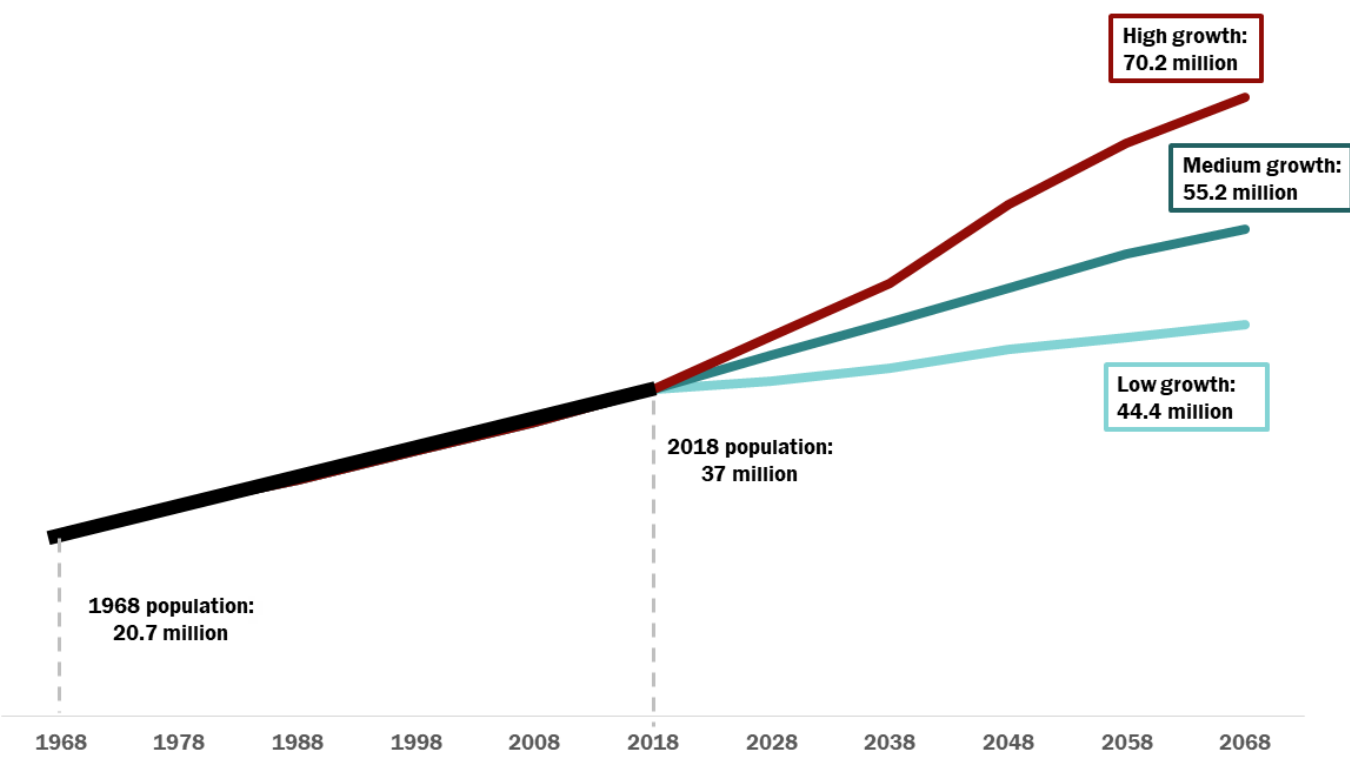


Figure 21: Population growth projection scenarios for Canada in 2068 (Statistics Canada, 2021)

Although climate modelling can track macro climate trends with some confidence, there is significant uncertainty about micro-climate impacts (Bush & Lemmen, 2019).



Automation and the digital economy

System levels: Causes, worldview

Digitization and connectivity. The growing connectivity among people, objects, and assets, along with the increasing demand for digital access and services.

Automation and predictive modelling. Automating processes and functions to increase efficiency and predictability. Employing artificial intelligence and machine learning to increasingly complex problems, greater reliance on computer-generated models for decision-making.

Data economy. Data as the most important commodity for the digital economy, with substantial economic benefit and strategic advantage to those able to harness and process vast amounts of data.



Equal rights

System levels: Litany, causes, worldview, metaphor

Reconciliation with Indigenous Peoples. The ongoing commitment to and actions towards reconciliation.

Social movements. Movements that highlight systemic experiences of discrimination, violence, and inequality, such as Black Lives Matter, Idle No More, and MeToo.

Youth movements. Growing youth disillusionment and the fight for climate justice mobilizing youth around the world.



COVID-19 pandemic

System levels: Litany, causes, worldview

Although not on the same timescale as the other change drivers in this list, the COVID-19 pandemic was orders of magnitude more disruptive and expensive than any other disaster in Canada’s history (cf. the Fort McMurray wildfire cost an estimated \$9 billion [Snowdon, 2017], while federal spending on the COVID-19 pandemic in direct aid to individuals and businesses and health-related costs such as vaccines and testing exceeded \$350 billion [International Monetary Fund, 2021]).

Because evolution in Canada’s emergency management system tends to happen in reaction to disasters, it is important to consider how the COVID-19 pandemic may drive change in this domain.

Top-down direction. Instead of a local focus, federal and provincial governments led the response to and recovery from the pandemic with minimal community input.

Rule by emergency order. Provinces enacted months-long states of emergency, a tool designed for short-term action and rarely extended beyond the emergency response phase of a disaster.

Fearful of each other. Sentiments shifted from “see you soon” to “stay safe” and the public health measures associated with lockdowns contributed to a climate of fearing other people, normally our greatest source of solidarity and hope in disasters.

Mental health. The pandemic took a toll on societal mental health but also brought an under-discussed dimension of disasters into mainstream public discourse.

Emerging issues

While the drivers of change will continue to exert substantial influence over the disaster recovery domain, several weaker signals of change were identified through the participant interviews and horizon scan. The following section describes seven emerging issues with corresponding signals of change, countertrends (where relevant), and potential implications for the system of disaster recovery.



Trend 1: The rise of the city-state

System levels: Litany, causes

The growing self-sufficiency of cities enables greater autonomy and faster action on climate adaptation.

Although cities have always played an important role in Canadian society, the scope of that role is growing. More than 80% of Canada’s population lives in urban areas, and urban populations increased faster than the national growth rate from 2016 to 2021 (Statistics Canada, 2022). Changing demographics, growing populations, and rising public expectations of government services have put pressure on municipal capacities and finance (AlMujadidi et al., 2021). The COVID-19 pandemic highlighted the essential role cities play in public health and community.

Cities are on the front lines of many societal challenges (such as climate change and affordable housing) and can be faster and more innovative to initiate change than other levels of government. While Canada is working towards its first National Adaptation Strategy for climate change, cities such as Surrey, Moncton, and North Vancouver have had strategies since 2013 (Guyadeen et al., 2019). In addition, cities are operating with greater autonomy: when the United States backed out of the Paris Climate Agreement in 2016, many American mayors committed their cities to the agreement’s principles (Muggah, 2020).

Technological change connected to the fourth industrial revolution¹⁵ may also increase the self-sufficiency of cities, accelerated by disruptions to global supply chains. Innovations in agriculture or the rise of vertical farming in Canada (Cardwell, 2021) offer new ways for cities to reduce reliance on supply chains, efforts that can be supported through social movements such as the 100-mile or climatarian diets (Wright, 2021). The development of microgrids and growing viability of satellite internet reduce reliance on transmission lines that may be vulnerable to disasters. Technological innovations, economic change, and shifting social values are accelerating the self-sufficiency of cities.

¹⁵ The fourth industrial revolution refers to the technological revolution blurring the boundaries between physical, digital, and biological systems, which may drastically alter societies. It includes the integration and growing use of technologies such as artificial intelligence, quantum computing, 3-D printing, and the internet of things (Schulze, 2019).

Table 5: Rise of the city-state

Signals	Countertrends
<ul style="list-style-type: none">• In the face of global shipping delays and uncertainty, energy giant Chevron turned to a local 3-D printing company in Australia to create the parts it needed for the maintenance of its \$54 billion Gorgon project (Condie, 2021).• Gull Bay First Nation, a community north of Thunder Bay that is not connected to a central power grid, co-developed a microgrid to reduce its diesel use, the first of its kind in Canada (Terrell, 2020).• The Arctic Institute of North America installed an off-grid hydroponic food production facility, predominantly solar-powered and adapted to sub-arctic conditions, to provide Yukon communities year-round access to fresh produce (Hyde, 2020).• Honduras has granted land on its island of Roatan to Próspera, a privately-run charter city designed as a self-sufficient technology and innovation hub (Alexander, 2021).• Architect Vicente Guallart won an international competition to design a self-sufficient city for a new development of Xiong’an, near Beijing (Herder, 2021).	<ul style="list-style-type: none">• The COVID-19 pandemic devastated Canadian municipal finances, with estimated operating shortfalls of \$12 billion in 2020 (RBC, 2020). This highlights how vulnerable municipal finances are to disruption and disaster.• Cities derive their existence from provinces, which have the power to overrule municipal decisions. When Edmonton voted to keep its COVID-19 mask bylaw in place after the province removed mask mandates, the Government of Alberta amended the Municipal Government Act to prevent municipalities from implementing their own public health measures (Bennett, 2022).

In contrast to nation-states, cities and mayors are stepping up to the global challenges of the twenty-first century. The sheer economic size, growth, and dynamism of our urban centers will be key to solving some of the world’s biggest existential challenges.

– World Economic Forum, 2020

Implications for disaster recovery

New resilience, new vulnerability. Greater self-sufficiency would provide new avenues for resilience, as communities decrease their reliance on external actors. Disconnecting from global supply chains would reduce vulnerabilities to disruptions originating elsewhere, giving municipalities more direct control over their risks. However, over-reliance on local resources and capacity could give rise to new types of vulnerability should a hazard completely overwhelm a city. This could also widen the divide between rural and urban areas or between large and small cities, as self-sufficiency may be out of reach for municipalities with smaller populations and economic capacity. The move to more self-sufficient large cities could shift the power dynamics between levels of governments and geographic regions in Canada.

The end of the ‘victim’. With less expectation of and reliance on outside assistance, citizens may increasingly turn to each other for help. The empowerment of people to contribute to their own recovery has been shown to reduce negative mental health impacts (AIDR, 2018) and can create a stronger sense of community. The collective, in-it-together ethos could elevate the community vision of what is possible for recovery and open new opportunities. However, as Rebecca Solnit observed, “Catastrophe always means social change. There is not always progress” (2009, Chapter 2). The loss of the safety net provided by outside assistance could leave some behind during recovery.

Networked recovery. In its current construct, disaster recovery is government-centric. Although many municipalities develop multi-sectoral partnerships during recovery, there is power imbalance because governments control the most important recovery levers: funding (for uninsurable loss), infrastructure repair, permitting and inspections, and zoning. More self-sufficient cities would likely have to rely on a larger network of partners, even for traditional government tasks, which would more equally distribute power in the network.



Trend 2: Ripe for a financial revolution

System levels: Litany, causes

Creative financing through technological innovation frees municipal finances from over-reliance on property taxes and senior government funding.

Municipal finances have faced increasing pressure due to growing public expectations, rising infrastructure deficits and costs for capital projects, and declines in the relative level of funding from other levels of government (AlMujadidi et al., 2021). In addition, provinces are adding more restrictions to disaster financial assistance programs, increasing the municipal share of disaster financial liabilities (see Emergency Management British Columbia, 2016; Government of Alberta, 2021). COVID-19 has exacerbated the financial situation as municipalities faced an estimated \$12 billion in revenue shortfalls (RBC Economics, 2020).

Some municipalities are leveraging improved data modelling and new platforms to shift to more fee-for-service models and access new revenue streams. Civic crowdfunding offers a way for local communities to fund initiatives important to them (eCivivs, 2012), while some fintech startups are seeking to transform the municipal bond market (Cutler, 2015), and the City of Miami created its own cryptocurrency (Majchrowicz, 2022).

At a more fundamental level, some cities are rethinking their economic structures entirely. Amsterdam has adopted “doughnut economics”, a theory developed by British economist Kate Raworth suggesting humans should aim for a sweet spot between a social foundation and an ecological ceiling rather than pursuing endless growth (Nugent, 2021).

Table 6: Ripe for financial revolution

Signals	Countertrends
<ul style="list-style-type: none">• The City of Waterloo transferred the costs of its stormwater management from property taxes to a user fee, based on runoff modelling from land use classification and property size. The new fee was accompanied by a credit program, which provided discounts for residents who reduced runoff through rain gardens or green roofs (Modak & Chapman, 2014).• Seoul, South Korea, charges usage fees for food waste through smart machines that charge by weight, encouraging residents to not waste food and to remove moisture first, thus reducing city costs for waste collection (Broom, 2019).• During the early stages of the COVID-19 pandemic, Amsterdam sought to address the lack of computer access for low-income residents. Rather than purchasing new, the city arranged to collect and refurbish old computers from those who could spare them, and then distributed 3,500 computers to people in need (Nugent, 2021).	<ul style="list-style-type: none">• The Canadian government introduced the Canada Emergency Response Benefit (CERB) early in the COVID-19 pandemic to reduce the impact of public health measures (such as lockdowns) on Canadians. This new benefit flowed money from the federal government directly to individuals (and its companion program for businesses) as part of its crisis response, rather than through layers of government (like disaster financial assistance programs for natural hazards).

Implications for disaster recovery

From top-down to bottom-up. As cities learn how to tap into their local financial markets, industrial capability, and citizen power to build infrastructure and deliver services, they may rely less on other levels of government for funding. This would radically alter the current recovery model, which is primarily defined by senior levels of government through the eligibility criteria in disaster assistance programs, and provide greater freedom for municipalities to establish their own recovery priorities.

Accelerating inequitable outcomes. If municipalities assume a greater role in funding disaster recovery, it could increase the difficulty in balancing competing priorities and managing tradeoffs. Turning to alternative funding sources could offer project-specific opportunities but would likely result in a more piecemeal approach, where wealthy communities may be more successful in crowdfunding for recovery projects in their neighbourhoods while poorer communities may see more disaster blight.

Privatizing cityscapes. The private sector offers substantial financial resources that are largely untapped by existing recovery processes, except for insurance. If municipalities cannot afford to repair all damaged infrastructure during recovery, they may sell off assets and privatize services. The broad privatization of city infrastructure and services could invite questions about whether municipal governments are necessary and lead to the creation of charter cities.



Trend 3: Diminishing resilience reserves

System levels: Litany, causes, worldview, metaphor

Compounding disasters push social and governmental capacity to the breaking point.

The growing frequency and severity of disasters has resulted in more simultaneous disasters, where communities face multiple disasters at once. In 2021, British Columbia faced a series of compounding disasters: the ongoing COVID-19 pandemic, a deadly heatwave that created the conditions for more extreme wildfires such as the one that destroyed the town of Lytton, and a series of atmospheric rivers that triggered catastrophic flooding. As hazard seasons get longer due to warming temperatures and shifting precipitation patterns (Bush & Lemmen, 2019), the risk for compounding disasters increases.

Compounding disasters challenge government capabilities in exponential ways, “more than one plus one” (Stern, 2021). For example, wildfires and pandemic require opposite responses: the former prompts evacuations and congregate housing, while the latter expects people to remain home and socially distance (Stern, 2020). Similarly, compounding disasters draw on the same pool of resources and may create new resource scarcities that do not exist in a single disaster (for example, the COVID-19 pandemic had already strained the availability of lumber, which is needed to rebuild wildfire and flood-devastated communities).

New research into post-disaster mental health has revealed troubling trends about the effects of simultaneous disasters. While some people become more resilient, “for most people, the stress compounds: surviving one crisis puts one at greater risk of having an unhealthy psychological reaction to another” (Stern, 2021, para. 4). With the near-universal experience of stress due to the COVID-19 pandemic, our collective mental health is already under strain and may increase societal vulnerability to compounding disasters. At the same time, the constant exposure to disasters is starting to have a corrosive effect on our collective capacity for empathy (Stern, 2021), which may begin to affect charitable donations and voluntary responses in support of disaster victims.

Table 7: Diminishing resilience reserves

Signals	Countertrends
<ul style="list-style-type: none">• People’s coping reserves are finite entities, and the collective stress of the pandemic has left society more vulnerable to the psychological effects of tomorrow’s earthquakes, mass shootings, and other disasters (Stern, 2021).• Research suggests empathy is declining in the West and people are becoming more selective about whom they feel is worthy of empathy (Enright, 2019).• In South Africa, scientists have discovered that for every degree the temperature goes up, there is a 1.5% increase in the number of murders. This has been linked to broader research into the connection between heat and aggression (Grovet, 2020).• Emergency management systems in Canada face chronic underfunding: the 2021 federal budget for emergency management was about \$273.8 million (about \$7 per Canadian) versus approximately US\$14.5 billion (CAD\$18.6 billion) in the United States, nearly US\$55 (CAD\$70) per American (Lindsay, 2022).• A 20-year study of people exposed to recurrent hurricanes in the Gulf of Mexico found repeated exposure has long-term mental health impacts (Sansom et al., 2022).• The 2022 US budget called for a 14% increase in the number of FEMA staff after a record number of deployments in 2021 depleted the agency’s readiness (Katz, 2021).	<ul style="list-style-type: none">• Following a terrorist attack in Manchester, England in 2017, the community experienced a strong sense of togetherness, with higher levels of social interactions across ethnic groups, a phenomenon psychologists call “post-traumatic growth” (Taylor, 2020).• The creation of a Minister of Emergency Preparedness separate from the Minister of Public Safety indicates the Government of Canada is preparing for more frequent disasters (Horwood, 2021).• There is a growing movement to combine efforts across climate change adaptation and disaster risk reduction, which could increase the resources available for both (Council of Canadian Academies, 2022).

Implications for disaster recovery

Ending the social contract. If governments lack the capacity to recover from compounding disasters, they may be forced to choose which areas receive assistance. Limited resources would likely go towards restoring critical built infrastructure and leave intangible impacts such as mental health and childcare unfunded. The corrosive effect of unaddressed mental health issues and perceptions of unequal access to support could further erode the social fabric of communities, fuelling widespread protests, polarization, and even violence.

Transforming emergency management. If compounding disasters stretch the existing top-down governance model past the breaking point, it could create opportunities for transformation. Citizen-driven, bottom-up approaches focused on hyper-localized solutions and leveraging social capital could replace or work in parallel with the bureaucratic, one-size-fits-all approach. Although this type of paradigm shift could bring new benefits and dynamism to emergency management, it could also exacerbate vast inequalities between different communities depending on their resources and capacities.



Trend 4: Financial hot potato

System levels: Litany, causes, worldview

The insurance industry retreats from climate-related perils.

The insurance industry plays an important role in financial risk transfer by leveraging private sector financing. Risk-based pricing through higher premiums helps to signal the level of risk to property owners, although there is conflicting research on the extent to which insurance pricing changes consumer behavior (cf. Booth & Tranter, 2018; Hanger et al., 2018; Thistlethwaite et al., 2020). Insured losses have been rapidly increasing in Canada; prior to 2009, insured losses from catastrophic weather averaged \$400 million per year; since then, the annual average has reached \$1.4 billion (IBC, 2019a).

Some insurance companies have warned climate change could result in insurance premiums too expensive for most people (Nelsen, 2021). Already, signals of these changes have begun to emerge. In California, the insurance commissioner issued a one-year moratorium on insurers dropping policyholders after nonrenewal rates rose by more than 60% in 2019 (Bikales, 2020), while state officials warn that in higher-risk areas, the insurance marketplace “has largely collapsed” (Flavelle, 2020, para 1.). In British Columbia, many insurers will not issue new policies if there is an active wildfire in the area (Lindsay, 2017) and some interview participants related anecdotes about difficulties renewing home insurance policies during wildfire season. Overland flooding, a difficult hazard for private sector insurance due to adverse selection (Thistlethwaite, 2017), already receives public sector support in all G7 countries through varying mechanisms. But the costs to the public sector for flooding continue to rise: the National Flood Insurance Program in the United States is more than USD \$20 billion in debt (Irfan, 2021), while Australia recently announced the development of an AUD \$10 billion reinsurance pool to reduce home insurance premiums in northern Australia (Settle, 2021).

Table 8: Financial hot potato

Signals	Countertrends
<ul style="list-style-type: none">• 2021 was the second costliest year on record for the insurance sector, with USD\$120 billion in losses (Munich Re, 2022).• Insurance companies in British Columbia do not issue new policies while wildfires are active in the area (Warren, 2021).• During the 2021 budget, the federal government in Australia committed to creating a \$10 billion reinsurance pool to reduce homeowner insurance to floods and cyclones in northern Australia (Settle, 2021) and some have called for the program to be expanded to cover all natural disasters across the entire country (Murphy, 2022).• A 2021 CBC Marketplace report found up to 10% of Canadian homes are currently uninsurable for flood risk and that number could increase with the effects of climate change (D'Souza et al., 2021).• The Federal Emergency Management Agency launched a new flood insurance assessment system in 2021 called Risk Rating 2.0, the first update to its assessment methodology in 50 years, to better price flood risk (FEMA, 2021).	<ul style="list-style-type: none">• Residential flood insurance was made available in Canada in 2015 and one of the priorities of the federal government for its current (2021) term, as articulated through the Mandate Letter to the new Minister of Emergency Preparedness, is to develop a viable national flood insurance model (Trudeau, 2021).• The development of catastrophic risk pools and the catastrophic bond market are helping the insurance industry evolve to mitigate increasing disaster losses (Ghesquire & Mahul, 2021; Jaramillio & Hua, 2021).

Insurability, markets where insurance is available and affordable, is eroding in Canada. Unless we make more effort to manage climate risk, insurance will become a luxury for the rich and unaffordable for most.

– Jason Thistlethwaite, 2021

Implications for disaster recovery

Slower recovery. Research has shown that the availability of insurance in disaster recovery speeds up recovery timelines by providing access to cash more quickly than government support or charitable donations (Carpenter et al., 2020). Beyond just offering cash, insurance companies have pooled their resources together to accelerate some recovery tasks, such as debris removal from burned out homes in Fort McMurray after the 2016 wildfire. Without the insurance industry invested in recovery, timelines would likely slow for communities, residents, and businesses, and may result in worse recovery outcomes.

Greater system fragility. Because of its financial stake in disasters, the insurance industry plays a critical role in driving innovation, advocacy for and investment in disaster risk reduction research, and improvements in construction techniques. If the industry retreats from climate risks, it could leave the system more rigid and increase its fragility.

Rethinking capitalist finances. Astronomical levels of public debt from more frequent and expensive disasters could force a reckoning in financial systems and open the door for new economic constructs. Modern monetary theory, which posits that a government with sovereign control of its own fiat currency should never have to default on its debts, offers a new way to think about government debt and services. Under this theory, as long as government spending does not compete with the private sector or trigger inflation, governments can print money as required because government debt plays little role in the economy (Matthews, 2019). In this model, recovery services such as childcare and mental health support may not compete with the private sector and could be financed without governments raising taxes or issuing bonds to pay down debt. While this is only one theory, an economic crisis that forces governments to entertain new economic ideas could transform the role of government in recovery.



Trend 5: Fractured reality

System levels: Litany, causes, worldview, metaphor

Losing a shared understanding of what is real and whom we should trust

Social scientists have been tracking the declining trust in institutions across Western nations for years. Many forces have contributed to this decline, including slowing economic growth, globalization and mass migration, and the Great Recession (Edelman, 2018; Potter, 2021). Within the overall downward trend, there are diverging levels of trust that primarily split along social class lines: those in the top 25 percent of income distribution and with college educations have significantly higher levels of trust in institutions than the mass public, who are more likely to see systems as failing them (National Intelligence Council, 2021).

The already-fractured media landscape continues to splinter, pushing people towards more ideological extremes and opinions they might not otherwise hold (Kolbert, 2021). With platforms and business models driven by algorithms and bots that can be easily manipulated, tech companies cannot effectively manage the tsunami of misinformation (Hao, 2021) as the sheer volume of fake news crowds out facts (Edelman, 2018). Advances in artificial intelligence are making it easier to create “deep fakes” in which manipulated images, audio, and videos are harder to detect (McKee, 2021). A 2021 global survey on trust found 76% of respondents worry about false information being used as a weapon (Edelman, 2022, p. 8).

Societal trust is not just eroding between people and institutions, but between peers (Edelman, 2018). Different viewpoints on COVID vaccines are driving families apart, social bonds which may not recover even after the pandemic ends (Valleau, 2021). Technological innovations may accelerate this trend in the future as augmented and virtual reality enable people to literally create their own realities (Rothman, 2018). With greater access to information than ever and a billion more people coming online by 2025, individuals are increasingly dependent on their preferred voices of authority – be it media personalities, celebrities, or experts – to help sift fact from fiction (National Intelligence Council, 2021). The decline in trust challenges our ability to develop a shared sense of reality or find any common ground, which makes collective action increasingly difficult.

Table 9: Fractured reality

Signals	Countertrends
<ul style="list-style-type: none">According to the 2022 Edelman Trust Barometer, distrust has now become society’s default, where 59% of people say they distrust new information until they see evidence convincing them it is trustworthy. Nearly half of respondents viewed government and media as divisive forces in society and among the least trusted (Edelman, 2022).Scientists at MIT created a seven-minute video of Richard Nixon describing the unsuccessful moon landing, a contingency speech written but never delivered in case the Apollo 11 mission failed. They hoped to raise awareness of deep fakes and the power they could have to fuel conspiracy theories and rewrite history (McKee, 2021).Former president Donald Trump’s media company launched a new social media called Truth Social, modelled after Twitter, an initiative linked to Trump being banned from Twitter for inciting violence (Porter, 2022).During the 2022 Freedom Convoy in Ottawa, Member of Parliament Charlie Angus found himself under threat as he tried to share details of the situation in Ottawa with his constituents. People accused him and the media of lying, and saying if they did not lie, they would not have to worry about violence. “How do you discuss politics when you’re not arguing facts, but reality itself?” (Angus, 2022).Researchers at MIT studied the most popular Facebook pages among Christian and Black Americans in the leadup to the 2020 election and discovered 19 of the top 20 pages were run by troll-farms based in Eastern Europe (Hao, 2021).	<ul style="list-style-type: none">Youth movements for climate and social justice have brought together people from different nations, backgrounds, religions, ethnicities. This collective action at a global scale is a unifying force across national divides (Institute for the Future, 2018).A 2020 survey of Americans found the lowest level of climate denial since the Yale Program on Climate Change Communication first started collecting data in 2008 (Winters, 2020). This follows a shift in right-wing political circles from dismissing the existence of climate change to acknowledging its existence (Milman, 2021).

Implications for disaster recovery

Hijacked by special interests. The recovery process could be hijacked by a small minority of vocal citizens leveraging increasingly sophisticated techniques to mobilize support and disrupt governments, as seen during the Freedom Convoy in Ottawa in 2022. The shift towards special interests that benefit few instead of broader, more inclusive recovery could exacerbate underlying vulnerabilities and fracture community cohesion. With eroding trust in institutions and one another, local economies would likely be slow to recover (Useem, 2021) and key businesses may relocate to new jurisdictions, triggering an economic death spiral.

Recovery through emergency rule. If governments cannot build consensus or make decisions, they may turn to tools such as emergency powers to accomplish disaster recovery. As seen during COVID-19, emergency powers limit some individual freedoms and eliminate more competitive government processes to streamline decision-making. The shift towards more autocratic governance for recovery could expedite timelines but excludes the community from participating in the development of a shared vision for the future.



Trend 6: Radical transparency

System levels: Causes, worldview

Transparency and disclosures hold governments and corporations accountable for how they evaluate and reduce risk.

There is growing societal demand for greater transparency in how institutions assess and reduce risk. Environmental, social, and governance (ESG) reporting first appeared in a United Nations paper in 2006 and by 2020, more than 2,000 investment firms with over USD\$80 trillion in assets require ESG disclosures from companies (Atkins, 2020). Lending institutions and asset management firms have warned companies to produce “investor grade” data or risk losing investment capital (Clendaniel, 2021). Although a lack of standardized methodology and poor data has led to many legitimate critiques of ESG (Stewart, 2021), this may be changing as regulators get involved. The public sector also faces a push for greater transparency. A bipartisan bill in the United States has proposed the creation of a National Disaster Safety Board, modelled after the National Transportation Safety Board, to analyze underlying causes of disaster deaths and damages (National Low Income Housing Coalition, 2021).

In addition to transparency, activists are turning to the courts to hold institutions accountable for not reducing known risks. The global number of climate lawsuits has risen dramatically over the past few years, while municipalities in Canada have faced class action lawsuits for failing to effectively mitigate flood risk.

Technological change and the democratization of data are accelerating the push for transparency. Distributed ledger technology (i.e., blockchain), improvements to remote sensory imaging, and the integration of smart devices into buildings and infrastructure to monitor performance all provide real-time data that is more accessible to individuals.

Table 10: Radical transparency

Signals	Countertrends
<ul style="list-style-type: none">• The CEO of BlackRock, the world’s largest investment firm, has warned companies to provide better climate data or risk votes against management (Clendaniel, 2021).• Globally, the number of climate change-related cases has more than doubled since 2015. Just over 800 cases were filed between 1986 and 2014, while over 1,000 cases have been brought in the last six years (Setzer, 2021).• India became the first country to announce its intention to regulate ESG and carbon emission reporting, an important step towards improving data collection and transparency (Bee et al., 2022).• A \$375 million lawsuit against Thunder Bay claiming negligence for failing to effectively mitigate flood risk is moving to trial after mediation failed in 2021 (Rinne, 2021).• A bipartisan bill to create a permanent and independent National Disaster Safety Board, modelled after the National Transportation Safety Board that investigates airplane and railway crashes, to investigate the underlying causes of disaster death and damage was introduced to the United States Senate in 2021 (National Low Income Housing Coalition, 2021).• Restor is a publicly available mapping platform that uses high satellite imagery and crowdsourced data to track the restoration of ecosystems and provide computer-modelled predictions for tree cover and wildlife diversity in an area (Jones, 2022).	<ul style="list-style-type: none">• A Federal Court judge ruled against a youth-led climate lawsuit against the Canadian government on the grounds the scope of actions that contribute to climate change were “too broad for the court” (Brend, 2020).• A former BlackRock investor blew the whistle on the “sham” of ESG and sustainable investing. He argues that capitalist markets cannot address climate risks: “Wall Street is focused on scoring points (maximizing profits) not good sportsmanship (being a responsible investor). To save the planet, you have to change the rules of the game” (Browne, 2021).

Implications for disaster recovery

Depoliticizing recovery. Greater transparency and accountability could free disaster recovery from the realm of politics. With open data on previous disasters shared freely, the democratization of expertise could enable greater citizen involvement in recovery. Depoliticizing the process may also allow for more open conversations about disaster risk reduction and developments in at-risk areas. However, removing political interests from recovery could also reduce the amount of funding available and would deny citizens an important channel for advocacy.

Incentivizing risk reduction. Our current urban development system does not reward prevention and risk reduction. Investments in effective mitigation tend to decrease program funding over the long term because it is hard to see the tangible benefits (Henstra, 2011). The move to greater transparency and universal adoption of ESG-type standards would level the playing field and provide incentives for communities to invest in risk reduction, though such standards could likely still be manipulated by special interests.



Trend 7: New frontiers for universal rights

System levels: *Litany, causes, worldview, metaphor*

Legal rights expand to the natural world and future generations.

In recognition of the multiple benefits derived from the environment and its importance to intergenerational equity, nations around the world are expanding legal rights to the natural world. In 2017, New Zealand became the first country to grant personhood to the Whanganui River (Evans, 2020). Recently, the Italian government approved a constitutional amendment mandating the state to protect the environment, biodiversity, and natural ecosystems “in the interest of future generations” (Lai, 2022). Concurrently, there is a push to incorporate “natural capital” into the economic calculations that underpin much of our institutional decision-making, beyond traditional environmental assessments (Warren & Lulham, 2021).

A parallel movement granting legal rights to future generations has also begun to shift the decision-making landscape. Wales became the first country to appoint a “Minister for Future Generations” with the statutory authority to represent the interests of those not yet born in public sector decision-making (Balch, 2019). In a municipal pilot study, a citizen advisory panel in Yahaba, Japan, was divided into two groups: one representing the interests of the current generation and one representing future generations. When faced with the question of what to do with water utility surpluses, the current-focused group argued for rebates, while the future-focused group recommended creating a fund for future upgrades and investments (Kobayashi, 2019). The future-oriented lens of the debate gave the administration the public support to raise water rates.

Although these trends may be emerging in nation-states, they have a long, established history in many Indigenous cultures. The Haudenosaunee embedded the Seventh Generation Principle into the Great Law of their confederacy, written sometime between 1142 and 1500 CE (Joseph, 2020). The Seventh Generation Principle prompts decision-makers to consider the impacts of their decisions seven generations into the future. Similarly, many Indigenous communities have long incorporated nature into their laws, reflecting the belief that humans are equal to and dependent on, not separate from and superior to, nature (Jang, 2021).

Table 11: New frontiers for universal rights

Signals	Countertrends
<ul style="list-style-type: none">• In 2021, the Innu Council of Ekuanitshit and the Minganie Regional County Municipality in Quebec granted legal personhood to the Magpie River/ Mutehekau Ship, which included the rights to maintain biodiversity, be free from pollution, and the right to sue (Jang, 2021).• Italy amended its constitution to include the protection of the environment, biodiversity, and ecosystems, requiring the state to safeguard the environment (Lai, 2022).• Wales became the first nation to appoint a Minister for Future Generations to represent the interests of future generations in public sector decision-making (Balch, 2019), and the United Kingdom is currently considering similar legislation (Geraghty, 2022).• The City of Nanaimo was one of the first in Canada to participate in a pilot to implement the Municipal Natural Assets Initiative by identifying and integrating its natural assets (such as wetlands and green spaces) into its financial and asset management systems (Warren & Lulham, 2021).	<ul style="list-style-type: none">• Nobel Memorial prize-winning economist William Nordhaus developed an economic model for climate change that argued for a discount rate of 3%, 30 times higher than the rate recommended by British economist Nicholas Stern (the higher the rate, the greater value assigned to the interests of the present over the future). Canada currently uses the 3% rate as part of its carbon tax calculation, though it acknowledges “this value underestimates the damages of climate change to society and the social benefits of reducing carbon pollution” (Government of Canada, 2021).• Mark Carney, the former Governor of the Bank of Canada, has argued that the trend of attaching financial value to everything (including nature) directly contributed to the 2008 global financial crisis and is part of what is holding back faster action on climate change. He has called this trend the move from a “market economy to a market society” and warns that it risks undermining our social contract and humanity (Carney, 2021).

Implications for disaster recovery

Greater consultation, harder tradeoffs. Disaster recovery already requires the integration of many diverse perspectives and evaluating tradeoffs between competing priorities. Legal requirements to elevate the interests of nature and future generations on par with current citizens would add complexity to this process but could enrich the discussion and lead to longer-term thinking. This type of decision-making would require fundamental changes to disaster recovery funding, both through governments and insurance, but could help cities take advantage of the opportunity provided by disasters to accelerate shifts to more sustainable and equitable communities.

Leverage points

The consideration of change drivers and emerging issues reveals the following barriers and opportunities to integrate more systematic risk reduction into recovery:

Barriers

- The eroding trust in institutions and fracturing social cohesion significantly complicates disaster recovery and increases the challenge of developing a collective vision for recovery.
- The reliance of municipal governments on property taxes and development fees incentivizes risky urban development.

Opportunities

- Increase accountability for decisions that create disaster risk to shift incentive structures and risk calculations for decision-makers.
- Enable greater self-sufficiency in municipalities to open new economic opportunities, create space for more local actors in recovery, and allow local authorities to establish their own recovery priorities.
- If insurance becomes more expensive, especially for businesses, municipalities that invest in risk reduction may attract increasing investment.
- Include the perspectives of future generations and nature into recovery decision-making to expand considerations about whom should benefit from recovery spending and investment.

Implications

The disaster recovery system in Canada that evolved throughout the second half of the last century is already straining under the social and environmental conditions today (PBO, 2016). Accelerating forces of change and emerging issues pose additional challenges for recovery. To truly prepare Canadian communities to thrive in the face of increasing disaster risks, incremental improvements based on existing policy assumptions and mechanisms will likely not suffice. The system requires transformational change, designed from the future, to avoid recreating structures that continue to privilege some and limit the agency and opportunity of others (Halford, 2021).

This section explored some of the powerful drivers of change and emerging issues that may disrupt disaster recovery in the future. Some of these forces may pose new challenges, while others offer novel, perhaps even radical, opportunities. The next chapter synthesizes the ongoing analysis of leverage points throughout this research into an intervention map that compares the relative power of different leverage points to create change within the disaster recovery system in Canada.

“

When patterns are broken, new worlds emerge.

- Tuli Kupferberg

CHAPTER 6

LEVERAGE POINTS ANALYSIS

In 1999, renowned systems expert Donella Meadows published an article on leverage points to create system change. Based on years of analyzing how counterintuitive leverage points can be, especially in complex systems, she developed a hierarchy of effectiveness for different types of interventions. Naturally, the most powerful interventions face the greatest resistance and tend to be the most difficult to implement (Meadows, 1999).

Leverage points provide a different approach for exploring system dynamics from the perspective of implementing change. The hierarchy of leverage points generally align with the vertical levels of the system revealed through the causal layered analysis, with the lowest intervention points corresponding to the top layers of the system (the litany and causes), and the highest intervention point (paradigm) a reflection of the system myth and metaphor (see Figure 22).

This section maps the leverage points identified throughout this study onto a lever diagram to explore the relative power of different interventions (Namahn, 2018). Although the focus of this research is on municipal recovery, many levers require intervention by other system actors: senior governments, financial institutions, industry, the media, and individuals. This assessment considers how to improve outcomes for disaster risk reduction at the municipal level, not the actors controlling each lever (some levers require multiple actors), and thus concentrates on the levers with greater power over the system (see Appendix F for a full intervention map). For a system as entrenched and resistant to change as recovery, simultaneous interventions across multiple dimensions are necessary to transform the system, requiring a whole of society approach.

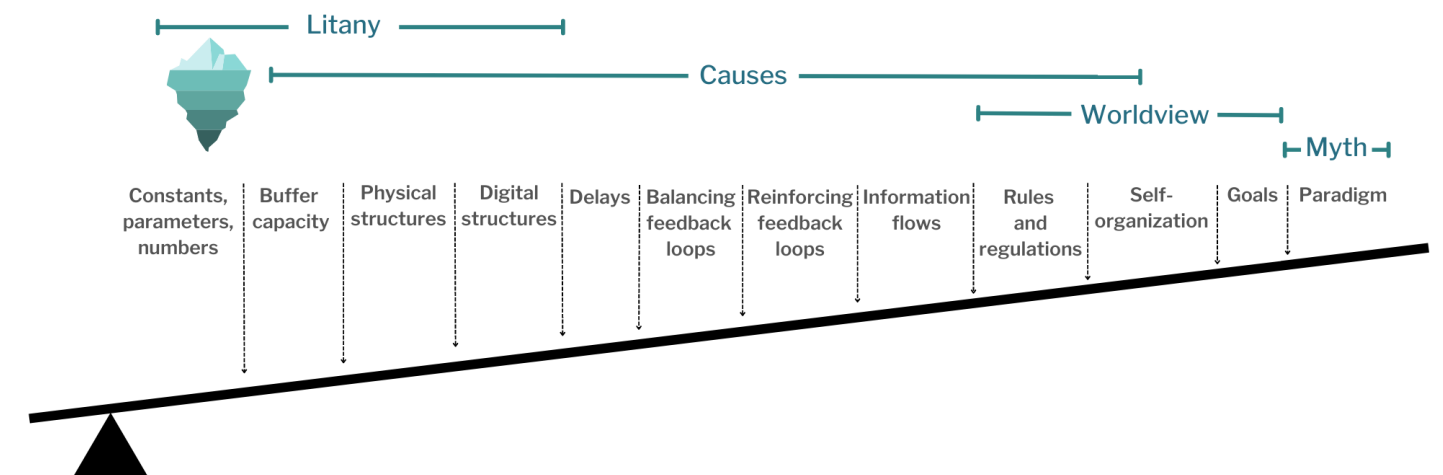


Figure 22: Leverage points diagram with causal layered analysis

System Interventions

This diagram uses a lever to indicate the relative power of existing barriers (below) and opportunities (above) to integrating systemic disaster risk reduction into municipal recovery. This analysis focuses on the intervention points with the greatest power over the system (the right half). A full system intervention map can be found in Appendix G.

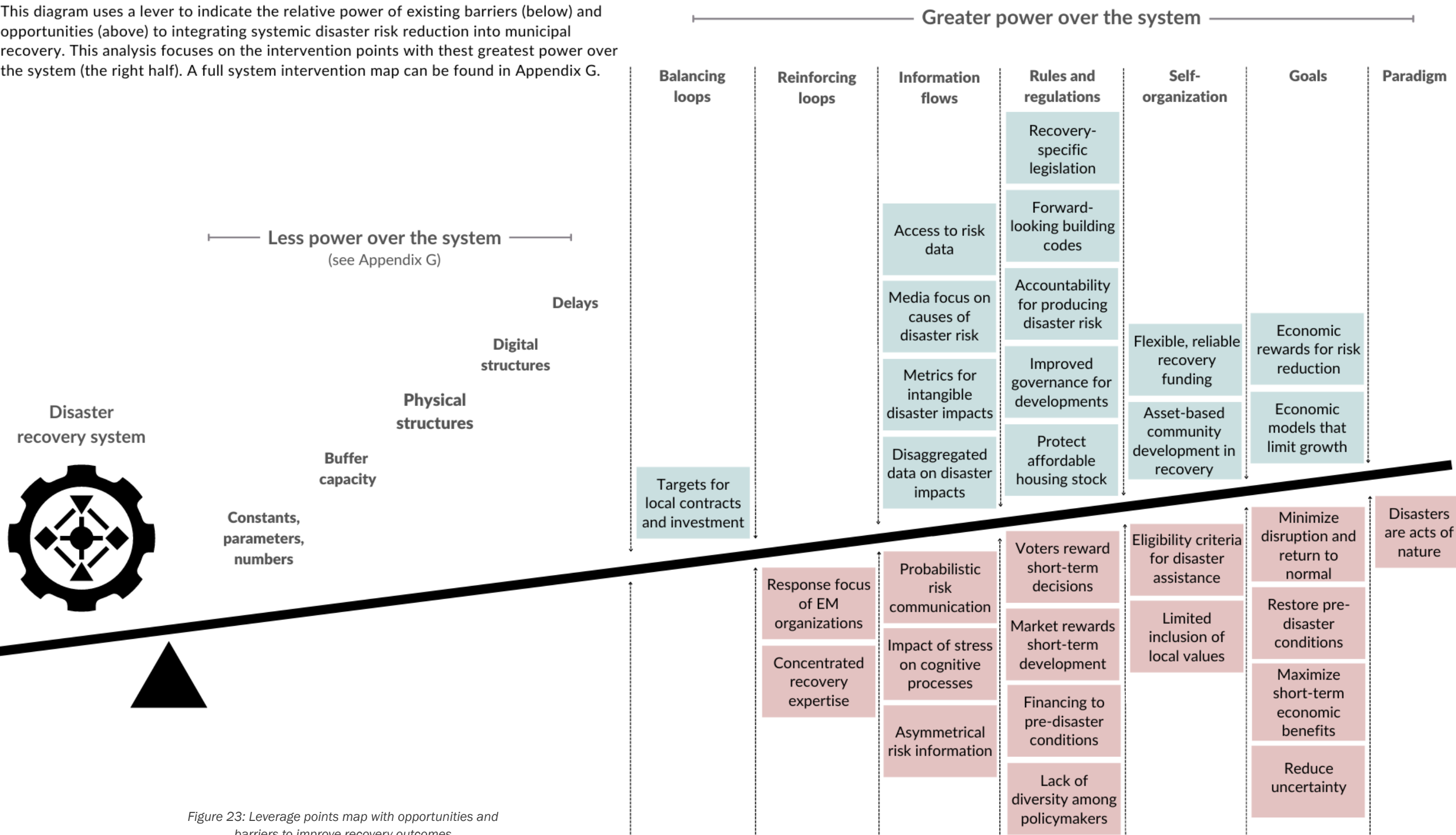


Figure 23: Leverage points map with opportunities and barriers to improve recovery outcomes

Unpacking the leverage points analysis

The following discussion focuses on the most influential leverage points, those on the right half of the diagram, as necessary for system change. It begins with feedback loops and ends by considering the disaster recovery paradigm.

Feedback loops

System levels: Causes

Feedback loops are critical concepts in system modelling and depict how variables in a system influence each other (Ryan & Hamilton, 2012). Reinforcing loops generate exponential growth or collapse, such as compounding interest rates in a bank account (Goodman et al., 1994). Balancing loops involve forces of resistance that limit growth and contribute to self-regulation within systems. A thermostat is balancing loop: it turns on the furnace when the temperature drops below a set level and shuts the furnace off once the desired temperature is reached. Balancing loops rely on goals (e.g., a set temperature) and regulate the activities of the system to keep performance on target (Goodman et al., 1994).

Barriers

Two reinforcing feedback loops contribute to the status quo:

- The response anchor leads emergency management organizations to invest in response capabilities, thereby perceiving emergency management issues through the lens of response (see Figure 24). This framing overlooks the entirely different set of capabilities and approaches needed for recovery.

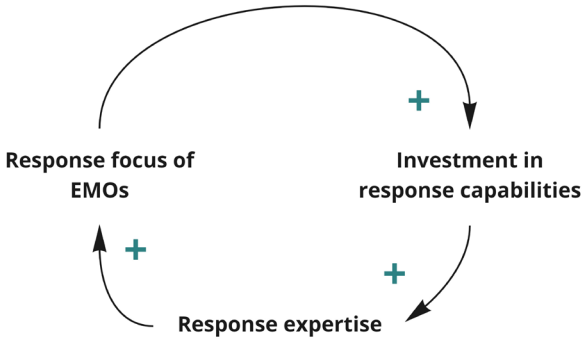


Figure 24: Reinforcing loop of response-driven focus for emergency management organizations (EMOs).

- Large contractors and disaster organizations are the most successful at securing contracts for disaster recovery, adding to their capacity and expertise and making them more likely to win future contracts (see Figure 25). This concentrates expertise in external organizations and may come at the expense of investing in local capacity.

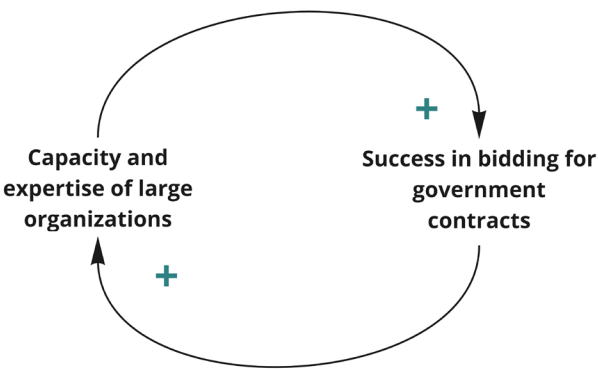


Figure 25: Reinforcing loop of successful contractors.

Opportunities for action

- Incorporate a balancing feedback loop that establishes a required target for contracts to local businesses or nonprofits. Where the capacity does not exist locally, a percentage of recovery funding could be invested in training and capacity-building rather than simply awarded to external organizations (see Figure 26).

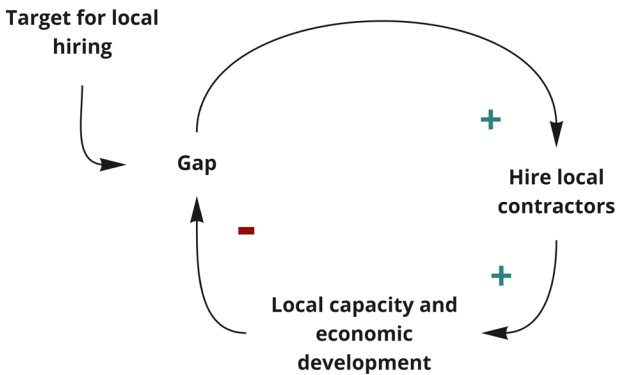


Figure 26: A balancing loop showing how targets for hiring local contracts can increase the capacity of local organizations, which are part of the community long after recovery services end.

Information flows

System levels: Causes

Information flows improve the feedback in a system and provide a way for users to see how the system is performing in near-real time. According to Meadows, “we humans have a systematic tendency to avoid accountability for our own decisions. That’s why so many feedback loops are missing” (1999, p. 13). Because information flows help establish accountability, they can be powerful levers for change.

Barriers

The existing disaster recovery system is missing effective information flows and presents information in a way that cannot easily be understood when making decisions:

- People often misunderstand probabilistic risk language (e.g., 1-in-100-year event) and have difficulty incorporating it into decision-making. Framing risk in this way limits its utility to inform decisions.
- Stress and trauma have known impacts on cognitive processes, including impairments to concentration, memory, and decision-making (SAMHSA, 2014), yet the complexity of recovery processes add to survivor stress rather than designing for it.
- Asymmetrical disaster risk information between insurance, governments, and individuals creates an environment for mistrust and opportunism (Tarver, 2020).

Opportunities for action

- Provide greater access to risk assessments and improve the way risk is communicated to level the power imbalance caused by information asymmetry. This can improve accountability for decisions that create risk and establish system feedback to encourage risk reduction actions.
- Improve media coverage of disasters by focusing on the underlying conditions that create disaster risk to enhance information flow during a disaster, when public and political attention is greatest.
- Establish metrics to quantify the intangible impacts of disasters and rates of recovery to add feedback and accountability to this essential dimension of recovery, so often undervalued in funding decisions.

- Improve the ability to see disaggregated data on the impacts of disasters to enable more targeted recovery actions proportional to impact and need. Toronto demonstrated the power of this type of information flow through its mobile testing and vaccination clinics deployed to COVID-19 hotspots, assigning resources to the areas of greatest need (Wilson, 2021).

Rules and regulations

System levels: Causes, worldview

Rules and regulations define the scope, boundaries, and degrees of freedom within a system (Meadows, 1999). Some rules have greater power – natural laws such as gravity or strong social rules like the Constitution – while other rules have less power, such as informal social contracts. The ability to define the rules of a system confers significant power.

Barriers

- The rules of the existing disaster recovery systems are optimized for short-term gains and generating a certain type of income and wealth (based on property). Political leaders get rewarded for new construction and investments in healthcare or new schools, but not for increasing flood zones designations or upgrading sewer pipes. During recovery, the rules support a rapid return to pre-disaster conditions.
- Voters do not tend to reward long-term investments in risk mitigation, especially at the expense of short-term gains. As such, it costs political capital for elected officials to pursue such policies. Likewise, deferring infrastructure upgrades or mitigation projects can free up budget space for more popular initiatives.
- The market rewards short-term developments, financially benefitting companies, individuals, and governments through tax revenue and fees.
- The existing rules for disaster financial assistance restrict options for mitigation or risk reduction during recovery.
- The lack of diversity among the people with power over the rules – elected officials, senior policymakers, and bureaucrats – results in policies designed to best serve a narrow segment of the population.

Opportunities for action

- Design recovery-specific legislation that recognizes the unique decision-making environment and challenges of recovery and establishes a set of rules optimized for longer-term considerations, such as the Recovery Transition Periods in New Zealand.
- Raise design standards for building codes, hazardous area designations (such as flood plains), and infrastructure, and require resilient building materials to account for emerging rather than existing risk. While there are many unknowns about the future risk environment, climate models show an increase in extreme heat and precipitation in the coming decades, well within the lifespan of structures currently being built.
- Establish regulations that enable greater accountability for decisions that produce disaster risk. For example, after the 2008 financial crisis, the United Kingdom brought in rules to reduce the perverse incentives of large banker bonuses that rewarded short-term high-risk investments, instead paying out these bonuses over seven years. Employees forfeited the bonuses if evidence of misconduct or “failures of risk management” emerged (Carney, 2020).
- Remove some of the ability for senior-decision makers to approve risky developments for short-term gain through different governance models (such as the conservation authorities in Ontario) or automatic thresholds.
- Establish rules that protect affordable housing stock during recovery and prioritize its repair or reconstruction.

Self-organization
System levels: Causes, worldview

“The ability to self-organize is the strongest form of system resilience. A system that can evolve can survive almost any change” - Donella Meadows.

Self-organization refers to the ability of a system to create new structures and behaviours; it is one of the most powerful leverage points.

Because disaster recovery in Canada is primarily the domain of governments, it already faces limitations on its ability to self-organize. Governments struggle to accommodate self-organization and emergent actors

due to rigid systems and risk aversion, and have difficulty operating outside the established hierarchy that governs bureaucratic decision-making.

Barriers

- The role of senior governments in establishing eligibility criteria for disaster recovery places significant constraints on local autonomy to self-organize. To the extent municipalities are reliant on funding support from provinces, and provinces on the federal government, they must operate within these boundaries.
- The system relies heavily on outside expertise deployed to help provide guidance and fill capacity gaps for governments overwhelmed by a disaster. Where outside expertise fails to incorporate local values and to invest in local capacity (Marchezini, 2019), it limits self-organization.

Opportunities for action

- Empower local decision-making during recovery by enabling municipalities to set their own recovery priorities through more flexible and sustained funding. Similarly, municipalities should enable neighbourhoods and communities to self-organize around hyper-local recovery goals.
- Embed asset-based community development principles and practices in disaster recovery, which mobilize community capacity by emphasizing strengths, leveraging local knowledge, and helping communities become self-sufficient (AISD, 2018).

System goals
System levels: Worldview

System goals refer to what the system is organized to achieve and the outcomes it produces, which may not align with its stated objectives (Meadows, 1999). Changing the goals of a system is challenging, especially for a domain such as recovery which spans social, economic, technological, environmental, and governmental dimensions.

Barriers

The existing system of disaster recovery has three primary system goals:

- To minimize disruption and return to normal functioning as quickly as possible,

- To restore pre-disaster conditions, and
- To maximize short-term economic benefits.

Each of these goals is in service to a larger, overarching system goal:

- To reduce uncertainty.

Opportunities for action

Psychology research has shown how uncertainty disrupts many mental processes and can trigger a state of hyper-vigilance, making it much more likely for us to see threats and experience outsized emotional reactions (Heid, 2020). Prolonged uncertainty is particularly insidious and has been linked to numerous anxiety disorders (Reynolds, 2020). Thus, humans seek coping strategies to reduce uncertainty and its impact on our brains (Walker, 2021). Many human systems, such as markets and financial systems, react poorly to uncertainty. Governments see reducing uncertainty as an essential part of their role. While the overarching goal of disaster recovery may always be to reduce uncertainty, opportunities may exist to change how we do so:

- Strengthen links between disaster risk reduction, private sector investment, and profitability. If economic systems reward companies for reducing climate and disaster risks, governments investing in risk reduction could attract new investments, similar to the existing use of tax breaks and subsidies to lure desirable business sectors.
- Adopt new economic models that do not prioritize endless growth, such as Kate Raworth’s doughnut model (Nugent, 2021). A different economic model would have different priorities and rules (e.g., a circular economy or building codes that require carbon neutral construction), and thus different system goals during recovery.

Alone, governments do not have the power to intervene at this level. This level of change requires alignment across economic, social, technological, and government systems.

Paradigm
System levels: Metaphor

Paradigms reflect shared beliefs about how the world works and are the sources of systems, and therefore the highest leverage point (Meadows, 1999). They correspond to the worldview and metaphor levels of the

causal layered analysis, the deeply embedded and often unquestioned ideas we have about reality. Currently, disaster recovery operates under the paradigm and metaphor that *disasters are acts of nature*. While we have long recognized and studied the socio-economic causes of disasters, this tacit awareness has not permeated the system. As a result, we:

- Have minimal systems of accountability for disaster risk because disasters are not seen as the result of human actions.
- Invest heavily in response to prepare for the capricious acts of nature instead of adapting the structural ways we produce risk.
- Spend significant public-sector funding on disaster recovery to repair the damage caused by disasters, rebuilding in the same places and the same ways.
- Place our faith in feats of human engineering and technology to master the environment and impose order on the forces of nature.

According to Meadows, societies “resist challenges to their paradigm harder than they resist anything else” (1999, p. 18). The existing paradigm enables many of the collective benefits we enjoy in modern Canadian life: living in beautiful places; building structures to support human comfort, entertainment, and economic activity; using waterways as transportation networks; and designing cities to enable modern convenience and economic prosperity. Altering this paradigm could rewrite the relationship between humans and nature and not just transform disaster recovery, but the landscape of Canadian cities.

Implications

The intervention map in this section has demonstrated the relative power of barriers and opportunities for implementing systemic change. The barriers at the highest level of intervention are deeply engrained in our economic and governmental structures and collective psyches, making them extremely resistant to change. However, the power to define the rules of recovery and to restrict or enable self-organization largely rests with governments. Collaborative action across all orders of government could rewrite the rules of disaster recovery, enabling greater self-organization and setting new recovery targets based on reducing future disaster risk and truly investing in resilience.

“

The greatest danger in times of turbulence is not the turbulence; it is to act with yesterday's logic.

– Peter Drucker

CHAPTER 7

DISCUSSION

The preceding chapter mapped the essential elements of the disaster recovery system onto an intervention map, indicating the relative power of the status quo and potential inventions in changing the system. This section focuses on the key findings of this investigation in consideration of the guiding research question:

How might futures thinking enable greater integration of systemic disaster risk reduction into municipal decision-making during disaster recovery?

The system (mostly) works as designed

In Canada, recovery is the “after response” period and lacks a dedicated legislative framework or specific policies outside of disaster financial assistance¹⁶; even where such policies exist, financial assistance still plays a significant role in shaping recovery trajectories. The origins of government financial assistance can be traced to the major floods of the late 1940s and early 1950s, and was shaped by the prevailing ideas about governments, individuals, and disaster risk. Its policy goals include limiting the amount the federal government pays for disasters, providing for the basic needs of people affected by disasters, reducing disruption, and rebuilding infrastructure (see Bumsted, 1987; Robinson & Cruikshank, 2006). This process was not intended to support holistic community recovery or include dimensions of economic, social, or natural recovery.

The recovery system largely produces these policy outcomes. At a macro level, it enables relatively quick reconstruction of damaged property and infrastructure to pre-disaster conditions, although individuals may have varying experiences, and smaller communities may struggle more to navigate the bureaucratic processes than larger organizations with greater administrative capacity. Through short timelines, limitations on feasibility or engineering studies, and a heavy reliance on damage assessments to determine funding allowances, the recovery system actively discourages comprehensive risk reduction or crafting alternative futures that address underlying structural vulnerabilities. To the extent municipalities rely on insurance and

disaster assistance, these policy outcomes shape municipal recovery.

Thus, the characterization of disasters as “missed opportunities” in which “local leaders failed to take advantage of the recovery period to reshape their devastated communities in a way that would improve their ability to withstand future disasters” (Mileti, 1999, p. 236) overlooks the significant limitations on municipal autonomy in the system and the ways in which recovery is designed to reproduce pre-disaster conditions.

Limitations of problem framing

The dominant framing of disasters as natural forces that pose disruptive, expensive threats to human life and economic prosperity significantly limits our perception of potential solutions. It casts disasters as complicated problems with technical solutions: If disasters are disruptive, how do we reduce disruption? If they are expensive, how do we reduce costs? If they impact our communities, how do we “build back better”? This type of framing suggests a visible, linear relationship between cause and effect and between risk and impact, where building back better becomes a technical problem (Moulton & Machado, 2019).

However, academic literature offers a competing frame: disasters indicate failed development (Manyena et al., 2013). This framing could fundamentally shift our understanding of the problem. For example, many Indigenous cultures in Canada have collective narratives based on symbiotic relationships between humans and nature (Jang, 2021; Lavallée, 2009), and traditional land use practices – such as cultural burning – that allow natural forces to occur without threatening communities. If we recognized the flooding of rivers and burning of forests as natural processes of rejuvenation instead of destruction, how would we think about the intersection of those processes with human settlements? Elements of this shift have begun, especially in changes to

The hand that receives is always below the hand that gives.

– African proverb

¹⁶ British Columbia has a recovery framework intended to guide municipal recovery decision-making.

forestry management and wildfire fighting practices (see Gathering Voices, 2017; Wickham et al., 2021), but it has yet to supplant the dominant paradigm.

Foresight offers methodologies to expand our understanding of the forces of change and alternative futures. Through techniques such as the causal layered analysis (Inayatullah, 2005), we can not only deconstruct the existing system of emergency management, but reconstruct alternative options based on new collective narratives that can be powerful forces of societal change. Foresight also enables more inclusive futures by helping us recognize who benefits from (property owners) and who is marginalized by (people outside normative property ownership situations) the existing system and inviting diverse perspectives to craft alternative visions of the future. By challenging assumptions about why things work the way they do and the inevitability of certain outcomes, foresight allows us to question the permanence of deep structural forces and invites us to collectively imagine alternative futures.

Data, metrics, and the relative power of leverage points

In disaster recovery, and emergency management more broadly, we highly value data and metrics, such as quantitative risk assessments, design standards for buildings and designated hazard zones, and measurements during recovery of how close we are to pre-disaster conditions (school enrolments, small business licenses, etc.). Governments spend substantial funding to improve the data available pre- and post-disaster to help us understand the current state of the system and make informed decisions.

However, Meadows observed that although we spend much of our time debating the numbers and parameters of a system, these serve as the lowest point of intervention: “If the system is chronically stagnant, parameter changes rarely kick-start it” (1999, p. 6). In other words, merely adjusting parameters does not change the behaviour of the system. For example, increasing emergency management budgets does not improve disaster recovery outcomes if those investments continue to go towards response capabilities. Likewise, increasing the DFAA mitigation allowance from 15% to 30% still focuses recovery efforts on the structural damage of the previous disaster instead of future-oriented planning.

However, when metrics connect to higher leverage

points, they begin to change the system. Changing design standards for buildings and infrastructure connects to the *physical* structures leverage point, a stronger level of intervention, although it still results in residual risk. Japan, which has some of the most stringent building codes in the world, continues to suffer not-infrequent damage from disasters. At an even more powerful level, shifting from *damage* assessments to *asset and needs* assessments during the post-disaster phase taps into a much higher invention point: the rules of the system. A needs assessment, while still based on a quantitative analysis, shifts from a recovery target of returning to pre-disaster conditions to a greater consideration of equity and underlying vulnerabilities. It changes the rules from discouraging risk reduction to requiring it. Numbers provide important insights into the system but on their own have limited ability to affect change. What we choose to measure matters more than the metrics themselves.

The focus on data has two additional shortcomings: data are lagging metrics, especially the risk assessments we use in emergency management, and all data are in the past, reflecting existing structures and systems. Even forecast models that attempt to push data into the future assume significant continuity in governmental, economic, social, and environmental systems and fail to account for forces of change (Schultz, 2015).

Foresight can add significant value to the way we use data by challenging our assumptions about system stability. It complements quantitative analysis by inviting us to consider forces of change and alternative futures in which some of our most fundamental assumptions prove incorrect, broadening our perspectives of what is possible and encouraging strategic conversations to prepare for change and shape more desirable futures.

The power of uncertainty

Uncertainty is perhaps the greatest barrier to integrating systematic risk reduction during disaster recovery. Reducing uncertainty serves as the overarching goal of our existing system for good reason. At an individual and collective level, uncertainty can be an especially powerful driver of “irrational” behaviour (Kahneman, 2011). Many human systems, from governments to corporations, are designed to reduce uncertainty.

Disasters cause significant uncertainty and as a result, we look for sources of stability and familiarity as important coping mechanisms. The built environment

powerfully symbolizes stability; it provides a tangible link between the past and the future (McDonald, 2004). Building back the same taps into formidable psychological motivations. When governments seek to open conversations about rebuilding differently during a crisis – especially levels of government not directly impacted by the disaster – it can trigger fear responses and backlash (for example, the contentious decision to rebuild Waterways in a flood plain after the Fort McMurray wildfire in 2016). Some have suggested that implementing broad societal change during recovery is not only impractical, but also immoral (see Bumsted, 1987; Hamann, 2020) because citizens are unable to effectively engage in democratic processes and dialogue to shape visions for the future.

As a field, foresight arose from the desire to better navigate uncertainty (Schultz, 2015). It offers techniques to expand horizons, detect emerging signals of change, and consider alternative futures in which some of our deepest societal structures have changed, all with the goal of helping individuals and organizations better prepare for uncertainty.

However, foresight requires the openness and ability to entertain ideas about alternative futures that are not mere continuations of the past (Schirrmester et al., 2019). For communities in crisis, this is a tall order. It would require carefully structured and supportive engagements that would stretch already-limited resources and slow down decision-making in an environment that demands rapid judgments. As powerful as foresight can be to facilitate future-ready conversations and inform long-term planning, the aftermath of disaster might be one of the most challenging times to employ it.

How can foresight enhance decision-making during recovery?

Foresight is not a panacea for the many and varied challenges of disaster recovery. The existing system is designed to reproduce pre-disaster conditions and places significant boundaries on municipal autonomy, while psychological and economic drivers urge us to reduce uncertainty and avoid loss, limiting the potential of disasters to create space for reimagining communities. However, even within the current recovery construct, foresight can enhance recovery decision-making in the following ways:

Elevating strategic conversations. By challenging our

assumption that the future is merely a continuation of the past, foresight can elevate strategic conversations during recovery by expanding ideas about what is possible (Schirrmester et al., 2019). If some elements of communities were struggling before the disaster, rather than simply restoring the status quo, how can we prepare our communities to thrive in the future? For example, if an economic sector has been in decline for some time, strategic conversations about the future may help to depoliticize the current debate and consider ways to invest recovery dollars into supporting a transition to the skills and technologies needed for the emerging economy (Lowe, 2012). Or if a neighbourhood struggles with high levels of poverty, imagining a future in which that neighbourhood is thriving and working backwards can guide recovery priorities.

Challenging hegemonic visions of society. Foresight offers the opportunity to challenge dominant systems and ways of knowing through deconstructing and reconstructing alternative futures. In an era of declining trust in institutions and disillusionment with governments’ ability to deliver prosperity for citizens, foresight can create space for emergent and diverse visions of the future (Osborne et al., 2021). It allows for deep questions about existing economic and political structures and can challenge pre-determined visions of recovery (Moulton & Machado, 2019).

A powerful source of hope. Outside of disasters, the twenty-first century is a period of rapid and accelerating change that can cause people to feel a sense of future estrangement, “the gut feeling that the future is a hostile and bewildering world that we may not have a place in – or may not want to have a place in” (Bengston, 2020, p. 3). Adding a disaster on top of that existing collective sentiment can trigger a profound sense of powerlessness. Foresight offers participatory methods to reframe our relationship with the future, allowing us to create aspirational visions of desirable futures that can be powerful sources of hope (Inayatullah, 2008).

As with most activities in emergency management, foresight would have the greatest value if applied to strategic priority-setting and municipal capacity-building in advance of a disaster. The post-disaster environment increases the structural and psychological barriers to engaging in transformative conversations about the future. However, foresight can also tap into the spirit of solidarity and sense of possibility that emerges during disaster, and act as an accelerator of change.

Although the opportunities of disasters come with substantial challenges, they are pivotal moments for communities. Municipal governments, on the forefront of disaster impacts and able to operate more quickly than other levels of government, can leverage disasters as accelerators of change. Despite the systemic barriers to embedding risk reduction in disaster recovery, many communities across Canada have successfully advocated for and implemented risk reduction measures. As attention from senior governments and the public brings disaster risk reduction into the spotlight, municipalities have an important role to play in advocating for transformational change that will support them in reducing risk and rebuilding more resilient communities.

Disaster, along with moments of social upheaval, is when the shackles of conventional belief and role fall away and the possibilities open up.
– Rebecca Solint, 2009



A map of the world that does not include Utopia is not worth even glancing at...

Progress is the realisation of Utopias.

– Oscar Wilde

CHAPTER 8

A WAY FORWARD

For the past decade, emergency management has recognized the importance of building resilience to address the rising impacts of disasters. Although this work must occur in advance of disasters to reduce risk and mitigate damage, it also needs to be the focus of recovery so we do not recreate vulnerabilities and risks as we rebuild communities. The existing system, despite policy rhetoric, is designed to quickly return communities to pre-disaster conditions. Adding mitigation top-up funding or including aspirational visions in policy frameworks have limited ability to change recovery outcomes when much more powerful economic, governance, and societal forces continue to shape the current system.

For transformational change to occur, the forces of change must be able to overcome forces of resistance and general system inertia (Latham, n.d):

Dissatisfaction with status quo x actionable pathway to change x vision for the future > resistance to change + system inertia

This paper began by demonstrating the growing *dissatisfaction with the status quo* in the **Introduction**, as the rising frequency and severity of disasters have attracted attention from all levels of government. The dangers presented by compounding and simultaneous disasters add urgency to the need to address disaster risk. Much of the subsequent analysis, from **Constructing an Emergency Management System** to the **System Dynamics: Municipal Disaster Recovery** to the **Leverage Points Analysis** focused on the *resistance to change* and *system inertia* by identifying the barriers to systematic risk reduction during recovery and connecting system elements to vertical layers of societal construction through a causal layered analysis.

This section sets out an *ideal vision for the future* based on shifting the existing disaster paradigm and some of the economic and governmental structures most influential in maintaining the status quo. It outlines a high-level *actionable pathway to change* for how to redesign the system of disaster recovery so it not only reduces disaster risk but changes our relationship with the natural world. Because this pathway to change focuses on the outcomes of the recovery system,

implementation will require collaboration across all levels of government and sectors in society. The recommendations that follow are based on the literature review, insights from interview participants, and the analysis in this paper, particularly of intervention points and emerging forces of change.

The recommendations follow a Three Horizons framework, a foresight technique developed by Curry and Hodgson (2008) to add nuance and complexity to traditional, linear roadmaps. In this technique:

- **Horizon 1** represents the existing system and its eventual failure over time as it slowly loses its “fit for purpose” with the external context.
- **Horizon 2** represents the turbulent and contradictory transition period during which Horizon 1 is still dominant but in decline and the emergent change needed for Horizon 3 is gaining traction (Curry & Hodgson, 2008).
- **Horizon 3** represents the desired vision for the future, the outcome of transformational change.

The Three Horizons method enables the articulation of an ideal future but recognizes we often cannot get there from our current starting point. Instead, it accepts a messy transition period in which dominant forces struggle to maintain ascendancy while creative minorities challenge system orthodoxies and imagine a different future (Inayatullah, 2008), a struggle in which the outcome is not certain (Curry & Hodgson, 2008).

The diagram on the following page suggests an actionable pathway towards an ideal future that goes beyond reducing the impacts of disasters to a transformed relationship with nature. Key actions are mapped out across three horizons and connected to the vertical level of the system that would have to change to enable the recommended action.

Pathways to change

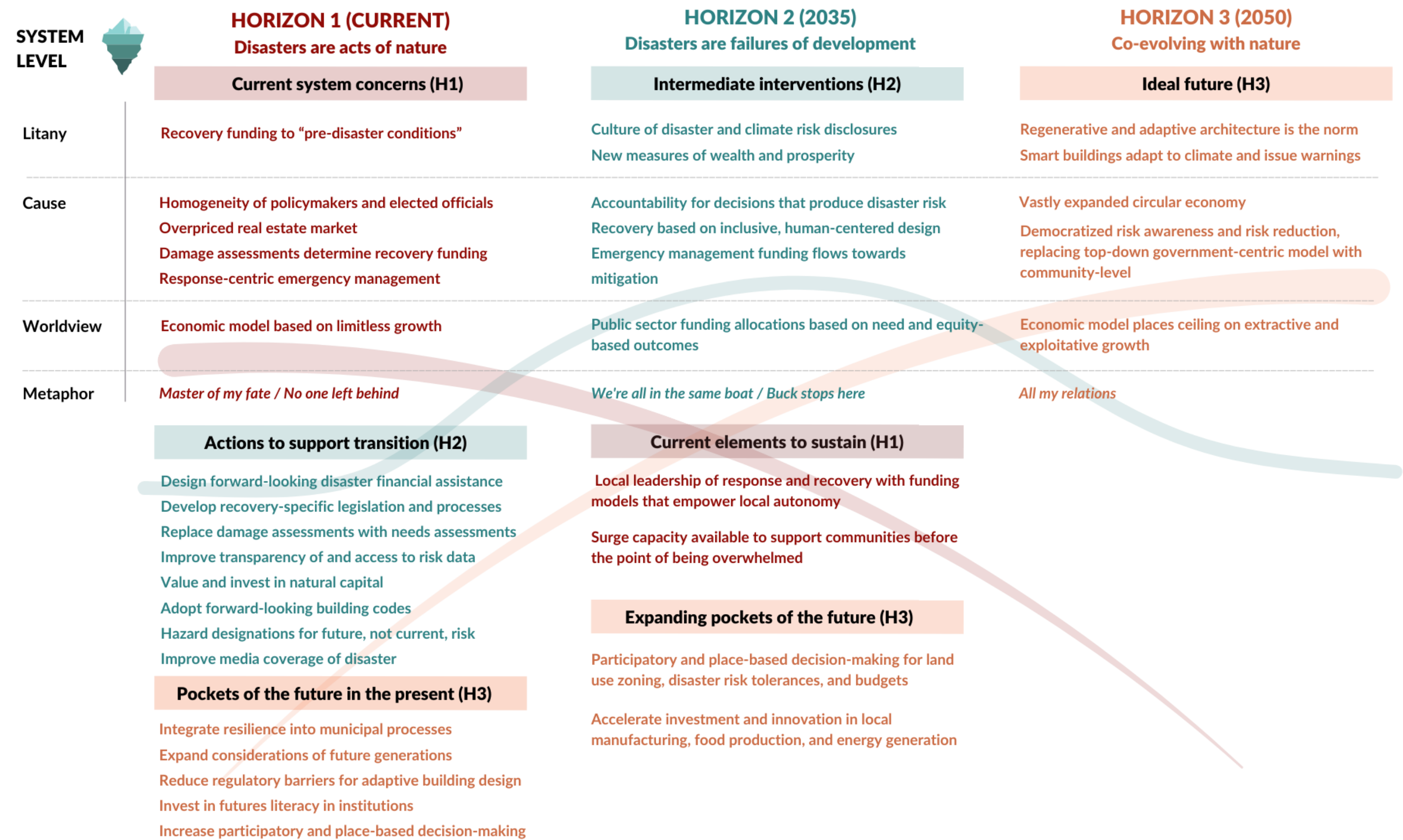


Figure 27: Pathway to transformation of disaster recovery outcomes in Canada

Unpacking the Three Horizons

This section expands upon the recommendations identified in the preceding diagram.

Horizon 1

System Paradigm: Disasters are acts of nature

The following features of the current system have started and will continue to lose “fit” with the goal of reducing disaster impacts:

- Recovery funding to “pre-disaster conditions”
- Homogeneity of senior policymakers and elected officials
- Overvalued real estate market
- Damage assessments as the foundation for recovery funding formulas
- Response-centric emergency management
- Economic model based on limitless growth

Declining metaphor: Master of my own fate (individual) / No one left behind (collective)

The following actions should be taken to support the transition from Horizon 1 to Horizon 2:

- Design forward-looking disaster financial assistance
 - ◆ Develop a flexible, forward-looking recovery funding program that requires mitigation, rewards pre-disaster investments in risk reduction, and builds on existing community capacity
 - ◆ Require governments to assess and disclose current and known future risks as part of recovery funding applications; invest in capacity to improve risk assessments before disasters
 - ◆ Assess the viability of assets in the face of future risk before funding repairs (Australia requires a viability assessment before granting individual or small business loans during recovery to avoid unnecessarily increasing debt)

- Develop recovery-specific legislation and processes designed for the unique conditions and challenges of disaster recovery
 - ◆ Establish an overarching vision for holistic recovery that includes expanded metrics for tracking progress, integrating wellness and resiliency measures
 - ◆ Align recovery funding with the overall vision for recovery and increase the flexibility and timelines of disaster financial assistance and insurance claims to enable and prioritize risk reduction
 - ◆ Improve accountabilities for how public sector recovery dollars are spent
 - ◆ Create enabling authorities that recognize the unique challenges of the recovery environment, such as recovery-specific procurement, land zoning, and public consultation rules
 - ◆ Require investments in local capacity as part of recovery funding, and establish targets for hiring local contractors
 - ◆ Rather than establishing net-new projects for recovery, whenever possible link recovery funding to existing community development, poverty reduction, and affordable housing programs to increase the speed and effectiveness of funds
 - ◆ Develop training programs, codes of practice, guidelines, and templates for local governments for recovery founded upon asset-based community development, not extensions of incident response. Guidelines should include job descriptions and skillsets for recovery personnel that emphasize skills in community development, facilitation, and collaboration, and encourage the hiring of diverse teams across sex, gender identity, race, socio-economic background, education, and vocation.
- Replace damage assessments with asset-based needs assessments as the initial step in recovery and the foundation for recovery funding formulas
 - ◆ Establish a national methodology and centralized training for asset-based needs assessments (similar to the European Union)
 - ◆ Maintain a database of trained assessment personnel who can be deployed to support

- local communities if needed
- Improve the transparency of and access to property-level disaster risk profiles
 - ◆ Invest in technological improvements in risk modelling and remote sensory risk assessments to provide property-specific (or near to) risk profiles
 - ◆ Integrate property-level risk assessments into key decision points for financial decisions (e.g. real estate listings, land titles) and investments (e.g., lending agreements such as mortgages, capital projects, new developments, etc.)
 - ◆ Replace probabilistic risk assessment language with narrative communication to improve comprehension and decision-making
- Improve the valuation of and investment in natural capital
 - ◆ Expand programs such as the Municipal Natural Assets Initiative that identify and integrate natural assets (such as wetlands and green spaces) into financial and asset management systems (see Warren & Lulham, 2021)
 - ◆ Align disaster risk reduction and climate adaptation initiatives and funding
- Adopt forward-looking building codes, materials, and hazard zone designations (e.g., flood plains) based on the risk over the lifespan of the built environment (50+ years)
 - ◆ Expand building code focus from life safety to building resilience and recoverability
 - ◆ Enable more adaptation and innovation under existing building codes
 - ◆ Reduce timelines for code development and adoption to be more responsive to the changing risk environment and innovations in building technologies
- Improve media coverage of disasters
 - ◆ Focus on the policy decisions that create risk, not the natural phenomena
 - ◆ Hold elected officials accountable for risky development decisions
 - ◆ Improve public discourse on options for risk reduction, moving beyond framing the issue around what could be lost

The following niche initiatives can be seen as “pockets of the future” in the present, pilot projects that need to scale up and become mainstream to support Horizon 3:

- Integrate resilience and forward-looking risk reduction into general municipal processes and decision-making
- Expand the rights and considerations of future generations in governmental decision-making; reduce the amount we currently discount the future
- Reduce regulatory barriers for innovations in adaptive and regenerative building design
- Invest in futures literacy and systems thinking in institutions to expand perspectives on plausible alternative futures and forces of change and to improve anticipatory decision-making
- Increase participatory and place-based decision-making initiatives of local governments to involve more citizens in decisions (see Osborne et al., 2021)

Horizon 2

System Paradigm: Disasters are failures of development

During the transition period of Horizon 2, the focus is on substantially reducing disaster risk and losses by radically increasing risk transparency and accountability, enabling a culture of disaster and climate risk disclosures.

Some of these developments can be enabled by shifting societal metaphors to recognize that our collective survival in the face of increasing climate risks depends upon each person doing their part and for governments and businesses to embrace accountability for risk:

Emerging metaphors: All in the same boat (individual) / Buck stops here (collective)

Building off the initiatives begun in Horizon 1, Horizon 2 is characterized by the following:

- We have created a culture where disaster and climate risk disclosures are the norm, demanded by investors, consumers, and voters
 - ◆ Investors require risk disclosures from companies
 - ◆ Homeowners and businesses demand risk disclosures when purchasing real estate

- We have adopted new measures of national wealth and prosperity
 - ◆ GDP is no longer the only metric for economic wealth; wealth is measured more holistically, with metrics such as the World Bank’s Changing Wealth of Nations: renewable and non-renewable natural assets (natural capital), assets created by people (produced capital), wealth embedded in people (human capital), and net foreign assets (Voegelé, 2021)
 - ◆ Measures of well-being move beyond quantity (life expectancy) to quality (life experience), such as well-being adjusted life years (see Travers, 2021)
- We have systems of accountability for decisions that produce disaster risk
 - ◆ Elected officials are accountable for short-term, high-risk decisions through financial penalties over time (e.g., a reduction in pension) or ethics inquiries
 - ◆ Developers maintain some financial liability for disaster risk even after construction is complete
 - ◆ Individuals are responsible for risks they knowingly accepted through means-tested limitations on funding support
- Recovery supports are based on inclusive, human-centered design principles
 - ◆ Financial assistance mechanisms (government assistance, insurance, and charitable assistance) are streamlined into a single portal that connects people to the services they need and is designed to support diverse populations with different needs at a time of stress and crisis
 - ◆ We have strong mental health and financial literacy supports over time frames that meet community needs
 - ◆ Recovery practices use asset-based community development principles
 - ◆ Recovery funding accommodates non-normative living situations (such as multi-generational or off-grid homes)
- Most emergency management funding flows towards mitigation and risk reduction
 - ◆ All levels of government have prioritized disaster risk reduction and established frameworks to guide decision-making
- National standards have been developed and communities receive discounts on insurance for measures implemented (similar to health and safety audits that reduce worker compensation premiums)
- Public sector recovery funding allocations are based on need, equity outcomes, and future-ready communities, not loss
 - ◆ Asset and needs assessments consider tangible and intangible disaster impacts
 - ◆ Recovery programs prioritize equity outcomes, not equal treatment
 - ◆ Disaggregated data is available to understand the differential impacts of disasters and develop micro-interventions to support vulnerable populations
 - ◆ Where communities are not viable in the face of increasing climate risks, supportive and culturally-appropriate relocation programs help people move to new homes and integrate nature-based solutions to increase the mitigative capacity of returning areas to undeveloped states

The elements of the system of Horizon 1 we need to sustain through Horizon 2 include:

- Local leadership of response and recovery, although funding mechanisms empower rather than limit local autonomy in alignment with an overarching vision for recovery
 - ◆ Enhance funding accountability mechanisms and link them to risk assessments
- Communities can access surge capacity *before* becoming overwhelmed by a disaster
 - ◆ This capacity is available before a local community “fails” and suffers significant burnout rates that make it difficult to recover
 - ◆ Surge capacity prioritizes local leadership and supports the local community in establishing the vision and values of the response and early recovery
 - ◆ This capacity is built around a mentorship model that leaves a community more capable when the additional resources demobilize

- The “pockets of the future” pilot projects need to scale up and become more prominent under Horizon 2:
- Regulatory requirements include participatory and place-based decision-making for land use zoning, disaster risk tolerances, and budgets
 - ◆ Increase civic literacy of citizens
 - Investment and innovation in local manufacturing, food production, and energy generation have accelerated
 - ◆ Scale up Fourth Industrial Revolution technologies that enable greater self-sufficiency and build significant local capacity
 - ◆ Improve use of renewables and recycled materials for construction and manufacturing

Horizon 3

System Paradigm: Co-evolving with nature

To reach Horizon 3, we have reframed our relationship with nature and have designed technologies, buildings, and communities to co-evolve with natural ecosystems, using biomimicry and regenerative design principles. This shift is made possible by embracing a new collective metaphor for urban design and development:

Ideal metaphor: All my relations (individual and collective)

“All my relations” is an Indigenous way of knowing based on profound interconnectedness. It reflects an awareness of the connections between all things: individuals, families, and communities; ancestors and future descendants; land, air, and water; and among all living creatures (Kaminski, 2013). As a guiding metaphor, it suggests a society not based on exploitation or a winner takes all mentality, but on the web of kinship that exists between all animate and inanimate entities.

In the ideal future of Horizon 3, disaster recovery becomes far less important as communities have been designed to adapt to the natural environment. Regenerative design means buildings and communities have a net zero or positive impacts on energy, water, and waste, and use non-toxic materials sourced from ethical, sustainable suppliers (International Living Future Institute, 2021). Although communities in Horizon 3 will likely still experience extreme weather, the dividends of the substantial investments in risk reduction and adaptation made during the transition period pay off in

- Horizon 3:
- We have adopted a new economic model that places a ceiling on extractive and exploitative growth and have vastly expanded the circular economy
 - Regenerative and adaptive architecture is the norm, with smart technologies embedded in buildings to adapt to natural variations in precipitation and temperature
 - We have democratized risk awareness and risk reduction measures, moving from a top-down government-centric model to community-level response plans and resilience hubs, with warning systems embedded in buildings and local manufacturing capacity for repairs
 - Our governance model has broken free from short-termism to consider current and future humans and non-humans in decision-making

Conclusion

The increasing impacts of disasters on Canadian communities threaten our social and economic well-being. Our historical and current practices of urban development and underinvestment in risk reduction have left many communities vulnerable to disasters. Although emergency management requires shared responsibility across the whole of society, governments play a critical role in defining the rules by which the system operates.

This research study explored the barriers and opportunities to reduce disaster risk in the existing system of disaster recovery by employing methods and analytical tools from the fields of systems thinking, foresight, and design.

Design thinking. The design process of iterating between divergent thinking and convergent analysis guided the overall approach to this research in exploring multiple dimensions of disaster recovery.

Systems thinking. Most of this research project focused on understanding the disaster recovery system in Canada, leveraging numerous analytical methods that explored how the system came to be, deconstructed it to uncover the deep structural forces holding it in place, identified stakeholder power dynamics and systemic patterns of behaviour, and mapped barriers and opportunities of system interventions. This analysis revealed the extent to which the existing system creates

substantial resistance to forward-looking disaster recovery but identified potential opportunities to implement change.

Foresight. This research included the identification of emerging issues and change drivers that may present new challenges or offer novel opportunities to transform the system of recovery. It demonstrated how the current disaster recovery regime is losing fit in a rapidly changing environmental, social, and political context. The study concluded with recommendations mapped onto a potential pathway to an ideal future in which communities work with, rather than against, nature.

Further research

Foresight in recovery. As outlined in the introduction, this study focused on phase one of the research project: understanding the barriers and opportunities for integrating systemic disaster risk reduction into municipal disaster recovery and considering how forces of change may disrupt the system. Phase two requires further research to design futures thinking processes for the unique context and constraints of recovery, and to prototype and test foresight interventions for integrating more risk reduction into recovery decision-making.

Indigenous experiences. This research drew considerable inspiration from Indigenous worldviews and ways of knowing, as well as from examples of Indigenous land use practices such as cultural burning. However, this study did not look at Indigenous experiences of disasters, which are substantially different from other communities due to the historical legacy and ongoing impacts of colonialism, displacement from traditional lands, relative remoteness, and inadequate housing and infrastructure. However, Indigenous peoples have unique cultural perspectives; alternative epistemologies, sources of knowledge, and relationships with the land; and diverse governance structures that can serve as an inspiration for reframing disasters in Canada. Further research into disaster risk reduction should be conducted with Indigenous communities with the aim of reducing the disproportionate impacts of disasters and improving resilience and self-determination.

Enabling conditions. There are many examples of communities that have implemented risk reduction measures during recovery, although usually focused on reducing recurrent risk (e.g., of another flood) and not systematically applied. Further research is recommended to identify the conditions that enabled

investments in risk reduction and figure out how to scale up successes to a systems level.

A hopeful future

Disaster recovery in Canada is currently failing to deliver systemic risk reduction. The system of recovery, given shape during the 1950s and formalized in 1970, no longer meets the needs of communities faced with the increasing risks and impacts of disasters. We need a new approach that capitalizes on the political and public attention during recovery to focus reconstruction efforts on *future* risk and resilience, not the past.

Foresight, which relies on creative and divergent thinking to explore possibilities, acknowledge uncertainty, and imagine alternative futures in which the fundamental structures of society may change, can help us shift

towards anticipatory urban design and offers techniques to elevate strategic conversations, challenge hegemonic visions of society, and build collective hope. Because disasters happen infrequently, especially at the local level, integrating the foresight and resilience into general municipal planning and financial tools will build the capacities needed for resilient recovery in advance of a disaster.

The growing dissatisfaction with the status quo from governments and communities is converging with the groundswell of grassroots activism and government attention to climate change adaptation. This alignment of political and public will may offer an auspicious opportunity to transform emergency management from reactionary response to proactive risk reduction and resilience.

The start to a better world is to believe that it is possible.

- Lily Tomlin



Photo from Adobe Stock

APPENDICES

APPENDIX A: INTERVIEW GUIDE

This research study involved semi-structured research interviews. The following questions were used as a guide to help structure these conversations.

Preamble

Thank you so much for agreeing to participate in this interview. Our conversation should last no more than 60 minutes, during which time we will discuss the current state of and emerging issues related to disaster recovery.

- Review the contents of the Interview Participant Consent Form and specific risks of the study.
- Confirm permission to conduct the interview.
- Confirm permission to record the interview.

Introduction

What is your name, position at your organization, and the role of your organization (if any) in disaster recovery?

Current state of disaster recovery

- In your experience, what are the strengths and limitations of the current legislative framework for disaster recovery in Canada?
- In your experience, who/what are our current disaster recovery policies and practices designed to service best? Who/what are left behind or left out? What events or ideas do you think have shaped the current system?
- From your perspective, what constraints / barriers do you see to making changes to the disaster recovery framework in Canada? What opportunities or leverage points do you see now or in the future?

Emerging issues and trends

- What trends or new developments in disaster recovery do you think are particularly interesting? What potential changes or disruptions are on the horizons that we should pay attention to?
- Imagine a future in which these trends play out in a positive way: what does that future look like and how did we get there?

- Imagine a future in which these trends play out in a negative way: what does that future look like and what new problems might emerge?
- What lasting impact might the COVID-19 pandemic have on disaster recovery?

Closing thoughts

- Is there anything else you would like to add?
- Is there anyone else you think I should talk to that could provide additional insights to this topic?

Conclusion

Thank you so much for your time and for sharing your thoughts and insights with me. I will send you a transcript of this discussion in the next two weeks to confirm that I captured your thoughts and to give you an opportunity to provide any clarifying details.

Clarifying questions

- Can you expand on that?
- Can you give me an example?
- Does that concept/thought/idea apply to other types of disasters? (in case the participant is focused on only one kind of disaster, such as a pandemic)

Alternate questions

- Depending on the interview participant (e.g., academic, practitioner, area of expertise, etc.), some of the following questions might be used instead.
- How might shifts in disaster recovery policies and practices affect the practice/discipline of emergency management in Canada?
- What is your experience with disaster recovery in Canada?
- In your professional experience, what is the greatest challenge for policymakers/decision-makers in disaster recovery? What is the greatest opportunity?

APPENDIX B: LIST OF POLICY DOCUMENTS

This study included a review of 30 provincial acts, regulations, and plans to understand the provincial legislative landscape and policy framework for disaster recovery.

Provincial policies

Province	Policies
Alberta	<ul style="list-style-type: none">Emergency Management Act, RSA 2000, c E-6.8 (2020)Government Emergency Management Regulations 248/2007 (2018)Local Authority Emergency Management Regulation 203/2018 (2018)Disaster Recovery Regulation 51/1994 (2006)Provincial Recovery Framework (2021)
British Columbia	<ul style="list-style-type: none">Emergency Program Act, RSBC 1996, c 111 (2020)Emergency Program Management Regulation, BC Reg 477/94 (2009)Local Authority Emergency Management Regulation, BC Reg 380/95 (2009)Compensation and Disaster Financial Assistance Regulation, BC Reg 124/95 (2017)Interim Provincial Framework for Disaster Recovery (2019)
Manitoba	<ul style="list-style-type: none">The Emergency Measures Act, CCSM c E80 (2022)Disaster Financial Assistance Policies and Guidelines (Private Sector) Regulation, Man Reg 177/99 (2003)Disaster Financial Assistance Policies and Guidelines (Public Sector) Regulation, Man Reg 178/99 (2020)Local Authorities Emergency Planning and Preparedness Regulation, Man Reg 159/2016 (2016)
New Brunswick	<ul style="list-style-type: none">Emergency Measures Act, RSNB 2011, c 147 (2020)Disaster Assistance to Municipalities Regulation, NB Reg 83-71 (2020)Emergency Planning for the Continuity of the Government of New Brunswick Regulation, NB Reg 84-7 (2021)
Newfoundland and Labrador	<ul style="list-style-type: none">Emergency Services Act, SNL 2008, c E-9.1 (2016)Newfoundland and Labrador Disaster Financial Assistance Program Policy Statement (2020)Disaster Financial Assistance Program Guidelines and Criteria (2020)
Nova Scotia	<ul style="list-style-type: none">Emergency Management Act, SNS 1990, c 8 (2014)Civil Emergency Planning Regulations, NS Reg 82/71 (2011)Emergency Welfare Services Regulations, NS Reg 19/70 (2016)Emergency Planning Committee Regulations, NS Reg 15/66 (2006)
Ontario	<ul style="list-style-type: none">Emergency Management and Civil Protection Act, RSO 1990, c E.9 (2019)Standards, O Reg 380/04 (2021)
Prince Edward Island	<ul style="list-style-type: none">Emergency Measures Act, RSPEI 1988, c E-6.1 (2020)PEI Disaster Financial Assistance Program Guide (2020)
Quebec ¹⁷	<ul style="list-style-type: none">Civil Protection Act, SQ 2001, c 76 (2001)Financial assistance and compensation for property owners and tenants*

17 Quebec policies and regulations were only available in French and were not included in this review due to the language limitations of the researcher.

Province	Policies
Saskatchewan	<ul style="list-style-type: none">The Emergency Planning Act, SS 1989-90, c E-8.1 (2021)The Provincial Disaster Assistance Program Regulations, 2011, RRS c E-8.1 Reg 2 (2011)

This study also included a review of numerous federal statutes, policies, and guidance documents. Of these, 16 were identified as key policies in framing the disaster recovery system in Canada and were analyzed in greater detail to uncover the underlying policy assumptions (see Appendix C).

Government of Canada Policies

Policy Type	Policy Document
Statutes	<ul style="list-style-type: none">Department of Public Safety and Emergency Preparedness Act, S.C. 2005, c. 10 (2005)Emergencies Act R.S.C., 1985 (2003)Emergency Management Act S.C. 2007 (2007)Emergency Preparedness Act R.S.C., 1985, c. 6 (2002)
Funding Programs	<ul style="list-style-type: none">Federal Damage Commissions (1948, 1950, 1954)Disaster Financial Assistance Program Guidelines (1970 and 2008)<ul style="list-style-type: none">Interpretation Bulletin 1: Mitigative Enhancements to Private InfrastructureInterpretation Bulletin 2: Timeframe for a Request for Financial AssistanceInterpretation Bulletin 3: Application of Mitigative Enhancements cost sharingInterpretation Bulletin 4: First Nations reservesInterpretation Bulletin 5: Cost-Sharing Formula Adjustment and Extensions of the Terms and ConditionsInterpretation Bulletin 6: Clarification of Audit RolesInterpretation Bulletin 7: 15% Mitigation EnhancementsInterpretation Bulletin 8: Innovative Recovery SolutionsInterpretation Bulletin 9: Emergency Financial Relief SystemsNational Flood Damage Reduction Program (1975)Joint Emergency Preparedness Program Guidelines (2010)National Disaster Mitigation Program Guidelines (2015)Disaster Mitigation and Adaptation Fund Applicant Guide (2018)
Policies	<ul style="list-style-type: none">Federal Policy for Emergency Management (2009)
Guidance Documents	<ul style="list-style-type: none">Federal-Provincial Conferences (1959-1962)Federal Emergency Response Plan (2011)Emergency Management Framework (2007, 2011, 2017)Emergency Management Strategy (2019)
Program Reviews	<ul style="list-style-type: none">2011-12 Evaluation of the Disaster Financial Assistance Arrangements Program: Final Report (2011)2016-17 Evaluation of the Disaster Financial Assistance Arrangements: Final Report (2017)Evaluation of the National Disaster Mitigation Program: Evaluation Report (2019)

APPENDIX C: POLICY ANALYSIS

The following table lists the federal policies included in a detailed policy analysis to identify policy assumptions. These policies were selected based on the longitudinal analysis of emergency management and policies most influential in shaping the practice of emergency management. In addition to the longitudinal analysis, the identification of key policies was informed by a research paper from Defence Research and Development Canada, which used a network analysis to identify the federal policies and legislation most used by federal departments to support their work in emergency management and resilience (Verga et al., 2013).

*For some older policies, original documents were not publicly accessible online. As a result, the analysis of these documents is based on newer editions or secondary sources.

Enabling Statutes	Funding Programs	Plans & Guidance
Emergency Preparedness Act (1985)*	Federal Commissions (1948, 1950, 1954)*	Federal-Provincial Conferences (1959-1962)*
Emergencies Act (1985)*	Disaster Financial Assistance Program (1970)*	Federal Policy for Emergencies (1995*, 2009)
Public Safety and Emergency Preparedness Act (2003)	DFAA Updates (2008, 2015)	Federal Emergency Response Plan (2011)
Emergency Management Act (2008)	Flood Damage Reduction Program (1975)*	Emergency Management Framework (2007, 2011, 2017)
	Joint Emergency Preparedness Program (1980)*	Emergency Management Strategy (2019)
	National Disaster Mitigation Program (2015)	
	Disaster Mitigation and Adaptation Fund (2018)	

Enabling Statutes

Emergency Preparedness Act (1985*)

*The version of this act that was publicly accessible dated from 2002, which had a few sections repealed and amended.

Description: This act established the statutory foundation for emergency preparedness, which focused on planning and training for response. This legislation closely aligns emergency preparedness with the interests and civil and national defence.

Assumptions:

- Civil defence and emergency preparedness are complementary, leveraging the same skill sets and approach
- Readiness for war means readiness for other types of emergencies

- The federal role is coordination and provision of assistance (not directive)
- The federal role in recovery is to provide funding
- Federal support should be requested when provinces are at capacity (wait to be asked model)
- Be ready to act once an emergency happens (reactive)

Emergencies Act (1985*)

*The version of this act that was publicly accessible dated from 2002, which had a few sections repealed and amended.

Description: This Act replaced the War Measures Act as the legislation that bestowed extraordinary powers to the federal government in the event of a national emergency. It identifies four potential causes of a national emergency: a public welfare emergency, a public order emergency, an international emergency, or a war emergency. For both public welfare and public order

emergencies, the Act balances potential jurisdictional conflicts with provinces by restricting federal authority where impacts are confined to a single province (unless the province has requested support). The Act enables specific extraordinary authorities depending on the type of emergency, and unlike provincial legislation for emergency powers, includes checks and balances in the exercise of authority through the requirement for a confirmation vote in Parliament, ongoing review at least every sixty days while the order is in effect, and a commission of inquiry to be initiated within sixty days of the end of the emergency to analyze the use of the emergency authorities.

Assumptions:

- Failure based model - federal support is available when capacity of lower levels of government has been exceeded
- Federal authority in emergencies only applies to cross-jurisdictional impacts and consequences, except for international or war emergencies
- Coordinated governmental efforts are most effective in handling emergencies
- Accountability is needed for emergency authorities to protect against abuses of power
- The consequences of the emergency may still require extraordinary authority, even once the immediate threat has passed
- Support for disasters will fall along jurisdictional lines; disasters have definitive boundaries

Public Safety and Emergency Preparedness Act (2003)

Description: This act established the Department of Public Safety and Emergency Preparedness and a Minister responsible for all public safety and emergency preparedness issues not assigned to another department, board, or agency.

Assumptions:

- Security threats pose a similar threat to life and property as natural disasters
- Closer alignment between security and emergency preparedness will address gaps in preparedness
- Some threats require specialized expertise (such as security), emergency preparedness is a generalist approach

Emergency Management Act (2007)

Description: The Emergency Management Act replaced the Emergency Preparedness Act and enshrined comprehensive emergency management (mitigation, preparedness, response, and recovery) at the federal level. Although many similarities exist between the two, the EM Act assigns a leadership role to the federal minister of emergency preparedness and holds other ministers accountable for emergency management responsibilities in their area, signalling a more proactive federal role.

Assumptions:

- Emergency management is a distributed, shared responsibility
- The federal role is coordination and continuity of government
- Emergency management requires a common approach and interoperability
- Failure-based model from other levels of government
- Wait to be asked model
- Reactive – be ready to act once an emergency happens
- Disasters have definitive boundaries

Funding Programs

Federal Damage Commissions (1948, 1950, 1954)

The analysis in this section is based on the description of the federal damage commissions found in the work of Bumsted (1987) and Robinson and Cruikshank (2006).

Description: Three disasters early in the development of emergency management in Canada established the foundation for the federal government’s role in and approach to recovery: the 1948 Fraser River flood, the 1950 Red River flood, and Hurricane Hazel in 1954. In each disaster, based on an appeal for assistance from the premier of the affected province, the federal government agreed to assume some of the costs of recovery because of the widespread nature of disaster and recognition a province could not afford all costs on its own. In the absence of a policy, the federal government appointed a commission to assess damage and determine the price tag for the disaster, the amount

upon which the federal cost-share would be based.

Assumptions:

- Some disasters exceed provincial capacity and require financial support from the federal government
- The role of governments is in infrastructure and ensuring basic needs are met
- Damage assessments reveal the cost of disaster recovery
- Recovery should address only that which was damaged by the disaster
- Individuals, charities, and social solidarity are important components of the disaster recovery ecosystem
- No one should benefit or profit from a disaster
- Recovery should only address damage caused by the hazard

Disaster Financial Assistance Arrangements (1970)

Description: The DFAA program was created in 1970 to establish the criteria, process, and eligibility for federal cost sharing for disaster expenses above a specific per-capita threshold. The program guidelines primarily outline the different types of eligible and ineligible expenses.

Assumptions:

- Individuals are responsible for purchasing insurance and preventing recurrent damage
- Federal government is assistance of last resort, based on exceeded capacity (failure-based model)
- The role of government is to ensure basic functions and minimum standards
- No one should profit from a disaster
- Standardization is important, the same criteria can be applied in all circumstances (with consideration for exceptional circumstances)
- The restoration of property restores community and economic function to pre-disaster levels
- Jurisdictions faced with a disaster have the capacity to meet all program requirements and will act with rational objectivity
- Disasters have definitive boundaries and timelines

for response and recovery

- The link between hazard and damage is clear

Disaster Financial Assistance Arrangements Updates (2008, 2015)

Description: The Terms and Conditions of the DFAA program were updated in 2008 to restrict funding to natural disasters only and to include a 15% mitigation allowance in recognition of the importance to build back better and reduce vulnerability. They were further updated in 2015 to increase the cost-sharing formula and index it to inflation so the program focused on funding disaster response and recovery for events of a certain size.

Assumptions:

- Disaster damages are incurred immediately (in a defined disaster period) and are immediately visible and detectable
- Recovery expenditures occur quickly (within 5 years)
- Incremental recovery takes place in 2 years
- Federal role in recovery is financing
- Federal funding through the DFAA should be funding of last resort
- Impacted groups should not benefit or profit from recovery
- Incremental improvements can reduce vulnerability
- Standardization increases efficiency and allows for fairness and equality
- Loss is visible and quantifiable
- Property damage is the greatest financial cost of disasters
- The restoration of property restores community functioning to pre-disaster levels

Joint Emergency Preparedness Program (1980*)

**The earliest publicly-available program guidelines were from 2010.*

Description: JEPP was a reincarnation of the Financial Assistance Program that had existed in various forms since the origins of civil defence, an acknowledgement that the federal government had some responsibility to fund the development of emergency preparedness

capacity across the country. Eligible expenses under JEPP expanded from the tangible assets (such as equipment and supplies) that were the primary focus of earlier financial assistance programs (McDonald, 1998) to include training, exercises, hazard assessments, and the development of emergency plans. Aside from routine maintenance and program administration, public alerting systems, and capital projects, most emergency preparedness activities were eligible for JEPP funding. However, the program was explicitly designed to enhance national capacity for response.

Assumptions:

- Response capabilities saved lives and reduced the harm and damage caused by emergencies
- Differing capacities exist across the country and federal programs should enable equitable access
- Emergency management requires investments from multiple levels of government
- Emergency management projects have definitive start and end dates
- Provinces are responsible for developing their capabilities for emergency response

National Flood Damage Reduction Program (1975)

Because the program guidelines were not publicly available, this analysis is based on an article published in 1976 by the one of the officials responsible for developing and implementing the program, J. P. Bruce (Bruce, 1976).

Description: The National Flood Damage Reduction Program established the principles for the joint management of flood risk across the country. The federal government agreed to cost-share flood mapping as the initial step of coordinating action to reduce flood risk. The intention of the program was to increase awareness of flood risk among governments, developers, and the public and reduce development on flood plains.

Assumptions:

- Linear decision-making from risk assessment to collective agreement to joint action
- Risk awareness will lead to risk reducing behaviours
- Post-disaster financial assistance enables a moral hazard that encourages the development in at-risk areas

- Individuals are responsible for choosing to take on known risks

National Disaster Mitigation Program (2015)

Description: The National Disaster Mitigation Program was established in 2015 with \$200 million in funding to allocate across the country over the following five years to address flood risks. The program followed a linear model where projects would move through four streams, from Risk Assessments to Flood Mapping to Mitigation Planning to Investments in Non-Structural and Small Structural Mitigation projects. In some circumstances, applicants could apply to a later stream without completing the previous if they could prove they had equivalent pre-existing data. The program was based on a 50/50 cost share model with provinces and 75/25 with territories.

Assumptions:

- Flooding poses the most significant risk to Canadian communities
- Non structural mitigation can be achieved more cheaply than than structural mitigation
- Proactive investment in mitigation can reduce the cost and impact of disasters
- Provinces and communities have pre-identified mitigation projects that just need funds
- Federal officials can objectively assess and determine the value of projects
- Provinces must prove need

Disaster Mitigation and Adaptation Fund (2018)

Description: The Disaster Mitigation and Adaptation Fund is a program run by Infrastructure Canada to cost-share funding for small (\$1-20 million) and large (over \$20 million) natural and structural infrastructure mitigation projects to improve the resilience of the built environment to impacts of climate change and the natural hazards. The program includes all types of natural hazards (including seismic and geological hazards).

Assumptions:

- Nature is the source of disasters
- Human intervention and ingenuity can reduce the risks posed by natural hazards on communities

- Investing in mitigation will reduce government fiscal liabilities for recovery
- Structural mitigation can effectively reduce risks from natural hazards even in an era of climate change
- Natural infrastructure can also reduce risks from hazards
- The goals of mitigation include reducing disaster mortality, damage to critical infrastructure, economic disruption, and disruption of essential services
- Communities should be consulted about infrastructure projects
- Quantitative data enables objective and comparable assessments
- Projects able to most reduce risk across human impact, economic disruption, and essential services are considered the strongest applications (risk-based approach, not equal access for all communities)

Plans and Guidance

Federal-Provincial Conferences (1959-1962)

The analysis in this section is based on the description of the federal-provincial conference outcomes found in McConnell's detailed work on the history of emergency management in Canada (1998).

Description: In the 1960s, the federal government took on a more central and authoritative role in emergency planning, integrating the parallel goals of civil defence and continuity of government, in response to the threat of nuclear war. It created an Emergency Measures Organization in the Privy Council Office to coordinate the emergency planning activities across the federal government. Because the federal government did not have the authority to direct provinces on their role, a series of federal-provincial conferences were held to work out the division of responsibilities. Provinces agreed to accept the following civil defence tasks in the event of war, with the understanding they could use these assets and capabilities for natural disasters too: preservation of law and order, reception services for evacuees, medical services, repair of highways, support to municipalities to repair of sewers and water infrastructure and conduct firefighting operations, repair of electrical utilities, and training civilians.

Assumptions:

- Provinces were responsible for the consequences of a war (damage), not proactive activities (creating bunkers, emergency communications, etc. to minimize impact)
- Government-led recovery focused on repair to infrastructure
- The government has a role in providing for the immediate basic needs of populations affected by a disaster
- If the federal government wanted to ensure a certain level of preparedness, it had to assume much greater responsibility for planning

Federal Policy for Emergency Management (2009)

Description: This policy derives its authority from the Emergency Management Act and outlines the responsibilities of each federal Minister for implementing an emergency management program within their ministry/institution. These requirements include emergency plans, risk assessments, training, exercises, continuous improvement, and some planning for mitigation and recovery. Ministers must also consider how their department will assist provinces and territories with their emergencies. The policy recommends a generic approach to “all hazards”, based on a risk assessment.

Assumptions:

- Primary role of federal emergency management is continuity of government and coordination of information sharing across ministries
- Federal ministries may be called upon to assist provinces and territories when they are “overwhelmed” (reactive model; wait to serve)
- Risk assessments correctly identify hazards, risks, impacts, and vulnerabilities
- Standardized response mechanisms work across most hazards

Federal Emergency Response Plan (2011)

Description: This document describes how the federal government organizes itself to respond to emergencies, dealing primarily with governance and coordination structures, outlining the roles and responsibilities of committees, and describing how information is intended to flow across government.

Assumptions:

- Emergencies are local in nature
- Limited federal role in emergency response
- Failure-based model from other levels of government
- Wait to be asked model
- Response requires coordination across existing government functions
- Emergency Management Framework (2007, 2011, 2017)

Description: The Emergency Management Framework (which was updated with minor changes in 2011 and 2017) describes the common aspects of federal, provincial, and territorial emergency management systems to harmonize and enhance the collective approach to emergency response.

Assumptions:

- Emergency management is government led
- Response is most closely linked to the protection of life
- The ultimate goal is the protection of life
- Recovery is a return to readiness and a chance to make incremental improvements before the next disaster
- Linear progression from response to recovery to mitigation
- Risk environment is changing, but the past is the best source of information
- Disasters overwhelm local capacity
- Wait to be asked model
- Reactive – be ready to act once an emergency happens
- Impacts of disasters may transcend boundaries and jurisdictional roles

Emergency Management Strategy (2019)

Description: The Emergency Management Strategy integrated the priority actions outlined in the United Nations Sendai Framework into the priorities of Federal, Provincial, and Territorial governments for a Canadian context, and identified a common set of priority actions to advance disaster risk reduction and emergency management with the goal of building societal resilience.

Assumptions:

- Broad global trends are increasing disaster losses
- Disasters impact populations differently and can exacerbate pre-existing vulnerabilities
- Resilience is a system attribute
- Necessary to expand responsibility beyond governments
- Cannot undertake risk reduction without understanding risk (quantitative knowledge of risk more highly valued)
- We can reduce disaster risk and this is the most effective type of emergency management
- Disasters negatively affect social, economic, and health outcomes
- Share the financial risk of disasters
- Governments keep populations safe during emergencies (hero role)
- Because of the diversity of actors, alignment and interoperability are necessary to coordinate action (top-down structure imposed)
- Impacts of disasters transcend jurisdictional boundaries

APPENDIX D: A NOT SO SHORT HISTORY OF EMERGENCY MANAGEMENT IN CANADA

This appendix provides the full longitudinal analysis of policy developments in emergency management in Canada, a summary of which can be found in Chapter 3. It provides greater details of the political influences and key events that have shaped the field of emergency management.

Formative period

The formation of civil defence concepts and policies occurred against a backdrop of war: initially the advent of the Second World War, and later the threat of nuclear war with the Soviet Union. Unlike the First World War, the technological advancements of bombers, submarines, and intercontinental ballistic missiles meant the theatre of war was no longer confined to the continent on which it originated, and Canada faced the very real possibility of attacks against its civilian population.

In preparation, the federal government established the Interdepartmental Air Raid Precautions Committee to plan for the “non-military measures which should be adopted against the possibility of air attacks, including gas attacks, and the coordination of the actions of the various authorities concerned, both private and public” (National Archives, 1938 as cited in McConnell, 1998, p. 1). Although limited to “non-military measures”, this planning was considered an essential component of national defence and therefore a federal responsibility. As the most urgent impact would be to human health and well-being, the Department of Pensions and National Health chaired the planning committee and later the implementation, although in close collaboration with the Department of National Defence (McConnell, 1998; Lindsay, 2009).

Originally, only provinces and municipalities deemed at risk of attack were included in the Air Raid Precautions (ARP) program. This included Nova Scotia, New Brunswick, British Columbia, Quebec, and Ontario (McConnell, 1998). The provinces set up committees to mirror the federal structure and were responsible for helping to coordinate and advise municipalities on developing local organizations. The local organizations consisted of volunteers and included auxiliary

firefighters, public utility workers, first aid workers, and air raid wardens empowered to act as auxiliary police (McConnell, 1998, p 4). Because the program was federal in nature, provinces negotiated for federal funding to cover provincial salaries and administrative fees, and the federal government purchased most of the equipment supplied to local organizations and stockpiled by provinces. By the end of World War II, approximately 280,000 workers – primarily volunteers – participated in ARP programs across 775 communities (McConnell, 1998, p. 9). Though local organizations never had to respond to an air raid, ARP volunteers did respond to forest fires in New Brunswick and explosions at the Naval Arsenal in Nova Scotia, and some provincial governments purchased the firefighting equipment from the federal government at the end of the war to build volunteer fire departments in smaller communities (McConnell, 1998).

After the war, the federal and provincial governments quickly dismantled the program, although some believed civil defence should form a permanent part of Canada’s national defence strategy (Phillips, 1946). The rapid rise of the Soviet Union breathed life back into the program. The federal government consulted provinces to discover pain points and visited Western European countries to study their programs (McConnell, 1998). Though the structure of the revised civil defence program remained largely true to its World War II roots, the process of formalization established several fundamental principles:

- Planning responsibilities would be tasked to federal departments in addition to their existing mandates (decentralized planning);
- Civil defence would be led by a small agency designed to coordinate and direct planning efforts, which could rapidly expand if needed (central coordination);
- The implementation of emergency plans and on the ground response would be led by volunteers at the municipal level (local implementation); and
- Response capabilities had to be able to scale up quickly in the face of an emergent threat (rapid

expansion) (McConnell, 1998, p. 25).

These principles continue to characterize the practice of emergency management in Canada today.

The successful Soviet Union test of an atomic bomb in 1949 and the outbreak of the Korean War in 1950 added a sense of urgency to the development of civil defence. Two Dominion-Provincial Conferences, held in 1950 and 1951, clarified the roles and responsibilities of each level of government, each of which had established its own civil defence organization by this time (Henstra, 2011). At provincial insistence, the federal government agreed that civil defence resources could be used to respond to natural disasters. With this agreement in place, the Department National Health and Welfare again assumed responsibility for implementing the various plans under the civil defence umbrella (McConnell, 1998). The Civil Defence Financial Assistance Program was established in 1952 to support provinces in improving training, equipment and clothing, construction for civil defence, and operational equipment with peacetime uses. The funding was based on a cost-share model, with the federal share rising from 50% to 75% by 1959 (McConnell, 1998, p. 37).

General development continued over the next decade with the formalization of plans and training, creation of equipment stockpiles and emergency warning systems, and updated risk assessments based on the ever-evolving military capabilities of the Soviet Union. The Department of National Health and Welfare published numerous pamphlets and research reports to support the planning efforts across the whole society, including individuals.

The attention paid to civil defence rose and fell based on key events associated with the Cold War; it heightened during flash points such as the Cuban Missile Crisis in 1963 and lessened during periods of détente.

Early recovery

The 1948 Fraser River flood was the first sudden onset¹⁸ disaster to receive federal financial assistance after the government declared it a “national emergency” due to the impact on critical supply chains and agreed to fund 75% of relief costs and 50% of rehabilitation costs for eligible expenses (Bumsted, 1987). In the absence of any other policy for disaster recovery, this approach

established the precedent for disasters of a certain magnitude to warrant federal funding; at the time, most disaster relief came from private charitable donations (Bumsted, 1987).

During the 1950 Red River flood, the Manitoba government lobbied hard for a declaration of a national emergency to gain access to federal funding support. Ultimately, Prime Minister St. Laurent promised federal aid “upon the basis of this being *beyond your capacity to deal with alone* [emphasis added]” (St. Laurent, 1950, as cited in Bumsted, 1987, p. 354), a principle which still underlies disaster financial assistance policy today. Concerned about potential fiscal liabilities, St. Laurent established a commission to conduct an initial damage assessment to which the federal funding formula would apply, the same approach used during the Fraser River flood two years earlier. The assessment only considered structural damages, not household contents or loss of income. The government established maximum values for homes (except for vulnerable populations, which included pensioners, widows, and war veterans), refused to allow upgrades to properties, and expected citizens to be responsible for their own recovery (Bumsted, 1987). While the government provided the minimum to restore habitability, most recovery funding for individuals came from donations to the Manitoba Flood Relief Fund, which raised nearly \$10 million¹⁹ (Bumsted, 1987).

In 1954, Hurricane Hazel devastated the Greater Toronto Area and required a substantial recovery effort. Once again, the federal government agreed to cost-share response and rehabilitation expenses while the province took the lead in recovery. Notably, Ontario Premier Robert Frost insisted disaster relief would not be considered a “right”, determined to emphasize individual responsibility and avoid creating a sense of entitlement (Robinson & Cruikshank, 2006, p. 47). The model was based on existing notions of welfare, that assistance “should fall somewhat short of what might be needed” (Robinson & Cruikshank, 2006, p. 48). Individuals had to pay the first \$100 and 20% of all costs beyond that threshold (Robinson & Cruikshank, 2006). To refurbish their homes and replace contents, survivors turned to the Hurricane Relief Fund and private donors rather than the government.

Each of these events established important precedents for when and how senior levels of government would

18 The drought across the Prairies in the 1930s and the economic depression also received federal assistance.

19 Equivalent to \$121 million in 2022 dollars (according to the Bank of Canada Inflation Calculator)

cost-share disaster relief and reconstruction activities for major disasters in Canada, although a formal policy did not exist until 1970 with the creation of the Disaster Financial Assistance Arrangements.

An existential threat

This government believes that civil measures to prepare for the possibility of nuclear war must be taken as seriously as are military measures. Civil defence can serve a deterrent purpose by demonstrating to a potential aggressor that Canada is determined to survive even a nuclear war and carry on as an organized society and united nation in the face of the utmost perils and hardships – Prime Minister Diefenbaker, 1959.

The development of the hydrogen bomb (80 times more powerful than the atomic bombs dropped on Hiroshima and Nagasaki) and the intercontinental ballistic missile shifted several important planning assumptions for the federal government (McConnell, 1998). Previously, governments expected civilian populations to shelter in place during an air strike and then be on hand to assist the wounded, put out fires, and in general organize their own response and recovery. The devastating damage of a hydrogen bomb and minimal warning time associated with a missile delivery system posed an existential threat to Canada. With so much of Canada’s population and industry concentrated in a few urban centres, targeted strikes could take out its government and economic capabilities in a matter of days.

An Interdepartmental Working Group on War Measures was established to gauge the readiness of the civil defence program for nuclear war and concluded that “there does not appear to exist in any Canadian city a Civil Defence organization capable at present of meeting effectively the challenge of nuclear war” (1956, as cited in McConnell, 1998, p. 46). The committee identified several weaknesses, including the reliance on persuasion to encourage other levels of government to do their parts, the lack of funding from provinces and municipalities for civil defence, the inconsistent standards and progress across the country, and the insistence by some provinces that civil defence was a federal responsibility.

Alarmed by the devastating potential of nuclear war and the deteriorating state of Canada’s civil defence organizations, the federal government assumed greater responsibility for civil defence in 1957 (McConnell,

1998). It created the Emergency Measures Organization in the Privy Council Office to strengthen emergency planning, with a focus on preparing for the continuity of government. The persuade-and-encourage approach of the earlier civil defence era was replaced by more centralized planning, with a focus on technical elements such as the creation of bunkers, regional headquarters, and emergency communications systems.

Through a series of conferences between 1959 and 1962, the federal government clarified the roles and responsibilities – and funding arrangements – with the provinces, each of which subsequently passed their own emergency measures legislation and established emergency measures organizations to fulfill their duties (McConnell, 1998; Henstra, 2011). The division of responsibilities during this period crystallized the focus of government activities during recovery: provinces agreed to manage reception services for evacuated populations, clear and repair highways and road infrastructure, repair damage to municipal water and wastewater systems, repair electrical utilities, and organize debris removal (McConnell, 1998, p. 54). These activities still form the primary governmental considerations for recovery activities, with a particular focus on infrastructure restoration.

Growing complacency

In the late 1960s, with international tensions cooling and the risk of nuclear war fading, the government transferred the Emergency Measures Organization to the Department of National Defence. Between 1968 and 1974, its funding fell by more than 70% (McConnell, 1998), a reflection of the federal government’s waning interest and shifting societal values. As a result of the funding cuts and changing priorities, many provinces reduced their emerging planning capabilities, with Ontario going as far as disbanding its Emergency Measures Organization (Henstra, 2011).

The most influential domestic event during this period was the October Crisis of 1970, where members of the *Front de libération du Québec* (an armed Quebec independence movement responsible for a series of bombings throughout the 1960s) kidnapped several prominent political figures and murdered Quebec cabinet minister Pierre Laporte (McIntosh & Cooper, 2020). In response to a request for assistance from Quebec’s premier, Prime Minister Pierre Trudeau invoked the War Measures Act to suspend civil liberties and deployed the

armed forces to support local police (Lindsay, 2009).

In the aftermath of the crisis, the federal government commissioned a report to examine its ability to respond to such events. The Dare report, so named after its lead author Lieutenant-General M. R. Dare, highlighted two key shortcomings: underinvestment in emergency planning and the agency’s location in the Department of National Defence rather than connected to centralized authority. According to the report, emergency preparedness capacity had been “developed as far as past and present allocations of resources have permitted...the general state of national preparedness has fallen below its realizable and desirable potential” (Dare Report, 1972, as cited in McDonald, 1998, p. 74). This analysis set the groundwork for some important developments in the 1980s, but the short-lived nature of the October Crisis and an economic recession closed the window on major policy changes.

Formalizing financial assistance

Despite the declining budgets and fading prominence of emergency measures organizations in the 1970s, this decade saw the development of two important programs. First, the Disaster Financial Assistance Arrangements formalized the federal-provincial cost sharing formula for eligible response and recovery costs for disasters that reached a specific per capita loss threshold. These arrangements are still in place today, with few alterations, as the primary disaster recovery policy at the federal and provincial levels.²⁰

Second, the National Flood Damage Reduction Program was created in 1975 as the federal government recognized its growing financial liabilities for flood recovery: “If it [the federal government] was going to assume some financial responsibility for floods, it ought to take an interest in their prevention” (Robinson & Cruikshank, 2006, p. 43). Already the federal government had provided money to several flood mitigation projects, including the Winnipeg floodway and Fraser River dikes (Bruce, 1976). This new program established a cost-share program with provinces to undertake joint flood-mapping and risk reduction measures (Bruce, 1976). Modelled after the cooperative approach of the Canada Water Act, the Flood Damage Reduction Program established a series of principles

20 The first significant change to the program occurred in 2008, when a portion of damage costs could now be applied to mitigation and the program was restricted to natural disasters only. The second change came in 2015, when the government raised the cost thresholds for the first time since 1970 and benchmarked them to inflation rates.

that included agreement on flood mapping, raising public awareness of flood risk, refusal of disaster financial assistance to new flood plain developments once maps were made public, and agreement to restrict development in high-risk areas (Bruce, 1976). This was the first example of a proactive approach to disaster recovery because it prioritized areas susceptible to flooding; however, the federal government ended the program in 1999 (Thistlethwaite & Henstra, 2017).

Technological hazards

The partial meltdown of the nuclear facility at Three Mile Island in the United States in 1979 revived public interest in emergency planning, particularly in Ontario due to its nuclear reactors. Later that year, a train derailment that caused a chlorine tank to rupture in Mississauga required the evacuation of more than 200,000 people (Lindsay, 2009). These events were catalysts for reinvigorating emergency planning at the federal and provincial levels. The expansion to more technological hazards required new partnerships between provincial ministries, local governments, and industry. Additional international disasters, including the Chernobyl nuclear reactor meltdown in Ukraine and the Bhopal chemical disaster in India, kept industrial risks in the public eye and led to the creation of the Major Industrial Accidents Council of Canada, one of the first initiatives designed to facilitate inter-agency emergency planning across multiple sectors (Henstra, 2011).

In 1988, the federal government passed the Emergency Preparedness Act and the Emergencies Act, which replaced the antiquated and controversial War Measures Act. These two pieces of legislation provided the statutory basis for emergency management at the federal level and formalized the preparedness and response focus of the time.

At the international level, new terminology around “all-hazard” and “comprehensive” disaster planning gained traction. An all-hazard approach suggested generic emergency plans could be developed in response to any type of disaster, with specific activities customized based on the circumstances, while comprehensive planning meant focusing on the entire spectrum of mitigation, preparedness, response, and recovery (Henstra, 2011).

As a result of the increasing global impacts from disasters in the late 1980s, the United Nations General Assembly designated the 1990s as the International Decade for Natural Disaster Reduction. Midway through the decade, the First World Conference on Natural Disasters was held in Yokohama, Japan, which led to the adoption of the Yokohama Strategy for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness, and Mitigation. The Strategy recognized the importance of prevention, mitigation, and preparedness in achieving the goals of reducing disaster impacts, and the increasing risk from growing globalization and the interconnectedness of nations and societies (United Nations, 1994).

The changing hazardscape

Several incidents in the early 2000s redefined the nature of risk and led to significant change. First, the anxiety of Y2K prompted greater inclusion of business continuity planning in many governmental and private sector emergency management programs, with a focus on the restoration of and redundancy for information technology systems. Only a year later, the 9/11 terrorist attacks on the United States of America cast a long shadow on the emergency management domain and focused political attention on the security aspect of preparedness. Then in 2003, the SARS outbreak in Toronto highlighted the weaknesses in Canada’s emergency planning for pandemics (Lindsay, 2009). On the international level, the shocking devastation caused by the 2004 Indian Ocean tsunami and Hurricane Katrina in 2005 kept emergency management in the headlines and on the radar of politicians.

In response, the federal government made substantive structural changes. The government created the ministry of Public Safety Canada in 2003 to strengthen coordination across border security, criminal intelligence, and emergency management (Public Safety Canada, 2020). This action set the stage for the 2007 *Emergency Management Act*, which formalized the statutory foundation for comprehensive emergency management that included recovery, although the legislation and ministerial responsibilities still primarily dealt with issues of preparedness and response. The *Emergency Management Act* marked the formal separation of emergency management from national defence²¹ at the

21 The 1988 *Emergency Preparedness Act* included a civil preparedness mandate for war and armed conflict in addition to other types of emergencies.

federal level, and the creation of Public Safety Canada provided a permanent home for the federal emergency management function, which had previously moved between ministries at least once a decade (Lindsay, 2009; McConnell, 1998). In addition, the government formed the Public Health Agency of Canada in 2004 to monitor emerging threats from infectious disease, prepare for and respond to public health emergencies, and promote public health (Public Health Agency of Canada, 2021). The creation of two new ministries marked a turning point where emergency management could no longer be an afterthought.

The United Nations held the Second World Conference on Natural Disasters in 2005 in Hyogo, Japan. In the lead up, the United Nations Inter-Agency Task Force of Disaster Reduction conducted a review of the Yokohama Strategy from the previous decade. This assessment used strong language to frame the challenge facing the nations of the world: “Unless disaster risk reduction becomes part of countries’ development plans and programmes at all levels, progress in social and economic development will continue to be eroded by recurring disasters” (United Nations, 2004, p. 4). The outcome of this conference, the Hyogo Framework for Action, urged governments over the next ten years to make disaster risk reduction a priority, to undertake risk assessments and invest in early warning systems, to reduce risk, and to be prepared to respond (UNDRR, 2005). It also connected the increasing frequency and impacts of natural disasters to climate change and warned of growing future risks.

Austerity again

The global financial downtown of the 2008-2010 recession brought in a new era of fiscal austerity, which significantly affected emergency management. In 2012, the federal government closed the Canadian Emergency Management College and ended the Joint Emergency Preparedness Program (JEPP), the two main programs for the federal government to cost-share pre-disaster investments in emergency management capacity across the country. The cuts forced provinces to assume the full cost of emergency preparedness in their jurisdictions.

The 2013 Southern Alberta floods cost the federal government over \$1 billion in DFAA funding and the insurance industry over \$1.7 billion (Public Safety

Canada, 2021a) and provided additional incentive for the government to limit its fiscal liabilities. Over the next two years, it pressured the insurance industry to introduce residential flood insurance to the Canadian market (Thistlethwaite, 2017), reducing its own responsibilities as DFAA funding only applies to events for which insurance is not reasonably available²². In addition, the government adjusted the cost-share formula for the DFAA program for the first time, increasing the thresholds for events to qualify for federal funding and indexing the thresholds to the Consumer Price Index so they rise each year (Public Safety Canada, 2022).

An ounce of prevention...

Despite efforts to reduce government expenditures on disasters, the costs of recovery continued to mount, once again focusing the attention of senior governments on hazard mitigation. In 2015, the federal government announced \$200 million in funding for the National Disaster Mitigation Program²³, aimed at reducing the risk of Canada’s most common and costly disaster: floods (Public Safety Canada, 2021b).

The Third World Conference on Natural Disasters took place in Sendai, Japan, in 2015. The resulting Sendai Framework for Disaster Risk Reduction, which formalized the importance of risk reduction during the recovery process across short, medium, and long-term horizons, established seven global targets for disaster risk reduction. In addition to reducing disaster mortality, the number of people affected, direct economic losses, and damage to critical infrastructure and disruption of basic services, nations were encouraged to develop national *and local* disaster risk reduction strategies, enhance international cooperation, and increase early warning systems (UNDRR, 2015). Canada adopted the Sendai Framework in 2015.

The 2017 update to the Emergency Management Framework for Canada referred to many of the principles in the Sendai Framework. Two years later, the Federal, Provincial, and Territorial Ministers for emergency management agreed to the first Emergency Management Strategy for Canada to establish priorities for better risk assessments, risk reduction, and recovery

22 While overland residential flood insurance is not yet available for high-risk areas, the federal government is actively pursuing options for a national flood insurance program (IBC, 2019b; Trudeau, 2021).

23 The National Disaster Mitigation Strategy was developed in 2005 but contained no dedicated funding until 2015 (Public Safety Canada, 2005; Public Safety Canada, 2021b).

(Public Safety Canada, 2019a). Similarly, provinces have also made changes towards more programmatic mitigation, rather than one-off capital projects. Quebec introduced a new disaster relief program in 2019 that established a relatively low cap (up to 50% of damages or \$100,000) for properties in floodways, but triggered relocation funding once households reached that limit (Krishnan & Montpetit, 2019), while the 2022-23 provincial budget for British Columbia established a year-round wildfire service and expanded mandate for preventative fire measures such as prescribed burns (Government of British Columbia, 2022).

The substantial disaster costs of the past have garnered public and political attention and reinforced the economic incentives for mitigation. Although existing programs remain rooted in the past, there are growing signals of the potential for more substantial change to Canada’s reactive approach to recovery.

APPENDIX E: RECOVERY SYSTEM

STAKEHOLDERS

This section provides a more detailed description of the key stakeholders in the recovery system and the levers each stakeholder can access to influence or change the behaviour of other actors. Many of these relationships have elements of reciprocity and dynamism, where choices made by one stakeholder send ripple effects throughout the entire system.

Governments

Municipal. Municipalities control land use planning and zoning decisions within their jurisdiction. They build and maintain critical infrastructure and utilities, deliver essential services such as police, fire, and transit, conduct building inspections to monitor compliance, promote economic development, and provide social support services. Municipal policy tools include development and building permits; bylaws; relationships and advocacy with other orders of government and industry; business licenses; property tax, service fees, and fines; and subsidies. Approximately half of municipal income comes from property taxes, although this varies by province (Kitchen et al., 2019). The capacity and resources of municipalities differ widely, and not all municipalities provide all the above services, especially small or rural municipalities.

Provincial. Provincial jurisdiction spans land use and property, building codes, natural resource management and development, insurance, real estate, and emergency management. Through legislation, provinces create municipalities and delegate specific authorities and responsibilities to them. Provinces provide healthcare and some social services, build and maintain provincial highways, and fund municipalities to deliver many types of social services. Provincial policy tools include legislation and regulation; regulatory oversight and compliance monitoring; resource extraction licenses and permits; taxation, levies, and fees; fines and penalties; and subsidies.

Federal. The federal government has jurisdictional authority over national parks and federal lands, navigable waterways, interprovincial utilities and critical infrastructure, and for relationships with Indigenous peoples and reserves. It develops standards and

guidelines for adoption by provinces (such as model building codes) and cost-shares funding for large infrastructure and mitigation projects and disaster recovery. Though its role in recovery is limited primarily to financial support, it wields significant influence over other levels of government by establishing eligibility criteria for funding. The federal government can also exercise soft power through developing guidelines and frameworks and act as a convenor for multi-disciplinary stakeholder groups.

Industry

Real estate developers. Developers create real estate development proposals and oversee construction of new buildings, complexes, and subdivisions. They maintain close connections with municipal governments and exert substantial influence through lobbying at the local and provincial level (Bodgan, 2020). Developer and municipal financial interests often align as newer and more expensive developments attract higher municipal fees and property taxes. Once a building is occupied, developers have a limited warranty period (often only a year), then typically have no further financial stake.

Insurance. The insurance industry plays an important role in the financial transfer of risk. Insurance companies help to signal risk to property owners and renters by charging higher premiums and deductibles for properties in riskier locations. They can help incentivize property-level mitigation by offering premium reductions to policyholders who implement such measures. Insurance can use levers such as lobbying, advocacy, product offering and coverage, and premiums to influence the system.

Financial institutions. Financial institutions such as banks have substantial power because of their role in real estate lending. They can demand proof of insurance as a condition for loans. For individual mortgages, banks require insurance for some hazards, notably fire. For commercial entities, they often require more comprehensive insurance. Although they can exert significant influence, banks play a more conservative role.

Small businesses. Small businesses contribute to the economic vitality of communities and are an important source of employment, goods and services, and income for municipalities through commercial property taxes. They have limited power except through collective action via industry associations and chambers of commerce.

Construction contractors. Responsible for much of the reconstruction work in the aftermath of a disaster, construction contractors have some influence over the cost and speed of physical reconstruction, subject to market forces of supply and demand. They are regulated by provinces and municipalities through building codes, business licenses, permits, and inspections. Contractors have a significant influence on the recovery experience of individuals but less power over the system as a whole.

Nonprofits and social profits

Disaster charities. Established charitable organizations provide social, financial, and reconstruction services to individuals and (sometimes) small businesses in the aftermath of a disaster. Many of these organizations operate at a national level and may or may not have a permanent presence at the provincial or local level. Subject to federal regulation through the Canada Revenue Agency, charities help to fill gaps in the system and advocate for those affected by disasters. Charities can use lobbying, advocacy, and media campaigns to influence other stakeholders in the system.

Community organizations. Community organizations exist at the local level to provide services to residents. They play a critical role as social connectors and hubs of community activity, but often are underappreciated during recovery because they do not have a predefined function. As such, they have little power in the system but can suffer significant financial loss during disasters when their traditional funding sources are diverted to disaster recovery efforts.

Media

Media. The media helps to shape public perception and discourse in disasters, which in turn can influence political decision-making. Media coverage can draw attention to critical issues and inequalities that may spark policy change, or it can focus on the short-term impacts. A study by Thistlethwaite et al. found that Canadian media coverage of flood disasters rarely influences public policy because of its myopic focus on

sensational images of destruction and human-interest stories rather than the policy failures that contribute to disaster risk (2019). Media coverage has a substantial impact on charitable giving for disasters, which affects charities and community organizations alike.

Individuals

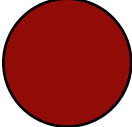
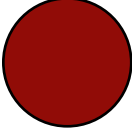
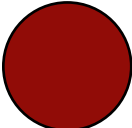
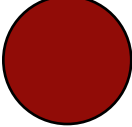
Individuals. Individuals experience the greatest impacts from disasters across multiple dimensions: physical, social, psychological, and financial. Pre-existing factors often dictate the extent to which individuals suffer from disasters and the speed and success of their recovery. Alone, individuals have almost no power in the system but through democratic processes such as community/public consultations, elections, writing to elected officials, and self-organizing, individuals can shape government decisions.


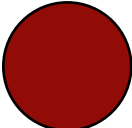

APPENDIX F: REVISITING POLICY ASSUMPTIONS

Although this research project was not a dedicated foresight study, it is worthwhile to consider how the fundamental assumptions that have shaped the existing disaster recovery system in Canada (identified in Chapter 3) may perform in the face of disruptive change.

This assessment uses a three-point ranking system, taken from the Policy Horizons Canada foresight methodology (2018):

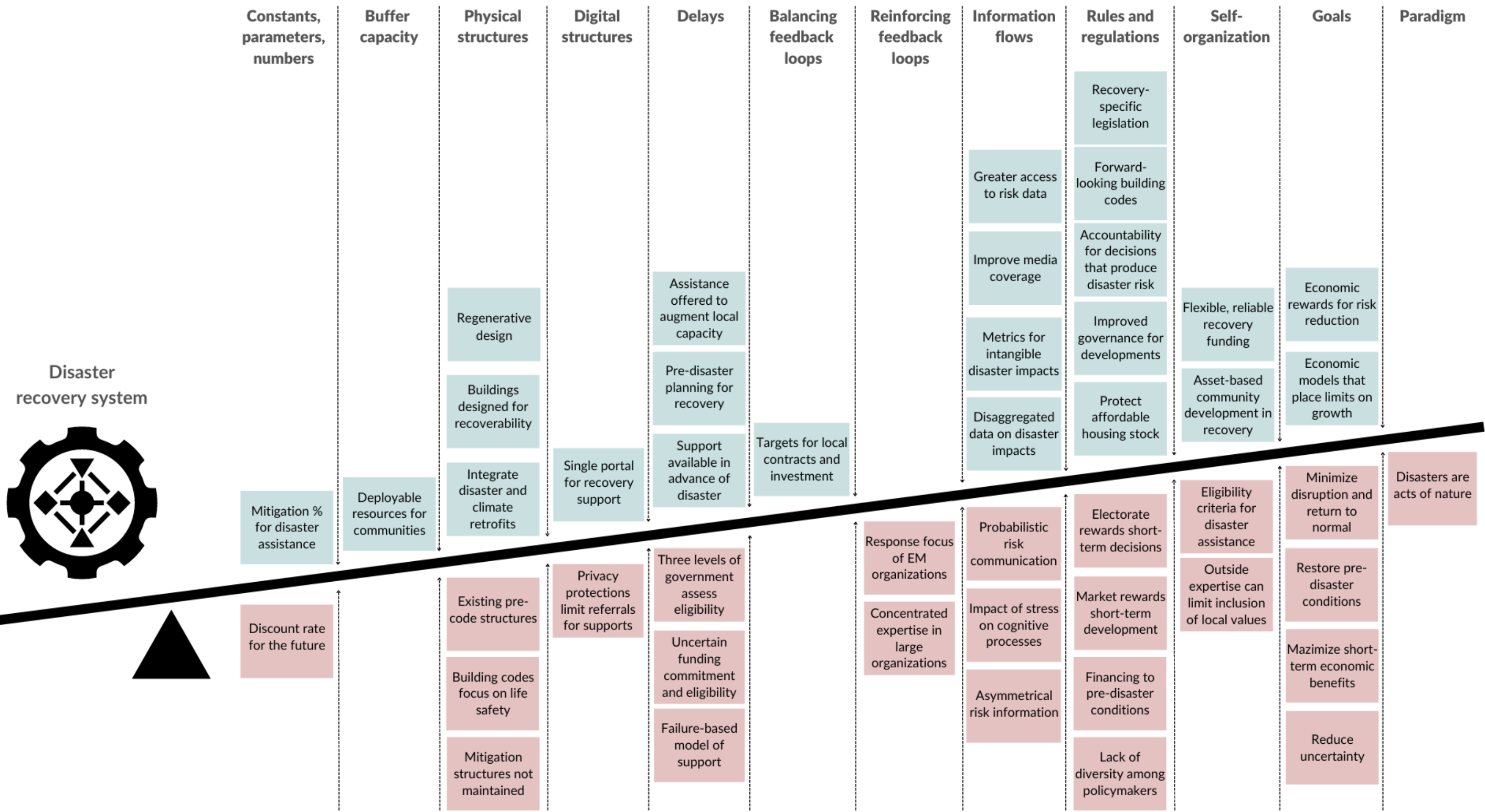
- Robust** – this assumption performs well across a range of potential disruptions
- Uncertain** – further analysis is needed to determine how well this assumption would perform
- Vulnerable** – this assumption does not perform well in the face of potential disruption

Assumption	Rating	Rationale
Disasters happen to us (not because of us); nature causes disasters	 <i>Vulnerable</i>	Framework documents have recognized the socio-economic sources of disaster, the extent to which decisions we make about where and how we build contributes to disaster risk, although this awareness has not yet translated into new policy. Climate change will continue to challenge this assumption, and the effects of compounding disasters may force a transformational change as the existing systems collapse under the unrelenting pressures of simultaneous disasters.
Disasters have definitive boundaries and causal links.	 <i>Vulnerable</i>	As simultaneous and compounding disasters increase, it will become more difficult to determine whether specific damage or impacts were caused by one disaster or another, especially as recovery is interrupted by new hazards causing additional damage. Attribution of damage may become increasingly important to insurance in the face of rising costs, enabling the industry to refuse claims for recurrent damage if people cannot prove they fully repaired their structures between events. The interconnectivity of systems and supply chains increases the vulnerability to the disruptions of disaster outside impact zones.
Disasters are local	 <i>Vulnerable</i>	While the impacts of disasters will always be felt locally, there is growing evidence of the outsized impacts disruptions can have due to interconnected supply chains and societies. The emerging trends around self-sufficiency and municipal finances may make cities more resilient to disruption and less reliant on other levels of government to fund their recovery, shifting the paradigm from a failure-based model that cascades up to higher levels of government to hyper-localized disaster adaptation and resilience.
Disasters threaten life and property; restoring property restores community	 <i>Vulnerable</i>	Governments had already begun to recognize the non-tangible impacts of disasters before the onset of the COVID-19 global pandemic, which destroyed no property but caused widespread suffering and disruption. The growing visibility of mental health impacts and research into compounding disasters has shown property does not equal community, and recovery encompasses broader societal impacts.

Assumption	Rating	Rationale
The role of governments is to ensure basic needs	 <i>Uncertain</i>	The rising costs of disasters has put greater strain on governments to provide basic financial assistance, which could be exacerbated if insurance for certain perils becomes widely unaffordable. However, trends in automation and digitization, and the COVID-19 precedent of direct federal funding to individuals (provinces such as Alberta have similar fund transfer programs), could introduce substantial efficiencies to government financial programs and reduce administrative costs. Greater alignment between disaster recovery and climate adaptation could prompt a re-evaluation of recovery as a mechanism to reduce future risks and meet climate targets. The inclusion of non-human legal rights into the calculation (such as natural entities or future generations) changes the fundamental conversation about whom should benefit from disaster recovery.
Standardized services are fair and efficient	 <i>Vulnerable</i>	Equity-seeking groups have raised national awareness of the systemic discrimination built into government systems intended to be “fair”, leading to unequal outcomes. Technological advances offer greater opportunity for individualized services based on unique needs and circumstances, although algorithms are known to contain significant bias and increasing obscurity of artificial intelligence can may biases difficult to detect.
Individuals are responsible for their decisions	 <i>Uncertain</i>	Risk-based insurance and better risk modelling are making it easier for consumers to understand their risks, enabling greater individual responsibility on where they live. Limitations to governmental assistance also creates incentives for people in the highest risk areas to relocate. However, growing number of class action lawsuits are attempting to hold local governments accountable for allowing risky developments and senior levels of government accountable for limited action on climate change and adaptation. The collective understanding of disasters as socio-economic phenomena is growing, which may also increase the perception of governments and corporations as responsible for much of society’s risk.

APPENDIX G: FULL SYSTEM INTERVENTION MAP

This diagram uses a lever to indicate the relative power existing barriers (below) and opportunities (above) to integrating more systemic risk reduction in disaster recovery.



REFERENCES

Acaroglu, L. (2018, October 22). *System failures: The education system and the proliferation of reductive thinking*. Medium. <https://medium.com/disruptive-design/system-failures-the-education-system-and-the-proliferation-of-reductive-thinking-dccf7dbb9b96>

Ackoff, R. L., & Gharajedaghi, J. (2003). *On the mismatch between systems and their models*. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.648.6840&rep=rep1&type=pdf>

Agyapong, V. I., Hrabok, M., Juhas, M., Omeje, J., Denga, E., Nwaka, B., Akinjise, I., Corbett, S. E., Moosavi, S., Brown, M., Chue, P., Greenshaw, A. J., & Li, X. M. (2018). Prevalence rates and predictors of generalized anxiety disorder symptoms in residents of Fort McMurray six months after a wildfire. *Frontiers in Psychiatry*, 9, 345. <https://doi.org/10.3389/fpsy.2018.00345>

Allard-Poesi, F. (2005). The paradox of sensemaking in organizational analysis. *Organization*, 12(2), 169-196. <https://doi.org/10.1177/1350508405051187>

American College of Occupational and Environmental Medicine [ACOEM]. (n.d.). *Stress after trauma*. Retrieved February 2, 2022, from <https://acoem.org/Practice-Resources/Emergency-Preparedness-Management-Center/Stress-After-Trauma>

Ariely, D. (2008). *Predictably irrational: The hidden forces that shape our decisions*. Harper Collins.

Associated Press. (2021, May 12). Florida Gov. Declares State of Emergency Due to Colonial Pipeline Shutdown. *NBC 6 South Florida*. <https://www.nbcmiami.com/news/local/florida-gov-declares-state-of-emergency-due-to-colonial-pipeline-shutdown/2448817/>

Auditor General of Canada. (2016). *Report 2: Mitigating the impacts of severe weather*. In Spring 2016, Reports of the Commissioner of the Environment and Sustainable Development. https://www.oag-bvg.gc.ca/internet/docs/parl_cesd_201605_02_e.pdf

Australian Institute for Disaster Resilience [AIDR]. (2018). *Australian Disaster Resilience Community Recovery Handbook* (3rd ed.). Australian Government Department of Home Affairs. <https://knowledge.aidr.org.au/media/5634/community-recovery-handbook.pdf>

Bengston, D. N. (2020). Future estrangement: Not having a place in the emerging future. *Journal of Futures Studies*. 25(2): 3-8. [https://doi.org/10.6531/JFS.202012_25\(2\).0002](https://doi.org/10.6531/JFS.202012_25(2).0002)

Blake, D., Marlowe, J., & Johnston, D. (2017). Get prepared: Discourse for the privileged? *International Journal of Disaster Risk Reduction*, 25, 283-288. <https://doi.org/10.1016/j.ijdr.2017.09.012>

Bogdan, E. (2019). *Perceptions and practices of flood risk management: A case study of flood risk governance in High River, Alberta* [Doctoral dissertation, University of Chicago]. Education & Research Archive. <https://doi.org/10.7939/r3-7efq-2n15>

Bodgan, E. A., Henstra, D., & Thistlethwaite, J. (2020a, May 21). Fort McMurray's flood disaster was foreseeable and preventable. *The Conversation*. <https://theconversation.com/fort-mcmurrays-flood-disaster-was-foreseeable-and-preventable-137850>

Bogdan, E. A., Beckie, M. A., & Caine, K. J. (2020b). Making room for nature? Applying the Dutch Room for the River approach to flood risk management in Alberta, Canada. *International Journal of River Basin Management*, 1-13. <https://doi.org/10.1080/15715124.2020.1723604>

Booth, K., & Tranter, B. (2018). When disaster strikes: Under-insurance in Australian households. *Urban Studies*, 55(14), 3135-3150. <https://doi.org/10.1177/0042098017736257>

Braun, W. (2002, January). The system archetypes. *System*. https://www.researchgate.net/publication/265348674_The_System_Archetypes_The_System_Archetypes

British Columbia Coroners Service. (2021, November 1). *Heat-related deaths: Knowledge update*. Retrieved February 4, 2022 from https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/statistical/heat_related_deaths_in_bc_knowledge_update.pdf

Brouillet, E. (2011). Canadian federalism and the principle of subsidiarity: should we open pandora's box? *The Supreme Court Law Review: Osgoode's Annual Constitutional Cases Conference*, 54(1), 601-632. <https://digitalcommons.osgoode.yorku.ca/sclr/vol54/iss1/21>

Bruce, J. P. (1976). The National Flood Damage Reduction Program. *Canadian Water Resources Journal*, 1(1), 5-14. <https://doi.org/10.4296/cwrj0101005>

Bumsted, J. M. (1987). Developing a Canadian disaster relief policy: The 1950 Manitoba flood. *The Canadian Historical Review*, 98(3), 347-373. DOI: 10.3138/CHR-068-03-01

Bush, E. & Lemmen, D. S. (Eds). (2019). *Canada's Changing Climate Report: 2019*. Environment and Climate Change Canada. <https://changingclimate.ca/CCCR2019/>

Canada, Senate. Standing Senate Committee on Energy, the Environment and Natural Resources. (2018, November). *Reducing greenhouse gas emissions from Canada's built environment*. Retrieved from: https://sencanada.ca/content/sen/committee/421/ENEV/reports/ENEV_Buildings_FINAL_e.pdf

Canada Mortgage and Housing Corporation. (2020). *Local planning process and approvals*. https://eppdscrmssa01.blob.core.windows.net/cmhcprodcontainer/sf/project/cmhc/pdfs/content/en/local_planning_en.pdf

Canadian Broadcasting Corporation (CBC) [The Fifth Estate]. (2021, November 25). *Come hell...B.C. under water: What the B.C. government knew about the flood threat* [video]. YouTube. https://www.youtube.com/watch?v=o6ktS3Ex4TU&ab_channel=TheFifthEstate

Carbon Brief. (2017, February 14). *The social cost of carbon*. <https://www.carbonbrief.org/qa-social-cost-carbon>

Carney, M. (2020, December 11). *How we get what we value: From credit crisis to resilience* [Audio podcast episode 2 of 4]. In *BBC Reith Lecture series*. <https://www.bbc.co.uk/programmes/m000q3sp>

Carrington, D. J., Combe, I. A., & Mumford, M. D. (2019). Cognitive shifts within leader and follower teams: Where consensus develops in mental models during an organizational crisis. *The Leadership Quarterly*, 30(3), 335-350. <https://doi.org/10.1016/j.leaqua.2018.12.002>

Carpenter, O., Platt, S., Evan, T., Mahdavian, F., & Coburn, A. (2020). *Optimising disaster recovery: The role of insurance capital in improving economic resilience*. Cambridge Centre for Risk Studies and AXA XL. <https://axaxl.com/-/media/axaxl/files/optimizing-disaster-recovery.pdf>

Cecco, L. (2021, November 17). 'A tipping point': how poor forestry fuels floods and fires in western Canada. *The Guardian*. <https://www.theguardian.com/world/2021/nov/16/canada-floods-fires-logging-british-columbia>

Centre for Constitutional Studies. (2019). *Peace, order and good government*. University of Alberta. <https://www.constitutionalstudies.ca/2019/07/peace-order-and-good-government/>

Clardy, A. (2011). Six worlds of tomorrow: Representing the future to popular culture. *World Future Review*, 3(2), 37-48. <https://doi.org/10.1177/194675671100300207>

Comes, T. (2016). Cognitive biases in humanitarian sensemaking and decision-making: Lessons from field research. In *2016 IEEE International Multi-Disciplinary Conference on Cognitive Methods in Situation Awareness and Decision Support (CogSIMA)*, 56-62. DOI: 10.1109/COGSIMA.2016.7497786

Commonwealth of Australia. (2020, October 28). Royal Commission into National Natural Disaster Arrangements Report. <https://naturaldisaster.royalcommission.gov.au/publications/royal-commission-national-natural-disaster-arrangements-report>

Council of Canadian Academies. (2022). *Building a resilient Canada*. The Expert Panel on Disaster Resilience in a Changing Climate, Council of Canadian Academies. <https://cca-reports.ca/wp-content/uploads/2022/01/Building-a-Resilient-Canada-web-EN.pdf>

Curry, A., & Hodgson, A. (2008). Seeing in multiple horizons: connecting futures to strategy. *Journal of Futures Studies*, 13(1), 1-20. https://www.researchgate.net/profile/Andrew-Curry-2/publication/253444667_Seeing_in_Multiple_Horizons_Connecting_Futures_to_Strategy/links/5540aca70cf2322272f346c/Seeing-in-Multiple-Horizons-Connecting-Futures-to-Strategy.pdf

Davies, J. B. (2020). Reforming Canada's Disaster Assistance Programs. *Canadian Public Policy*, 46(2), 187-197. <https://doi.org/10.3138/cpp.2019-066>

Design Council. (2007). *A study of the design process: Eleven lessons managing design in eleven global brands*. [https://www.designcouncil.org.uk/sites/default/files/asset/document/ElevenLessons_Design_Council%20\(2\).pdf](https://www.designcouncil.org.uk/sites/default/files/asset/document/ElevenLessons_Design_Council%20(2).pdf)

DiSabatino, A. (2022, January 11). How many Canadian renters lack tenant insurance? *Canadian underwriter*. <https://www.canadianunderwriter.ca/insurance/how-many-canadian-renters-lack-tenant-insurance-1004216181/>

Emergency Management British Columbia. (2016, May 4). *Disaster Financial Assistance (DFA) and residential flood insurance*. https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/dfa/residential_flood_insurance.pdf

Emergency Management British Columbia. (2019). *Interim provincial disaster recovery framework*. https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/local-government/provincial_disaster_recovery_framework.pdf

Emergency Preparedness Act, Revised Statutes of Canada (1985, c. 6). Retrieved from the Justice Laws website: <https://laws-lois.justice.gc.ca/eng/acts/e-4.6/20021231/P1TT3xt3.html>

Ewert, R. (2021). *Where there's smoke, there's fire: The social inequalities of disaster recovery* [Doctoral dissertation, University of Chicago]. ProQuest Dissertations Publishing.

Federal Emergency Management Agency [FEMA]. (2016a, June). *National disaster recovery framework* (2nd ed.). <https://www.fema.gov/emergency-managers/national-preparedness/frameworks/recovery>

Federal Emergency Management Agency [FEMA]. (2016b, July). *Crisis Counseling Assistance and Training Program Guidance*. <https://www.samhsa.gov/sites/default/files/images/fema-ccp-guidance.pdf>

Federation of Canadian Municipalities. (n.d.). *Infrastructure*. Retrieved February 5, 2022, from <https://fcm.ca/en/focus->

areas/infrastructure

Gathering Voices. (2017). Revitalizing traditional fire management in Tsilqot'in Territory. <https://www.gatheringvoices.com/tsilhqotin1>

Gharajedaghi, J. (2004). Systems methodology: A holistic language of interaction and design. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.90.7917&rep=rep1&type=pdf>

Global Facility for Disaster Reduction and Recovery [GFDRR]. (2016, May). The making of a riskier future: How our decisions are shaping future disaster risk. <https://www.gfdr.org/en/publication/making-riskier-future-how-our-decisions-are-shaping-future-disaster-risk>

Godsoe, M., Ladd, M., & Cox, R. (2019). Assessing Canada's disaster baselines and projections under the Sendai Framework for Disaster Risk Reduction: A modeling tool to track progress. *Natural Hazards*, 98(1), 293-317. <https://doi.org/10.1007/s11069-019-03599-z>

Golnaraghi, M., Thistlethwaite, J., Henstra, D., & Stewart, C. (2020, December). Flood risk management in Canada: Building flood resilience in a changing climate. The Geneva Association. https://www.genevaassociation.org/sites/default/files/research-topics-document-type/pdf_public/frm_canada_web.pdf

Goodman, M., Kemeny, J., & Roberts, C. (1994). The language of systems thinking:" Links" and" loops. In P. Senge et al. (Eds.), *The Fifth Discipline Fieldbook*. New York: Bantam Doubleday Dell Publishing Group, 113-148.

Government of Alberta. (2021, March 4). Disaster Recovery Program changes. <https://www.alberta.ca/disaster-assistance-and-recovery-support.aspx>

Government of British Columbia. (2022). Budget 2022: Stronger together. BC Budget. Retrieved March 3, 2022, from https://www.bcbudget.gov.bc.ca/2022/pdf/2022_Highlights.pdf

Government of Canada. (2019). Northern housing policy recommendations. <https://www.canada.ca/en/polar-knowledge/northern-housing-forum-knowledge-products/policy-recommendations.html>

Government of New Zealand. (2021, November 3). Futures thinking. Department of the Prime Minister and Cabinet. Retrieved January 26, 2022, from <https://dpmc.govt.nz/our-programmes/policy-project/policy-methods-toolbox/futures-thinking>

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of Qualitative Research* (pp. 105–117). Sage Publications, Inc.

Guyadeen, D., Thistlethwaite, J., & Henstra, D. (2019). Evaluating the quality of municipal climate change plans in Canada. *Climatic Change*, 152(1), 121-143. <https://doi.org/10.1007/s10584-018-2312-1>

Halford, H. (2021, April 12). "Build Back Better" – Used futures as the cornerstone for the new normal? *Journal of Futures Studies*. <https://jfsdigital.org/2021/04/13/build-back-better-used-futures-as-the-cornerstone-for-the-new-normal/>

Hamann, R. (2020). The promise and peril of "Building Back Better". *Environment: Science and Policy for Sustainable Development*, 62(6), 41-50. <https://doi.org/10.1080/00139157.2020.1820296>

Hamideh, S. (2020). Opportunities and Challenges of Public Participation in Post-Disaster Recovery Planning: Lessons from Galveston, TX. *Natural Hazards Review*, 21(4), 05020009. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000399](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000399)

Handmer, J. & Hillman, M. (2004). Economic and financial recovery from disaster. *Australian Journal of Emergency Management*, 19(4), 44-50. <https://search.informit.org/doi/10.3316/ielapa.37605003314615>

Haney, T. (2021, November 30). Why are homes still being built along rivers? Flooded residents disagree on the solution. *The Conversation*. <https://theconversation.com/why-are-homes-still-being-built-along-rivers-flooded-residents-disagree-on-the-solution-171660>

Hanger, S., Linnerooth-Bayer, J., Surminski, S., Nenciu-Posner, C., Lorant, A., Ionescu, R., & Patt, A. (2018). Insurance, public assistance, and household flood risk reduction: A comparative study of Austria, England, and Romania. *Risk Analysis*, 38(4), 680-693. <https://doi.org/10.1111/risa.12881>

Harari, Y. N. (2014). *Sapiens: A brief history of humankind* [E-book]. Dvir Publishing House Ltd.

Hebb, B. B. F. (2021, February 3). Subsidiarity and fiscal federalism in Canada. *E-International Relations*. <https://www.e-ir.info/2021/02/03/subsidiarity-and-fiscal-federalism-in-canada/>

Heid, M. (2020, March 19). *Science explains why uncertainty is so hard on our brain*. Medium. <https://elemental.medium.com/science-explains-why-uncertainty-is-so-hard-on-our-brain-6ac75938662>

Heinonen, S., Minkkinen, M., Karjalainen, J., & Inayatullah, S. (2017). Testing transformative energy scenarios through causal layered analysis gaming. *Technological Forecasting and Social Change*, 124, 101-113. <https://doi.org/10.1016/j.techfore.2016.10.011>

Henstra, D. (2011). The dynamics of policy change: A

longitudinal analysis of emergency management in Ontario, 1950–2010. *Journal of Policy History*, 23(3), 399-428. <https://doi.org/10.1017/S0898030611000169>

Howell, J., & Elliott, J. R. (2019). Damages done: The longitudinal impacts of natural hazards on wealth inequality in the United States. *Social problems*, 66(3), 448-467. <https://doi.org/10.1093/socpro/spy016>

Inayatullah, S. (2004). *The Causal Layered Analysis (CLA) reader: Theory and case studies of an integrative and transformative methodology*. Tamkang University Press. <https://www.metafuture.org/cla>

Inayatullah, S. (2005). Causal layered analysis: Deepening the future. *Questioning the future: Methods and tools for organizational and societal transformation*, 1, 1-22. <http://metafuture.org/cla%20papers/Inayatullah%20Causal%20layered%20analysis%20-%20%20Deepening%20the%20Future.pdf>

Inayatullah, S. (2008). Six pillars: futures thinking for transforming. *Foresight*, 10(1), 4-21. <https://doi.org/10.1108/14636680810855991>

Insurance Bureau of Canada [IBC]. (2013). *What would the "big one" cost Canadians? Economic impact of a major earthquake in Canada – study highlights*. http://assets.ibc.ca/Documents/Studies/EQ_brochure_EN-at-a-glance.pdf

Insurance Bureau of Canada [IBC]. (2018). *2018 facts of the property and casualty insurance industry in Canada*. <http://assets.ibc.ca/Documents/Facts Book/Facts Book/2018/IBC-Fact-Book-2018.pdf>

Insurance Bureau of Canada [IBC]. (2019a). *2019 Facts of the Property and Casualty Insurance Industry in Canada*. <http://assets.ibc.ca/Documents/Facts%20Book/Facts Book/2019/IBC-2019-Facts.pdf>

Insurance Bureau of Canada [IBC]. (2019b, June). *Options for managing flood costs of Canada's highest risk residential properties: A Report of the National Working Group on Financial Risk of Flooding*. <http://assets.ibc.ca/Documents/Studies/IBC-Flood-Options-Paper-EN.pdf>

Insurance Bureau of Canada [IBC]. (2021, January 18). Severe weather caused \$2.4 billion in insured damage in 2020. [http://www.ibc.ca/on/resources/media-centre/media-releases/severe-weather-caused-\\$2-4-billion-in-insured-damage-in-2020](http://www.ibc.ca/on/resources/media-centre/media-releases/severe-weather-caused-$2-4-billion-in-insured-damage-in-2020)

Insurance Canada. (2018, April 11). *Nearly half of tenants have no renter's insurance*. Retrieved January 29, 2022, from <https://www.insurance-canada.ca/2018/04/11/kanetix-tenants-renters/>

Intergovernmental Panel on Climate Change. (2012). *Managing the risks of extreme events and disasters to advance climate change adaptation*. A Special Report of

Working Groups I and II of the Intergovernmental Panel on Climate Change. (C. B. Field, V. Barros, T. F. Stocker, D. Qin, D. J. Dokken, K. L. Ebi, M. D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley, Eds). Cambridge and New York: Cambridge University Press.

International Institute for Sustainable Development [IISD]. (2021, July). Advancing the climate resilience of Canadian infrastructure: A review of literature to inform the way forward. *IISD.org*. <https://www.iisd.org/system/files/2021-07/climate-resilience-canadian-infrastructure-en.pdf>

International Monetary Fund. (2021, July 2). *Policy responses to COVID-19: Policy tracker*. Retrieved March 3, 2022 from <https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#C>

International Recovery Platform. (2012). Guidance note on recovery: Pre-disaster recovery planning. *PreventionWeb*. https://www.preventionweb.net/files/31963_predisasterrecoveryweb.pdf

Kahneman, D. (2011). *Thinking, Fast and Slow*. London: Penguin Books.

Kaminski, J. (2013). *Interconnectedness*. First Nations Pedagogy. <https://firstnationspedagogy.com/interconnection.html>

KerrSmith Design. (2019). *Vote 2040: Summative report on the Future of Electoral Administration in Canada*. Retrieved February 25, 2022 from https://issuu.com/kerrsmithdesign/docs/18elc01_elections_canada_report_sum_057b07fb974769

Kitchen, H., Slack, E., & Hachard, T. (2019). Property taxes in Canada: Current issues and future prospects. *Institute on Municipal Finance and Government Prospects*. University of Toronto. <https://tspace.library.utoronto.ca/bitstream/1807/98034/1/Perspectives-27-Kitchen-Slack-Hachard-Property-Tax-Issues-Prospects.pdf>

Klein, G., Snowden, D., & Pin, C. L. (2010). Anticipatory thinking. In *Informed by Knowledge* (pp. 249-260). Psychology Press.

Krishnan, S., & Montpetit, J. (2019, April 15). *Quebec hopes to nudge homeowners out of flood zones with disaster relief program*. CBC News. <https://www.cbc.ca/news/canada/montreal/quebec-hopes-to-nudge-homeowners-out-of-flood-zones-with-disaster-relief-program-1.5098819>

Labine, J. (2021). *'Probably overdue': Alberta turns to municipalities for portion of disaster recovery funds*. Edmonton Journal. <https://edmontonjournal.com/news/politics/alberta-bringing-in-cost-sharing-agreement-with-municipalities-for-disaster-recovery>

Laanela, M. (2018, May 24). *Flood victims could be denied*

\$300K assistance because of insurance changes. Canadian Broadcasting Corporation. <https://www.cbc.ca/news/canada/british-columbia/flood-victims-could-be-denied-300k-assistance-because-of-insurance-changes-1.4674236>

Latham, J. (n.d.). *Change Formula*. Retrieved March 26, 2022, from <https://www.drjohnlatham.com/change-formula/>.

Lindsay, J. (2009). Emergency management in Canada: Near misses and moving targets. *Comparative Emergency Management Book Project*. Retrieved from <https://training.fema.gov/hiedu/downloads/compemgmtbookproject/comparative%20em%20book%20-%20chapter%20-%20emergency%20management%20in%20canada%20-%20near%20misses%20and%20moving%20targets.doc>

Lowe, H. (2012). Can the Future Be Discovered? *World Future Review*, 4(1), 51-60. <https://doi.org/10.1177/194675671200400108>

Lune, H. & Berg, B. L. (2017). *Qualitative research methods for the social sciences* (9th ed). Pearson Publishing.

Manyena, S. B. (2014). Disaster resilience: A question of ‘multiple faces’ and ‘multiple spaces’? *International Journal of Disaster Risk Reduction*, 8, 1-9. <https://doi.org/10.1016/j.ijdr.2013.12.010>

Manyena, S. B., Mavhura, E., Muzenda, C., & Mabaso, E. (2013). Disaster risk reduction legislations: Is there a move from events to processes? *Global Environmental Change*, 23(6), 1786-1794. <https://doi.org/10.1016/j.gloenvcha.2013.07.027>

Manyena, B., O'Brien, G., O'Keefe, P., & Rose, J. (2011). Disaster resilience: a bounce back or bounce forward ability? *Local Environment: The International Journal of Justice and Sustainability*, 16(5), 417-424. <http://dx.doi.org/10.1080/13549839.2011.583049>

Marchezini, V. (2015). The biopolitics of disaster: power, discourses, and practices. *Human Organization*, 74(4), 362-371. <https://doi.org/10.17730/0018-7259-74.4.362>

Marchezini, V. (2019). The power of localism during the long-term disaster recovery process. *Disaster Prevention and Management: An International Journal*, 28(1), 143-152. <https://doi.org/10.1108/DPM-05-2018-0150>

Martin, B. & Hanington, B. (2017). *The pocket universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solutions*. Rockport Publishers.

May, P. J. (1991). Reconsidering policy design: Policies and publics. *Journal of Public Policy*, 11(2), 187-206. <https://doi.org/10.1017/S0143814X0000619X>

McConnell, D. (1998). *Plan for tomorrow, today: The story of Emergency Preparedness Canada 1948-1988*. Emergency Preparedness Canada. <https://www.publicsafety.gc.ca/lbrr/archives/hv%20551.5.c2%20m363%201998-eng.pdf>

McDonald, C. (2004). The promise of destruction. *Australian Journal of Emergency Management*, 19(4), 51-55. <https://search.informit.org/doi/10.3316/ielapa.376050033146158>

McGonigal, J. (2017, April 13). *Our puny human brains are terrible at thinking about the future*. Slate. <https://slate.com/technology/2017/04/why-people-are-so-bad-at-thinking-about-the-future.html>

McSheffrey, E. (2021, November 16). *First Nations leaders call on B.C. to declare indefinite state of emergency*. Global News. <https://globalnews.ca/news/8378157/bc-first-nations-state-of-emergency/>

Meadows, D. H. (1999). *Leverage points: Places to intervene in a system*. DonellaMeadows.org. <http://www.scrummaster.dk/lib/AgileLeanLibrary/People/DonellaMeadows/donellameadows.org-Leverage%20Points%20Places%20to%20Intervene%20in%20a%20System.pdf>

Mileti, D. (1999). *Disasters by design: A reassessment of natural hazards in the United States*. Joseph Henry Press.

Miller, R. (2019, May 10). *Flooded twice, Constance Bay man says he's being punished for having insurance*. Canadian Broadcasting Corporation. <https://www.cbc.ca/news/canada/ottawa/flood-victim-fighting-for-disaster-relief-money-1.5128225>

Mills, J. H., & Weatherbee, T. G. (2006). Hurricanes hardly happen: Sensemaking as a framework for understanding organizational disasters. *Culture and Organization*, 12(3), 265-279. <https://doi.org/10.1080/14759550600871485>

Moulton, A. A., & Machado, M. R. (2019). Bouncing forward after Irma and Maria: Acknowledging colonialism, problematizing resilience and thinking climate justice. *Journal of Extreme Events*, 6(01), 1-22. <https://doi.org/10.1142/S2345737619400037>

Multi-Hazard Mitigation Council (2019.). *Natural Hazard Mitigation Saves: 2019 Report*. Principal Investigator K. Porter. National Institute of Building Sciences. http://2021.nibs.org/files/pdfs/NIBS_MMC_MitigationSaves_2019.pdf

Mutter, J. (2010). Disasters widen the rich–poor gap. *Nature*, 466(1042). <https://doi-org.ocadu.idm.oclc.org/10.1038/4661042a>

Namahn. (2018). *Systemic design toolkit*. <https://www.systemicdesigntoolkit.org/>

Natural Resources Canada. (2018). *Residential Sector, Canada. Table 21: Housing stock by building type and vintage*. Government of Canada. <https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/showTable.cfm?type=CP§or=res&juris=ca&rn=21&page=3&CFID=1510097&CFTOKEN=7070aebd9ae0fa0f-0AA309D0-E2DB-1B19-B1E3EB35EBCB1789>

Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology*, 41(1), 127-150. <https://doi.org/10.1007/s10464-007-9156-6>

Office of the Parliamentary Budget Officer [PBO]. (2015, May 31). *Parliamentary Budget Office Request IRO206: DFAA disaster payments*. Government of Canada. <https://www.pbo-dpb.gc.ca/web/default/files/Documents/Reports/2016/DFAA/DFAA%20disaster%20payments%20EN.pdf>

Office of the Parliamentary Budget Officer [PBO]. (2016, February 25). *Estimate of the average annual cost for Disaster Financial Arrangements due to weather events*. Government of Canada. https://www.pbo-dpb.gc.ca/web/default/files/Documents/Reports/2016/DFAA/DFAA_EN.pdf

Olcott, G., & Oliver, N. (2014). Social capital, sensemaking, and recovery: Japanese companies and the 2011 earthquake. *California Management Review*, 56(2), 5-22. <https://doi.org/10.1525/cmr.2014.56.2.5>

Olshansky, R. B., Hopkins, L. D., & Johnson, L. A. (2012). Disaster and recovery: Processes compressed in time. *Natural Hazards Review*, 13(3), 173-178. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000077](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000077)

Osborne, C., Mayo, L., & Bussey, M. (2021). New frontiers in local government community engagement: Towards transformative place-based futures. *Futures*, 131, 1-11. <https://doi.org/10.1016/j.futures.2021.102768>

Pacini, A. (2017). *Housing horizons: Models for real estate and community investment* [Major Research Project, OCAD University]. OCAD University Open Research Repository. <http://openresearch.ocadu.ca/id/eprint/1758/>

Paidakaki, A., & Moulaert, F. (2018). Disaster resilience into which direction (s)? Competing discursive and material practices in Post-Katrina New Orleans. *Housing, Theory and Society*, 35(4), 432-454. <https://doi.org/10.1080/14036096.2017.1308434>

Pais, J. F., & Elliott, J. R. (2008). Places as recovery machines: Vulnerability and neighborhood change after major hurricanes. *Social Forces*, 86(4), 1415–1453. <http://www.jstor.org/stable/20430816>

Parker, C. (2021, November 19). Major flooding in Canada leads to widespread supply chain disruptions. *Washington Post*. <https://www.washingtonpost.com/world/2021/11/18/british-columbia-floods-canada-supply-chain/>

Penn, M. (2021, August 23). Statistics say large pandemics are more likely than we thought. *Global Health Institute*. Duke University. <https://globalhealth.duke.edu/news/statistics-say-large-pandemics-are-more-likely-we-thought>

Peters, J. (2021, December 17). *Hope mayor and council express thanks to community for strength through B.C. storms*. Hope Standard. <https://www.hopestandard.com/news/hope-mayor-and-council-express-thanks-to-community-for-strength-through-b-c-storms/>

Phillips, L. H. (1946). Canada's internal security. *Canadian Journal of Economics and Political Science*, 12(1), 18-29. <https://doi.org/10.2307/137329>

Piovesana, A. (2013, September 25). *Falling between the cracks after High River flood*. Canadian Broadcasting Corporation. <https://www.cbc.ca/news/canada/calgary/falling-between-the-cracks-after-high-river-flood-1.1867888>

Policy Horizons Canada. (2018). *Foresight Training Modules*. <https://horizons.gc.ca/en/resources/>

Potter, A. (2021). *On decline: Stagnation, nostalgia, and why every year is the worst one ever (Field Notes, 3)* [E-book]. Biblioasis.

Public Health Agency of Canada. (2021, November 5). *About the Agency*. Government of Canada. Retrieved February 23, 2022, from <https://www.canada.ca/en/public-health/corporate/mandate/about-agency.html>

Public Safety Canada. (2005). *Canada's National Disaster Mitigation Strategy*. Government of Canada. <https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/mgtgn-strtgty/mgtgn-strtgty-eng.pdf>

Public Safety Canada. (2007). *Guidelines for the Disaster Financial Assistance Arrangements*. Government of Canada. <https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/rcvr-dsstrs/gdlns-dsstr-ssstnc/gdlns-dsstr-ssstnc-eng.pdf>

Public Safety Canada. (2010). *Emergency management planning guide, 2010-2011*. Government of Canada. <https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/mrgnc-mngmnt-pnnng/mrgnc-mngmnt-pnnng-eng.pdf>

Public Safety Canada. (2017a). *An Emergency Management Framework for Canada* (3rd ed). Government of Canada. <https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/2017-mrgnc-mngmnt-frmwrk/2017-mrgnc-mngmnt-frmwrk-en.pdf>

Public Safety Canada. (2017b). *2016-2017 Evaluation of the Disaster Financial Assistance Arrangements*. Government

- of Canada. <https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/vltn-dsstr-fnncl-ssstnc-2016-17/index-en.aspx>
- Public Safety Canada. (2019a, December 30). *Evaluation of the National Disaster Mitigation Program: Evaluation report*. Government of Canada. <https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/vltn-ntnl-dsstr-mtgn-prgrm-2019/index-en.aspx>
- Public Safety Canada. (2019b). *Emergency Management Strategy for Canada: Toward a resilience 2030*. Government of Canada. <https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/mrgncy-mngmnt-strtgty/mrgncy-mngmnt-strtgty-en.pdf>
- Public Safety Canada. (2020, August 26). *Info Source: Sources of Federal Government and Employee Information*. Retrieved February 20, 2022 from <https://www.publicsafety.gc.ca/cnt/trnsprnc/nfsrc-en.aspx>
- Public Safety Canada. (2021a). *The Canadian Disaster Database*. Government of Canada. Retrieved January 16, 2022, from <https://www.publicsafety.gc.ca/cnt/rsrscs/cndn-dsstr-dtbs/index-en.aspx>
- Public Safety Canada. (2021b, January 18). *National Disaster Mitigation Program (NDMP)*. Retrieved February 23, 2022, from <https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr-prvntn-mtgn/ndmp/index-en.aspx>
- Public Safety Canada. (2022, February). *Guidelines for the Disaster Financial Assistance Arrangements Interpretation Bulletin Number 5: Cost-Sharing Formula Adjustment and Extension of the Terms and Conditions*. Government of Canada. Retrieved February 28, 2022, from <https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/rcvr-dsstrs/gdlns-dsstr-ssstnc/index-b5-en.pdf>
- Raikes, J., & McBean, G. (2016). Responsibility and liability in emergency management to natural disasters: A Canadian example. *International Journal of Disaster Risk Reduction*, 16, 12-18. <https://doi.org/10.1016/j.ijdr.2016.01.004>
- Reynolds, B. R. (2020, November 1). *There's a lot of uncertainty right now – this is what science says that does to our minds, bodies*. University of California San Francisco. <https://www.ucsf.edu/news/2020/11/418951/theres-lot-uncertainty-right-now-what-science-says-does-our-minds-bodies>
- Riddell, G. A., van Delden, H., Maier, H. R., & Zecchin, A. C. (2020). Tomorrow's disasters – Embedding foresight principles into disaster risk assessment and treatment. *International Journal of Disaster Risk Reduction*, 45, 101437. <https://doi.org/10.1016/j.ijdr.2019.101437>
- Roberts, P. S., & Wernstedt, K. (2019). Decision biases and heuristics among emergency managers: Just like the public they manage for? *The American Review of Public Administration*, 49(3), 292-308. <https://doi.org/10.1177/0275074018799490>
- Robinson, D., & Cruikshank, K. (2006). Hurricane Hazel: Disaster relief, politics, and society in Canada, 1954-55. *Journal of Canadian Studies*, 40(1), 37-70. <https://doi.org/10.3138/jcs.40.1.37>
- Rouhanizadeh, B., Kermanshachi, S., & Nipa, T. J. (2020). Exploratory analysis of barriers to effective post-disaster recovery. *International Journal of Disaster Risk Reduction*, 50, 101735. <https://doi.org/10.1016/j.ijdr.2020.101735>
- Rubin, O., & de Vries, D. H. (2020). Diverging sensemaking frames during the initial phases of the COVID-19 outbreak in Denmark. *Policy Design and Practice*, 3(3), 277-296. <https://doi.org/10.1080/25741292.2020.1809809>
- Ryan, A. J., & Hamilton, B. A. (2012). *Thinking in systems*. Schirrmester, E., Göhring, A. L., & Warnke, P. (2020). Psychological biases and heuristics in the context of foresight and scenario processes. *Futures & Foresight Science*, 2(2), 1-18. <https://doi.org/10.1002/ffo.2.31>
- Schultz, W. L. (2015). A brief history of futures. *World Future Review*, 7(4), 324-331. <https://doi.org/10.1177/1946756715627646>
- Snowden, D. J., & Boone, M. E. (2007). A leader's framework for decision making. *Harvard Business Review*, 85(11), 68. <https://hbr.org/2007/11/a-leaders-framework-for-decision-making>
- Snowdon, W. (2017, January 17). *Fort McMurray wildfire costs to reach almost \$9B, new report says*. Canadian Broadcasting Corporation. Retrieved March 1, 2022 from <https://www.cbc.ca/news/canada/edmonton/fort-mcmurray-wildfire-costs-to-reach-almost-9b-new-report-says-1.3939953>
- Standing Committee on Indigenous and Northern Affairs. (2018). *From the ashes: Reimagining fire safety and emergency management in Indigenous communities*. House of Commons Report. Retrieved from <https://www.ourcommons.ca/Content/Committee/421/INAN/Reports/RP9990811/inanrp15/inanrp15-e.pdf>
- Statista. (2021, September 30). *Gross domestic product (GDP) of Canada in June 2021, by industry*. <https://www.statista.com/statistics/594293/gross-domestic-product-of-canada-by-industry-monthly/>
- Statistics Canada. (2018, May 17). *Population growth: Migratory increase overtakes natural increase*. Government of Canada. <https://www150.statcan.gc.ca/n1/pub/11-630-x/11-630-x2014001-eng.htm>
- Statistics Canada. (2019, September 17). *Population projections for Canada (2018 to 2068), Provinces and Territories (2018 to 2043)*. Government of Canada. <https://www150.statcan.gc.ca/n1/pub/91-520-x/91-520-x2019001-eng.htm>
- Statistics Canada. (2021). *Annual demographic estimates, rural and urban areas: Interactive dashboard*. Retrieved January 25, 2022, from <https://www150.statcan.gc.ca/n1/pub/71-607-x/71-607-x2021030-eng.htm>
- Statistics Canada. (2022). *Canada tops G7 growth despite COVID*. <https://www150.statcan.gc.ca/n1/daily-quotidien/220209/dq220209a-eng.htm>
- Stone, J. T. (2021). The new Louisiana purchase: Gentrification and disaster in the heart of New Orleans [Doctoral dissertation, University of British Columbia]. Vancouver: University of British Columbia Library. <https://open.library.ubc.ca/collections/ubctheses/24/items/1.0406145>
- Solnit, R. (2009). *Paradise built in hell: The extraordinary communities that arise in disaster*. Penguin Books.
- Substance Abuse and Mental Health Services Administration [SAMHSA]. (2014). Understanding the impact of trauma. In *Trauma-Informed Care in Behavioral Health Services. Treatment Improvement Protocol (TIP)*. <https://www.ncbi.nlm.nih.gov/books/NBK207191/>
- Takeda, M., Jones, R., & Helms, M. M. (2017). Promoting sense-making in volatile environments: Developing resilience in disaster management. *Journal of Human Behavior in the Social Environment*, 27(8), 791-805. <https://doi.org/10.1080/10911359.2017.1338173>
- Tarver, E. (2020, October 16). *How financial markets exhibit asymmetric information*. Investopedia. Retrieved March 4, 2022 from <https://www.investopedia.com/ask/answers/042915/how-do-financial-market-exhibit-asymmetric-information.asp>
- Tassonyi, A. T. & Conger, B. W. (2015, November). An exploration into the municipal capacity to finance capital infrastructure. *School of Public Policy Research Papers*, 8(38). University of Calgary. <https://www.policyschool.ca/wp-content/uploads/2016/03/municipal-capital-infrastructure-tassonyi-conger.pdf>
- Thistlethwaite, J. (2017). The emergence of flood insurance in Canada: Navigating institutional uncertainty. *Risk Analysis*, 37(4), 744-755. <https://doi.org/10.1111/risa.12659>
- Thistlethwaite, J., & Henstra, D. (2017). Municipal flood risk sharing in Canada: A policy instrument analysis. *Canadian Water Resources Journal*, 42(4), 349-363. DOI: 10.1080/07011784.2017.1364144
- Thistlethwaite, J., Henstra, D., Minano, A., & Dordi, T. (2019). Policy framing in the press: analyzing media coverage of two flood disasters. *Regional Environmental Change*, 19(8), 2597-2607. <https://doi.org/10.1007/s10113-019-01576-7>
- Thistlethwaite, J., Henstra, D., Brown, C., & Scott, D. (2020). Barriers to insurance as a flood risk management tool: Evident from a survey of property owners. *International Journal of Disaster Risk Science*, 11, 263-273. <https://doi.org/10.1007/s13753-020-00272-z>
- Tollefson, J. (2020, August 7). Why deforestation and extinctions make pandemics more likely. *Nature*, 584, 175-176. <https://doi.org/10.1038/d41586-020-02341-1>
- Travers, T. (Host). (2021, March 2). How can policy makers use behavioural science? [Audio podcast episode]. In *LSE Events: Shaping the Post-COVID World*. London School of Economics and Political Science. <https://www.lse.ac.uk/Events/LSE-Festival/Post-Covid-World/Events/20210302/behavioural>
- Treasury Board Secretariat. (2011, December 15). *Values and Ethics Code for the Public Sector*. Government of Canada. Retrieved March 8, 2022, from <https://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=25049>
- Trudeau, J. (2021, December 16). *President of the Queen's Privy Council for Canada and Minister of Emergency Preparedness Mandate Letter*. Office of the Prime Minister. <https://pm.gc.ca/en/mandate-letters/2021/12/16/president-queens-privy-council-canada-and-minister-emergency>
- United Nations. (1994). *Yokohama Strategy and Plan of Action for a Safer World: Guidelines for natural disaster prevention, preparedness, and mitigation*. World Conference on Natural Disaster Reduction, May 23-27, 1994. Retrieved from https://www.preventionweb.net/files/8241_doc6841contenido1.pdf
- United Nations. (2004). *Review of the Yokohama Strategy and Plan of Action for a Safer World*. World Conference on Disaster Reduction. Retrieved from <https://www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Yokohama-Strategy-English.pdf>
- United Nations Development Programme [UNDP]. (2017). *National post-disaster recovery planning and coordination*. <https://reliefweb.int/report/world/guidance-note-national-post-disaster-recovery-planning-and-coordination>
- United Nations Office for Disaster Risk Reduction [UNDRR]. (2005). Hyogo Framework for Action. *Preventionweb*. <https://www.preventionweb.net/sendai-framework/Hyogo-Framework-for-Action>
- United Nations Office for Disaster Risk Reduction [UNDRR]. (2015). *Sendai Framework for Disaster Risk Reduction 2015-2030*. <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>

United Nations Office for Disaster Risk Reduction [UNDRR]. (2022). *Online glossary*. <https://www.undrr.org/terminology>

Van Zandt, S. (2022, February 9). *Disasters can wipe out affordable housing for years unless communities plan ahead – the loss hurts the entire local economy*. The Conversation. <https://theconversation.com/disasters-can-wipe-out-affordable-housing-for-years-unless-communities-plan-ahead-the-loss-hurts-the-entire-local-economy-174880>

Verga, S., Norton, S., & Kaminska, K. (2013). *Analysis of the multi-layer meta-network of legislation, policy, organizations, activities, programs, and projects related to resilience*. Centre for Security Science, Defence Research and Development Canada. https://cradpdf.drdc-rddc.gc.ca/PDFS/unc140/p538135_A1b.pdf

Voegele, J. (2021, October 27). *We can no longer grow our economies by degrading our natural capital*. World Bank. <https://blogs.worldbank.org/voices/we-can-no-longer-grow-our-economies-degrading-our-natural-capital>

Walker, A. R., Navarro, D. J., Newell, B. R., & Beesley, T. (2021). Protection from uncertainty in the exploration/exploitation trade-off. *Journal of Experimental Psychology: Learning, Memory, and Cognition* (advance online publication). <https://doi.org/10.1037/xlm0000883>

Warren, F., & Lulham, N. (Eds.). (2021). *Canada in a changing climate: National issues report*. Government of Canada. https://changingclimate.ca/site/assets/uploads/sites/3/2021/05/National-Issues-Report_Final_EN.pdf

Weber, L. (2017, November 29) Through the fog of disaster: The process of (re)creating inequities. *Research Counts: Natural Hazards Centre*. University of Colorado, Boulder. <https://hazards.colorado.edu/news/research-counts/through-the-fog-of-disaster-the-process-of-re-creating-inequities>

Weick, K. E. (1988). Enacted sensemaking in crisis situations. *Journal of Management Studies*, 25(4), 305-317. <https://doi.org/10.1111/j.1467-6486.1988.tb00039.x>

Weick, K. E. (1993). The collapse of sensemaking in organizations: The Mann Gulch disaster. *Administrative Science Quarterly*, 38(4), 628-652. <https://doi.org/10.2307/2393339>

Wickham, S., Trant, A., Davis, E., & Hoffman, K. (2021, August 16). How Indigenous knowledge could help manage wildfire risk. *World Economic Forum*. <https://www.weforum.org/agenda/2021/08/indigenous-burning-biodiversity-crisis-environment-ecosystems>

Wilson, K. (2021, April 21). *Toronto to triple COVID-19 vaccine doses in 13 hot spot zones*. CP24. [\[spot-zones-1.5396730?cache=pajhxigfncymiz+%3Fclipld%3D89530\]\(https://www.cbc.ca/news/canada/edmonton/alberta-introduces-legislation-to-limit-covid-19-rule-making-by-municipalities-1.6377997\)

World Economic Forum. \(2021, March 30\). *Global gender gap report 2021*. <https://www.weforum.org/reports/global-gender-gap-report-2021/digest>

World Economic Forum in collaboration with the University of Oxford. \(2020, November\). *Future series: Cybersecurity, emerging technology and systemic risk*. World Economic Forum. \[https://www3.weforum.org/docs/WEF_Future_Series_Cybersecurity_emerging_technology_and_systemic_risk_2020.pdf\]\(https://www3.weforum.org/docs/WEF_Future_Series_Cybersecurity_emerging_technology_and_systemic_risk_2020.pdf\)

Xiao, Y., & Van Zandt, S. \(2012\). Building community resiliency: Spatial links between household and business post-disaster return. *Urban Studies*, 49\(11\), 2523-2542. <https://doi.org/10.1177/0042098011428178>

Zhang, Y., & Wildemuth, B. M. \(2017\). Unstructured interviews. In B. M. Wildemuth \(Ed.\), *Applications of social research methods to questions in information and library science* \(2nd ed., pp. 239-247\). Libraries Unlimited.](https://www.cp24.com/news/toronto-to-triple-covid-19-vaccine-doses-in-13-hot-</p></div><div data-bbox=)

Horizon Scan Signals

Alexander, S. (2021, April 14). *Prospectus on Próspera*. Astral Codex Ten. <https://astralcodexten.substack.com/p/prospectus-on-prospera?s=r>

AlMujadidi, L., Azoury, C., Schmutzter, D., & Woetzel, J. (2021, June 23). *Unlocking the full potential of city revenues*. McKinsey & Company. <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/unlocking-the-full-potential-of-city-revenues>

Angus, C. (2022, February 22). *Canada was not prepared for an onslaught of disinformation*. The National Observer. <https://www.nationalobserver.com/2022/02/22/opinion/canada-was-not-prepared-onslaught-disinformation>

Atkins, B. (2020, June 8). *Demystifying ESG: Its history and current status*. Forbes. <https://www.forbes.com/sites/betsyatkins/2020/06/08/demystifying-esgits-history-current-status/?sh=597dcf512cdd>

Balch, O. (2019, March 5). *Meet the world’s first “minister for future generations.”* The Guardian. <https://www.theguardian.com/world/2019/mar/02/meet-the-worlds-first-future-generations-commissioner>

Bee, J., Davies, P., & Green, M. (2022, February 7). *India prepares to become first country to regulate ESG ratings providers*. JD Supra. <https://www.jdsupra.com/legalnews/india-prepares-to-become-first-country-2259550/>

Bennett, D. (2022, March 8). *Alberta introduces legislation to limit COVID-19 rule-making by municipalities*. Canadian Broadcasting Corporation. <https://www.cbc.ca/news/canada/edmonton/alberta-introduces-legislation-to-limit-covid-19-rule-making-by-municipalities-1.6377997>

[canada/edmonton/alberta-introduces-legislation-to-limit-covid-19-rule-making-by-municipalities-1.6377997](https://www.cbc.ca/news/canada/edmonton/alberta-introduces-legislation-to-limit-covid-19-rule-making-by-municipalities-1.6377997)

Bikales, M. B. J. (2020, November 5). *CA protects homeowners from having fire insurance dropped*. CalMatters. <https://calmatters.org/environment/california-wildfires/2020/11/california-homeowners-fire-insurance-dropped-again/>

Brend, Y. (2020, October 27). *Youth-led climate change lawsuit dismissed by Federal Court*. <https://www.cbc.ca/news/canada/british-columbia/climate-change-lawsuit-fails-dismissed-1.5778952>

Browne, A. (2021, October 2). *ESG whistleblower calls out Wall Street greenwashing*. <https://www.bloomberg.com/news/newsletters/2021-10-02/esg-whistleblower-calls-out-wall-street-greenwashing-new-economy-saturday?sref=vgVNYxhU>

Cardwell, M. (2021, September 2). *Vertical farming on the rise*. Food In Canada. <https://www.foodincanada.com/features/vertical-farming-on-the-rise/>

Carney, M. (2021). *Value(s): Building a better world for all* [E-book]. Penguin Random House Canada.

Clendaniel, M. (2021, March 23). *Why won’t companies release good corporate sustainability data?* Fast Company. <https://www.fastcompany.com/90617738/why-wont-companies-release-good-corporate-sustainability-data>

Condie, S. (2021, November 11). *Energy companies turn to 3-D printing to bypass snarled supply chains*. The Wall Street Journal. <https://www.wsj.com/articles/energy-companies-turn-to-3-d-printing-to-bypass-snarled-supply-chains-11636657907>

Cutler, K. M. (2015, September 15). *Neighborly raises \$5.5M from Joe Lonsdale’s Formation 8, Ashton Kutcher to transform the municipal debt market*. Tech Crunch. <https://techcrunch.com/2015/09/15/neighborly/>

D’Souza, S., McDonald, J., & Cowley, J. (2021, November 26). *Up to 10% of homes could now be ‘uninsurable’ because of flood risk. Yours may be one of them*. <https://www.cbc.ca/news/canada/marketplace-home-insurance-1.6262386>

eCivics. (2012, September 13). *Crowdfunding in the public sector*. <https://www.ecivis.com/blog/bid/109038/crowdfunding-in-the-public-sector>

Edelman, R. (2018). *The battle for Truth*. Edelman Trust Institute. <https://www.edelman.com/post/the-battle-for-truth>

Edelman. (2022). *The Edelman Trust Barometer 2022: Global report*. <https://www.edelman.com/sites/g/files/aatuss191/files/2022-01/2022%20Edelman%20>

[Trust%20Barometer%20FINAL_Jan25.pdf](https://www.edelman.com/sites/g/files/aatuss191/files/2022-01/2022%20Edelman%20Trust%20Barometer%20FINAL_Jan25.pdf)

Evans, K. (2020, March 20). *The New Zealand river that became a legal person*. BBC Travel. <https://www.bbc.com/travel/article/20200319-the-new-zealand-river-that-became-a-legal-person>

Federal Emergency Management Agency. (2022, February 18). *Risk Rating 2.0: Equity in action*. Retrieved February 27, 2022, from <https://www.fema.gov/flood-insurance/risk-rating>

Flavelle, C. (2020, September 10). *Wildfires hasten another climate crisis: Homeowners who can’t get insurance*. The New York Times. <https://www.nytimes.com/2020/09/02/climate/wildfires-insurance.html>

Geraghty, L. (2022, February 14). *What is the Future Generations Bill?* The Big Issue. <https://www.bigissue.com/news/politics/what-is-the-future-generations-bill/>

Government of Canada. (2021, February 12). *Annex: Pricing carbon pollution*. Retrieved March 8, 2022, from <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/healthy-environment-healthy-economy/annex-pricing-carbon-pollution.html>

Ghesquire, F., & Mahul, O. (2021, December 8). *Sovereign catastrophe risk pools – 15 years on and still more to come*. Preventionweb. <https://www.preventionweb.net/news/sovereign-catastrophe-risk-pools-15-years-and-still-more-come>

Hao, K. (2021, September 16). *Troll farms reached 140 million Americans a month on Facebook before 2020 election, internal report shows*. MIT Technology Review. <https://www.technologyreview.com/2021/09/16/1035851/facebook-troll-farms-report-us-2020-election/>

Herder, G. (2021, February 16). *Home of the future: Self-sufficient city model*. Eclectic Trends. <https://www.eclectictrends.com/self-sufficient-city-model-vicente-guallart/>

Horwood, M. (2021, November 9). *Splitting public safety, emergency preparedness post a sign future disasters are ‘top of mind’ for feds*. The Hill Times. <https://www.hilltimes.com/2021/11/09/splitting-public-safety-emergency-preparedness-post-a-sign-future-disasters-are-top-of-mind-for-feds/327610>

Hyde, P. (2020, December 8). *Western Canada’s first off-grid food production facility to provide fresh produce to Yukon community year-round*. University of Calgary News. <https://ucalgary.ca/news/western-canadas-first-grid-food-production-facility-provide-fresh-produce-yukon-community-year>

Institute for the Future. (2018). *A new story to spark the future*

of climate action. https://www.iftf.org/fileadmin/user_upload/downloads/ourwork/IFTF_CIF_Future_of_Climate_Action_2030_Map.pdf

Jang, M. (2021, September 2). *Rights of nature and Indigenous Peoples: Navigating a new course*. University of British Columbia. <https://allard.ubc.ca/about-us/blog/2021/rights-nature-and-indigenous-peoples-navigating-new-course>

Jones, B. (2022, January 21). *Nature conservation near you: Restor maps parks, forests, prairie, and more*. Vox. <https://www.vox.com/down-to-earth/22870194/restor-map-nature-healing-forest-restoration>

Joseph, B. (2020, May 30). *What is the Seventh Generation Principle?* Indigenous Corporate Training Inc. <https://www.ictinc.ca/blog/seventh-generation-principle>

Katz, E. (2021, June 23). *FEMA seeks more staff as it rests beleaguered employees ahead of busy season*. Government Executive. <https://www.govexec.com/workforce/2021/06/fema-seeks-more-staff-it-rests-beleaguered-employees-ahead-busy-season/174920/>

Kobayashi, K. (2019, March 8). *Future Design: A new policymaking system for future generations*. VOX EU. <https://voxeu.org/content/future-design-new-policymaking-system-future-generations>

Kolbert, E. (2021, December 27). *How politics got so polarized*. The New Yorker. <https://www.newyorker.com/magazine/2022/01/03/how-politics-got-so-polarized>

Lai, O. (2022, February 10). Italy makes protecting the environment part of its constitution. *Earth.Org*. <https://earth.org/italy-makes-protecting-the-environment-part-of-its-constitution/>

Lavallée, L. F. (2009). Practical application of an Indigenous research framework and two qualitative Indigenous research methods: Sharing circles and Anishnaabe symbol-based reflection. *International Journal of Qualitative Methods*, 8(1), 21-40. <https://doi.org/10.1177/160940690900800103>

Lindsay, B. (2017, July 14). ‘A tangled web’: insurance rules near wildfires complicate home sales. Canadian Broadcasting Corporation. <https://www.cbc.ca/news/canada/british-columbia/bc-wildfires-new-home-insurance-prince-george-1.4206359>

Lindsay, J. (2022, January 6). *Until we address chronic underfunding, Canada will keep failing at emergency management*. The Conversation. <https://theconversation.com/until-we-address-chronic-underfunding-canada-will-keep-failing-at-emergency-management-174270>

Majchrowicz, M. (2022, March 3). *MiamiCoin for dummies: What the heck is it?* Miami New Times. <https://www.miaminewtimes.com/news/heres-what-you-need-to-know-about-miamicoin-13933313>

Matthews, D. (2019, April 16). *Modern Monetary Theory, explained*. Vox. <https://www.vox.com/future-perfect/2019/4/16/18251646/modern-monetary-theory-new-moment-explained>

McKee, D. (2021, July 22). *Is Nixon’s failed moon landing speech real?* Policy Horizons Canada. <https://horizons.gc.ca/en/2021/07/22/is-nixons-failed-moon-landing-speech-real/>

Mertz, E. (2022, March 2). *Alberta to limit municipalities’ ability to have different public health bylaws than province*. Global News. <https://globalnews.ca/news/8652406/alberta-limit-municipalities-ability-different-public-health-bylaws/>

Milman, O. (2021, November 7). *Climate denial is waning on the right. What’s replacing it might be just as scary*. The Guardian. <https://www.theguardian.com/environment/2021/nov/21/climate-denial-far-right-immigration>

Modak, P. & Chapman, T. (2014). Waterloo’s Stormwater Utility Fee and Credit Program. *International Conference on Water Management Modeling*. <https://www.icwmm.org/Archive/2014-C023-16/waterloorsquos-stormwater-utility-fee-and-credit-program>

Muggah, R. (2020, January 23). *Look to cities, not nation-states, to solve our biggest challenges*. World Economic Forum. <https://www.weforum.org/agenda/2020/01/cities-mayors-not-nation-states-challenges-climate/>

Munich Re. (2022, January 10). *Hurricanes, cold waves, tornadoes: Weather disasters in USA dominate natural disaster losses in 2021*. <https://www.munichre.com/en/company/media-relations/media-information-and-corporate-news/media-information/2022/natural-disaster-losses-2021.html>

Murphy, K. (2022, March 4). *Liberal MP wants coalition to expand \$10bn scheme supporting insurers to cover all natural disasters*. The Guardian. <https://www.theguardian.com/australia-news/2022/mar/04/liberal-mp-wants-coalition-to-expand-10bn-scheme-supporting-insurers-to-cover-all-natural-disasters>

National Intelligence Council. (2021, March). *Global trends 2040: A more contested world*. Office of the Director of National Intelligence. <https://www.dni.gov/index.php/gt2040-home>

National Low Income Housing Coalition. (2021, June 7). *Bipartisan bill creating National Disaster Safety Board reintroduced with support from disaster recovery advocates, researchers, and former FEMA administrators*. <https://nlihc.org/resource/bipartisan-bill-creating-national-disaster-safety-board-reintroduced-support-disaster>

Neslen, A. (2021, August 25). *Climate change could make insurance too expensive for most people – report*. The Guardian. <https://www.theguardian.com/environment/2019/mar/21/climate-change-could-make-insurance-too-expensive-for-ordinary-people-report>

Nugent, C. (2021, January 22). *Amsterdam is embracing a radical new economic theory to help save the environment. Could it also replace capitalism?* Time. <https://time.com/5930093/amsterdam-doughnut-economics/>

Porter, J. (2022, February 21). *Trump’s new social media app launches on iOS*. The Verge. <https://www.theverge.com/2022/2/21/22944179/truth-social-launch-ios-donald-trump-twitter-platform>

RBC Economics. (2020, June 9). *Canadian city finances ailing from COVID-19*. <https://thoughtleadership.rbc.com/canadian-city-finances-ailing-from-covid-19/>

Rinne, G. (2021, October 13). *A trial date could be set next year in the 2012 Thunder Bay flooding lawsuit*. TBNewsWatch.Com. <https://www.tbnewswatch.com/local-news/a-trial-date-could-be-set-next-year-in-the-2012-thunder-bay-flooding-lawsuit-4507223>

Rothman, J. (2018, March 26). *Are we already living in virtual reality?* The New Yorker. <https://www.newyorker.com/magazine/2018/04/02/are-we-already-living-in-virtual-reality>

Sansom, G. T., Thompson, C., Sansom, L., Fawkes, L., & Boerlin, E. (2022). Compounding impacts of hazard exposures on mental health in Houston, TX. *Natural Hazards*, 1-10. <https://doi.org/10.1007/s11069-021-05158-x>

Schulze, E. (2019, January 22). *Everything you need to know about the Fourth Industrial Revolution*. CNBC. <https://www.cnbc.com/2019/01/16/fourth-industrial-revolution-explained-davos-2019.html>

Settle, A. (2021, July 7). *A national insurance crisis looms. The Morrison government’s \$10 billion ‘pool’ plan won’t fix it*. The Conversation. <https://theconversation.com/a-national-insurance-crisis-looms-the-morrison-governments-10-billion-pool-plan-wont-fix-it-163796>

Setzer, J. (2021, July 2). *Global trends in climate litigation: 2021 snapshot*. London School of Economics and Political Science. <https://www.lse.ac.uk/granthaminstitute/publication/global-trends-in-climate-litigation-2021-snapshot/>

Stern, J. (2020, August 21). *Two disasters are exponentially worse than one*. The Atlantic. <https://www.theatlantic.com/science/archive/2020/08/exponential-threat-pandemic-wildfires/615574/>

Stern, J. (2021, August 26). *Will pandemic fatigue change how we process disasters?* The Atlantic. <https://www.theatlantic.com/health/archive/2021/08/will-pandemic-fatigue-change-how-we-process-disasters/619858/>

Stewart, E. (2021, October 10). *ESG investing and 401k funds are everywhere. Does “ethical investing” work?* Vox. <https://www.vox.com/the-goods/22714761/esg-investing-divestment-fossil-fuels-climate-401k>

Taylor, S. (2020, April 19). *The coronavirus and post-traumatic growth*. Scientific American Blog Network. <https://blogs.scientificamerican.com/observations/the-coronavirus-and-post-traumatic-growth/>

Terrell, I. (2020, January 24). *Microgrids: An idea whose time has come?* Canadian Broadcasting Corporation. <https://www.cbc.ca/news/science/what-on-earth-newsletter-microgrids-green-energy-1.5437568>

Useem, J. (2021, November 24). *The end of trust*. <https://www.theatlantic.com/magazine/archive/2021/12/trust-recession-economy/620522/>

vanKampen, S. (2016, February 25). *Insurance Bureau of Canada urges national flood plan*. Canadian Broadcasting Corporation. <https://www.cbc.ca/news/canada/nova-scotia/flood-insurance-subsidize-1.3463863>

Valleau, N. (2021, October 10). *How disagreements over vaccination and COVID-19 have ripped apart these Alberta families*. Canadian Broadcasting Corporation. <https://www.cbc.ca/news/canada/calgary/alberta-covid-vaccination-disagreement-family-1.6201953>

Warren, E. (2021, August 30). *Buyers and builders frustrated after being refused insurance for homes near wildfires*. Canadian Broadcasting Corporation. <https://www.cbc.ca/news/canada/british-columbia/builders-and-home-buyers-frustrated-with-insurance-companies-1.6153681>

Winters, J. (2020, October 13). *New poll on climate change: Denial is out, alarm is in*. Grist. <https://grist.org/climate/new-polling-on-climate-change-denial-is-out-alarm-is-in/>

Wright, K. (2021, October 26). *What is a climatarian diet?* The Independent. <https://www.independent.co.uk/life-style/health-and-families/climatarian-diet-environment-carbon-footprint-b1945425.html>