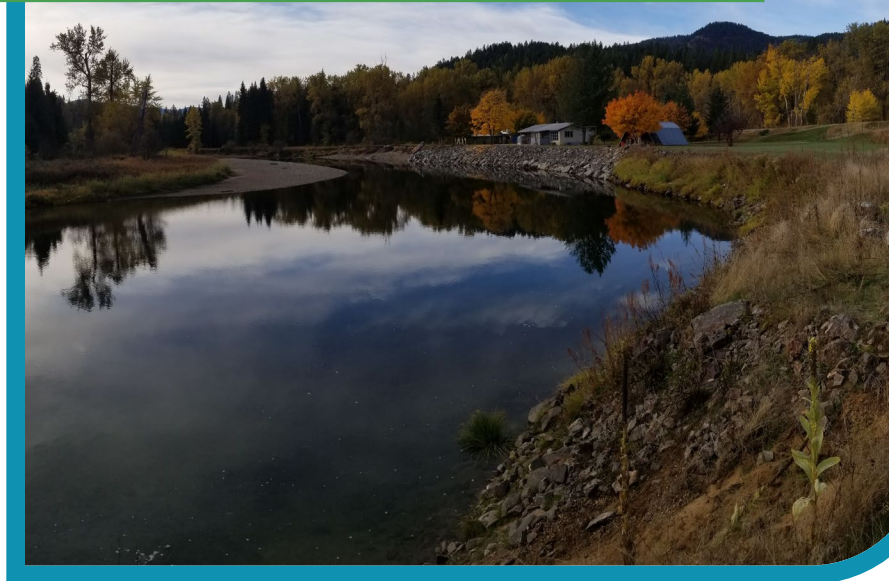


Fraser Basin Council
Investigations in Support of Flood Strategy
Development in British Columbia
Issue A: Flood Risk Governance
Final Report



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Executive Summary

Introduction

Disaster risk is always around us, and it is becoming increasingly important to understand and address. And yet, we struggle to manage and govern to reduce disaster risk, in large part because impacts are complex, systemic, and long-term. The present-day COVID-19 pandemic has highlighted the many tentacles of disaster impacts as well as the challenges that are faced by governments and others to understand, communicate, and act to mitigate these impacts. Similarly, many recent examples of floods and associated social, ecological, and financial impacts in British Columbia (BC), highlight the complexity of managing this one hazard in particular.

Effective governance of flood risk needs to recognise the wickedⁱ and systemicⁱⁱ nature of disaster risk. **Governance describes the process by which society organizes itself to make decisions and includes consideration of who has power, who makes decisions, how decisions are made, and how the ideas of interested and affected parties and broader society are considered and included in decision processes.** And therefore, effective flood risk governance needs to balance the intractable nature of flood with a consistent vision, defined roles and responsibilities, clear planning frameworks, meaningful engagement, and robust decision processes. There is an obvious tension here between the need for clear, transparent, and linear processes desired for good governance and the innately complex and non-linear flood issues. This is further exacerbated when externalities such as competing demands on government and society or legislated or otherwise mandated directions from other levels of government, are considered.

Given the present-day impacts and losses associated with floods and the expected increase in these losses as our climate changes, BC needs to reflect on its current governance model to assess how it is performing, and how might it be improved to better prepare for future flood risks. This project investigates the challenges and opportunities associated with flood risk governance in the province.

Drivers for Action on Flood Risk Governance

There are several drivers to explore flood risk governance in BC at this time. Some are a function of existing, arguably failing systems, as well as external pressures that are increasing our risk:

1. As evidenced by persistent losses and damages associated with flood as well as recent reckonings of the system in post-disaster reviews, there is a strong argument that there is a **failure of the current flood risk governance structure**.
2. The Province has recently legislated a change in its relationship with First Nations through the **BC Declaration on the Rights of Indigenous Peoples Act** [2018]. Given that issues of flood risk

ⁱ A wicked problem in policy, planning, or natural resource management is one that is difficult or impossible to solve. Where competing interests mean that there is no single solution, and because of complex interdependencies, solving one part of the problem will worsen or create other problems.

ⁱⁱ In this instance the term ‘systemic’ is used to describe the widespread impacts of flood that can affect all parts of society, are widespread, and can persist for long periods of time.

governance are effectively issues of land and water, it is imperative that existing governance structures are adjusted to reflect this legislation.

3. **Climate change** is increasing our flood hazard across the board. Sea levels are rising, increasing coastal flood hazard, and inland flood frequency and intensity is expected to increase on many systems.
4. Concurrently with increasing hazard from climate change, parts of the province face **increasing development pressures** that are potentially exposing more people, buildings, and critical infrastructure to hazard areas.

Whereas other drivers are opportunistic:

5. Canada and the Province are both recent signatories of the **Sendai Framework for Disaster Risk Reduction**, which sets out global targets and pathways for disaster risk reduction (DRR).
6. BC is currently in the midst of **modernizing the Emergency Program Act** [1996] to “support more effective management of emergencies”, which has obvious implications for flood risk governance.
7. The Province has **committed to begin and implement a BC Flood Strategy** to “continue to improve flood management and governance for a resilient BC”.

Project Background and Objective

The Fraser Basin Council (FBC) has been retained by the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD) to manage and coordinate research and engagement across a broad range of flood management issues relating to governance, hazard and risk management, forecasting, and emergency response and recovery (see Preamble). The FBC retained Ebbwater Consulting Inc. (Ebbwater) and Pinna Sustainability Ltd. (Pinna) to conduct research in support of Issue A-1: Flood Risk Governance, one of 11 interrelated projects. The overall **objective for this project is understand the baseline for the governance of flood risk management activities in BC, and to then explore obstacles and opportunities to improve governance.**

Project Methods

To explore the advantages and limitations of the current governance model, as well as opportunities to improve it five investigations were completed.

1. Investigation A-1.1: Identify the flood management services provided by each order of government in BC.
2. Investigation A-1.2: Investigate the roles of non-government entities in flood management in BC.
3. Investigation A-1.3: Identify challenges, gaps, and limitations with current service delivery and flood risk governance.
4. Investigation A-1.4: Identify opportunities for improving collaboration and coordination within and across authorities and adjusting non-government entities’ roles that would address challenges and improve efficiency and effectiveness.

5. Investigation A-1.5: Recommend changes to support improved collaboration and coordination in flood management, including an analysis of benefits and costs/limitations for each recommendation.
6. Investigation A-1.6: Investigate alternative options for distributing and integrating flood management responsibilities among authorities, including an analysis of benefits and costs/limitations for each option.

Each of these investigations included components of desktop research and analysis combined with structured and unstructured engagement with diverse interested and affected parties. The current system was then compared to best practice principles for flood risk governance to both probe the gaps and limitations, as well as to support a recommendation for a changed governance system.

The overall approach required that best practice for flood risk governance be defined as a baseline for comparison. Two important investigations supported this effort. In the first instance, a comprehensive list of core competencies (or activities) required across government, the private sector and the public was developed. 51 core competencies under the broad groupings of foundational tools (i.e., data or science required to support mitigation actions), risk reduction tools (i.e., planning and implementation of activities that reduce flood risk), and tools for resilience (i.e., activities that support quick and robust recovery from flood events).

To support the analysis and later engagement, a new methodology to catalogue and visualise activities was developed (see Figure 1). These visualisations and the engagement exercises provided a baseline to understand the current governance system, its gaps and challenges, as well as opportunities within it.

Figure 1: Extract of governance activity visualisation.

Core Competencies/Sector (Agency)		Government				Other Authorities				Civil Society			Private Sector			Public	
		Federal	Provincial	Local	First Nation	Linking Authorities	Dam Owners	Crown Corporations	Water Boards	Professional Associations	NGO	Post-Secondary	Asset Owners	Advisor of Consult	Insurance	
Foundational Tool	Data	Traditional Knowledge															
		Hydrometric and Climate Data															
		Topographic and Bathymetric Surveys															
		Topographic and Bathymetric Data															
		Flood Protection Infrastructure Surveys															
		Exposure and Vulnerability Data Development															
		Exposure and Vulnerability Data Dissemination															
		Flood Event Mapping															
	Forecast	Climate and Climate Change															
		Weather															
		River (Flows and/or Levels)															
		Coastal Conditions															
	Mapping	Hazard - Creation															
		Risk - Creation															
		Compilation/Storage															
		Publication and Sharing															
	Education	Post-Secondary Programs															
		Professional Programs															
Public Education																	

In addition to the core competencies additional research was conducted to define principles of good governance for flood risk. This work considered a broad spectrum of academic and grey literature related to general principles of good governance to those specific to disaster risk and flood risk. Ultimately, 8 principles for good flood risk governance in the context of BC were developed:

1. **Legitimacy and Voice:** A principle to ensure broad and equitable participation in flood governance processes.
2. **Direction:** A principle that describes the importance of a clear vision and strong leadership across all scales and levels of governance.
3. **Performance:** A principle to ensure transparency and efficiency of activities.
4. **Accountability:** A principle to ensure clear roles and responsibilities and require strong accountability for actions.
5. **Fairness:** A principle to promote equity in implementation of flood activities.
6. **Broad Ownership:** A principle in support of all-of-society ownership of flood risk and activities to mitigate it.
7. **Alignment, Links, and Synergies.** A principle to manage the systemic nature of flood through alignment with related processes to leverage efficiencies and identify competing actions.
8. **Continued Learning:** A principle to recognise that flood management requires adaptability, especially in the era of climate change.

These 8 principles, and the core competencies described above, are used to frame the analysis and results of the project.

Gaps, Challenges, Limitations and Opportunities within Existing Model

The investigations identified many challenges with the existing governance model as summarised below. The table is organised according to the 8 principles of good governance.

Principle	Identified Gaps/Challenges in Existing Model	Identified Opportunities in Existing Model
Legitimacy and Voice	<ul style="list-style-type: none"> • Roles and responsibilities are unclear. • Competing mandates and relationships challenge good governance. • Light-touch regulation leads to inactivity. • Broad participation is not currently occurring and will be challenging in future. • Consensus-oriented activities require patience and resources. • The current “voice” for flood risk governance does not respect the land. • Although steps have been taken towards reconciliation the process of reconciliation will be long and require a persistent effort that is not clearly outlined with regards to flood risk governance. 	<ul style="list-style-type: none"> • Leverage and strengthen existing Federal-Provincial relationships. • Acknowledge competing interests. • Model and build on existing initiatives led by Indigenous communities. • Leverage work already conducted in support of the BC Flood Strategy.
Direction	<ul style="list-style-type: none"> • There are no clear guiding policy statements or mandates at Province or Federal level that align with best practice (e.g., Sendai). • Many core competencies have no lead agency or vision/target. • Inertia continues to impede movement towards best practice in implementation of flood risk reduction. • Activities continue to be reactive rather than proactive. • Initiatives are often derailed when competing priorities become more visible. • There are no operational targets for risk reduction. • Adhoc funding makes strategic planning for local governments and First Nation governments a challenge. 	<ul style="list-style-type: none"> • Province and Canada have adopted the Sendai Framework and its principles. • The Province has adopted, and Canada has tabled legislation to empower UNDRIP in Canada. • Policy windows open during and post-flood. • Many First Nations and Local Governments are looking for additional regulations to support action and funding at a local level. • Leverage Indigenous Knowledge and generosity of Indigenous community members to create a holistic vision. • Take advantage of policy windows following flood events.

Performance	<ul style="list-style-type: none"> • Regulations are weak and unclear. • There are competing regulations. • Guidelines are non-prescriptive. • Funding is adhoc and managed without technical expertise. • Lack of capacity and expertise in all areas impedes good flood risk management. This is exacerbated by high turnover of staff within government roles. 	<ul style="list-style-type: none"> • Capitalise on strengthened Federal-Provincial relations to increase efficiency and to acquire Federal funding for the province. • Build on existing guideline model. • Leverage current appetite for additional and more prescriptive guidelines. • Improve existing funding programs to perform better on measures of risk reduction and equity. • Be opportunistic as research and collaborations and initiatives develop.
Accountability	<ul style="list-style-type: none"> • There are no clear targets or enforcement mechanisms. • Existing regulation, especially for non-structural activities, is voluntary. • There are many loopholes and unclear roles and responsibilities. • Some processes are opaque. 	<ul style="list-style-type: none"> • Adoption of Sendai targets as an interim measure. • Learn from communities that have funded positions that have created accountability at the local government level.
Fairness	<ul style="list-style-type: none"> • Existing risk for some communities is extremely high because of past decisions. • Participation in flood risk governance processes is not equitable. • Accessibility to funding is not equitable. • There are no systems to operationalise UNDRIP and FPIC. • Financial recovery is related to past economic standards. 	<ul style="list-style-type: none"> • Highlight existing Indigenous-led flood management projects. • Leverage existing funding programs but make them fairer and more transparent. • Leverage existing peer-to-peer alliances to support overall equity.
Broad Ownership	<ul style="list-style-type: none"> • Public understanding is very low. • Private sector understanding is mixed. • Flood is a challenging and overwhelming topic for many. 	<ul style="list-style-type: none"> • Leverage existing public communications. • Leverage ongoing activities related to flood hazard disclosure. • Showcase private sector activities.

Alignment, Links and Synergies	<ul style="list-style-type: none"> • There are innumerable potential initiatives with which to align, • Resources to enable good collaboration are generally not available or funded. • Natural systems do not match jurisdictional boundaries. • Other initiatives may have competing priorities. 	<ul style="list-style-type: none"> • Prioritize relationships with key groups. • Leverage existing watershed or regional relationships. • Capitalise on inertia around climate risk and resilience.
Continued Learning	<ul style="list-style-type: none"> • Current system is entrenched and rigid. 	<ul style="list-style-type: none"> • Acknowledge the gaps and need for change. • Support pilot projects. • Build on existing initiatives that are already increasing professional capacity.

A New Model for Flood Risk Governance in BC

The current model for flood risk governance in BC is imperfect. The province and its residents continue to face damages, losses, and misery associated with flood events. And, existing governance systems do not meet most principles for best practice. Further, there is an appetite for change from all levels of government as well as from non-government entities.

With this baseline in mind, along with an understanding of existing challenges and opportunities, as well as best practice governance concepts and models from similarly governed jurisdictions **a new concept for flood risk governance is proposed**. While this is a new model, it recognizes and leverages the important services that are currently being delivered by government and the private sector.

At a high-level the new concept shifts from the polycentric model of governance (i.e., having multiple centres of activity) currently in place to a hybrid model, where some key competencies are returned to the Province, and others remain in the hands of local governments and broader society. Further, this model works across the full emergency management cycle, and mitigation and preparation are brought together with response and recovery. Finally, the new concept addresses the principles of good governance, most notably by creating strong direction and accountability mechanisms.

The proposed new model has four main elements:

1. **A strong vision** that will acknowledge reconciliation with Indigenous Peoples and set direction and support future accountability.
2. **A central knowledge hub** within the Provincial government, which will support collaboration with the Federal government, will provide technical services and funding programs in a consistent and efficient manner, and will develop guidelines and tools to enable consistent and best practice flood management approaches across the province.
3. **Regional hubs** that will support collaboration on a regional and watershed basis, and will provide expertise and support to all, but especially underserved communities.
4. **Reliable and adequate funding for locally-driven flood mitigation activities** that will leverage local knowledge and processes and work towards a common provincial vision.

The model also has supporting enabling elements:

5. Continued and evolved support from professional associations.
6. Strengthened post-secondary programs to support the development of a diverse community of flood management professionals that are equipped to navigate the systemic and wicked nature of flood.

Conclusions

There is, at this moment a policy window for a shift in flood risk governance in BC, because of external factors in combination with knowledge of new paradigms for flood risk governance. This is an amazing opportunity to improve flood risk governance in the province, which will create safer more resilient communities today and in future.

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List of Acronyms

ACT	Adaptation to Climate Team (SFU)
ADM	Assistant Deputy Minister
AEP	Annual Exceedance Probability
BC	British Columbia
BCDRIPA	BC Declaration on the Rights of Indigenous Peoples Act
BCH	BC Hydro
BCR	Band Council Resolution
BCREA	BC Real Estate Association
CEPF	Community Emergency Preparedness Fund
CIER	Centre for Indigenous and Environmental Resources
CSA	Canadian Standards Association
DFAA	Disaster Financial Assistance Arrangements
DMAF	Disaster Mitigation Adaptation Fund
DND	Department of National Defence
DPA	Development Permit Area
DRDC	Department of Defence Research Canada
DRR	Disaster Risk Reduction
ECCC	Environment and Climate Change Canada
EGBC	Engineers and Geoscientists British Columbia
EMBC	Emergency Management British Columbia
EPA	Emergency Program Act
FBC	Fraser Basin Council
FCL	Flood Construction Level
FCM	Federation of Canadian Municipalities
FDRP	Flood Damage Reduction Program
FHALUMG	Flood Hazard Area Land Use Management Guidelines
FOC	Fisheries and Oceans and Canada
FPIC	Free, Prior and Informed Consent
FNA	First Nations Adapt
GSC	Geologic Survey of Canada
GFDRR	Global Facility for Disaster Risk Reduction
IBC	Insurance Bureau of Canada
IC	Infrastructure Canada
IOD	Inspector of Dikes
IPREM	Integrated Partnership for Regional Emergency Management
ISC	Indigenous Services Canada
LMFMS	Lower Mainland Flood Management Strategy
MECCS	Ministry of Environment and Climate Change Strategy
MFLNRORD	Ministry of Forest, Lands and Natural Resource Operations and Rural Development

MMAH	Ministry of Municipal Affairs and Housing
MoA	Ministry of Agriculture
MoH	Ministry of Health
MOTI	Ministry of Transportation and Infrastructure
NDMP	National Disaster Mitigation Program
NRC	National Research Council
NRCan	Natural Resources Canada
NRP	National Risk Profile
OCP	Official Community Plan
ONA	Okanagan Nation Alliance
OSPG	Office of the Superintendent of Professional Governance
PCIC	Pacific Climate Impacts Consortium
PPS	Provincial Policy Statement
PSC	Public Safety Canada
PSSG	Public Safety and Solicitor General (BC)
P/Ts	Provinces and Territories
RGS	Regional Growth Strategy
SCC	Standards Council of Canada
SFU	Simon Fraser University
UBC	University of British Columbia
UBCM	Union of BC Municipalities
UN	United Nations
UNDP	United Nations Development Programme
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
UNDRR	United Nations Office for Disaster Risk Reduction
UVIC	University of Victoria
WSA	Water Sustainability Act

Preamble

Many communities in BC are working to better manage their river and coastal flood risks through a wide range of flood management activities. But current approaches to managing flooding are not always efficient, coordinated, equitable, or cost-effective.

The **Investigations in Support of Flood Strategy Development in British Columbia** is a province-wide initiative aimed at developing a comprehensive understanding of current challenges and opportunities relating to flood management across BC. The focus is primarily on riverine, coastal, and ice jam floods, although other types of flooding are recognized where appropriate. This initiative recognizes that flood management is a multi-faceted, ongoing process requiring the coordination of many organizations, agencies, and orders of government and linked with broader processes, including climate change adaptation and disaster risk reduction, among others.

The BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development retained the Fraser Basin Council to manage and coordinate research and engagement across a broad range of flood management issues relating to governance, hazard and risk management, forecasting, and emergency response and recovery. Consulting teams were retained to undertake research and technical analysis with input from experts, practitioners, and stakeholders from all four orders of government, the private sector, and other organizations. Each investigation produced recommendations to inform flood management program improvements at multiple scales and across many jurisdictions.

Investigations were undertaken across 11 interrelated issues under 4 themes:

Theme A – Governance		
A-1	Flood Governance	Risk Review current governance and delivery of flood management activities in BC involving all four orders of government and non-government entities, identify challenges, and recommend changes to improve coordination, collaboration, and overall effectiveness.
Theme B – Flood Hazard and Risk Management		
B-1	Impacts of Climate Change	Investigate the state of climate change information and new and existing tools that can support authorities in integrating climate change impacts in flood management.
B-2	Flood Information	Hazard Examine the state of flood mapping and dike deficiency information and recommend ways to fill current gaps in flood mapping and manage and maintain information about flood hazards and dike deficiencies.
B-3	Flood Assessment	Risk Explore approaches to completing flood risk assessments at various scales, methods for prioritizing risk reduction actions, and standards-versus risk-based approach to flood management.
B-4	Flood Planning	Examine the ability of local authorities to undertake integrated flood management planning and opportunities to improve capacity.
B-5	Structural Management Approaches	Flood Assess the potential for improvements to dike management, improve the capacity of diking authorities, and implement innovative structural flood risk reduction measures.

B-6	Non-Structural Flood Management Approaches	Investigate current and alternative approaches to managing development in floodplains and opportunities for implementing non-structural flood risk reduction actions.
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Theme C – Flood Forecasting, Emergency Response and Recovery

C-1	Flood Forecasting Services	Identify gaps and opportunities for improvement in the province’s flood forecasting services.
C-2	Emergency Response	Investigate roles, plans, and capabilities for flood response and opportunities for improving emergency response.
C-3	Flood Recovery	Examine approaches that would support recovery efforts and help reduce future flood risk.

Theme D – Resources and Funding

D-1	Resources and Funding	Investigate resource and funding needs associated with actions to strengthen flood management and evidence in support of proactive flood mitigation.
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1 Introduction

Disaster risk is always around us, and it is becoming increasingly important to understand and address. And yet, we struggle to manage and govern to reduce disaster risk, in large part because impacts are complex, systemic, and long-term. The present-day COVID-19 pandemic has highlighted the many tentacles of disaster impacts as well as the challenges that are faced by governments and others to understand, communicate, and act to mitigate these impacts. Similarly, many recent examples of floods and associated social, ecological, and financial impacts in British Columbia (BC), highlight the complexity of managing this one hazard in particular.

Effective governance of flood needs to recognise the wicked¹ and systemic² nature of disaster risk. **Governance describes the process by which society organizes itself to make decisions and includes consideration of who has power, who makes decisions, how decisions are made, and how the ideas of interested and affected parties and broader society are considered and included in decision processes.** And therefore, effective flood risk governance needs to balance the intractable nature of flood with a consistent vision, defined roles and responsibilities, clear planning frameworks, meaningful engagement, and robust decision processes. There is an obvious tension here between the need for clear, transparent, and linear processes desired for good governance and the innately complex and non-linear flood issues. This is further exacerbated when externalities such as competing demands on government and society, or legislated or otherwise mandated directions from other levels of government, are considered.

Given the present-day impacts and losses associated with floods and the expected increase in these losses as our climate changes, BC needs to reflect on its current governance model to assess how it is performing, and how might it be improved to better prepare for future flood risks. This project investigates the challenges and opportunities associated with flood risk governance in the province.

1.1 Flood in British Columbia

The size, diversity, and hydroclimate of BC mean that there are numerous and varied flood hazards across the province. Coastal areas are subject to flooding from the ocean, the large and small creek and river systems are associated with fluvial flood hazards, some of the province's lakes see water level fluctuations that result in flooding, while other areas with significant rainfall have localised pluvial flooding. Floods are among the most commonly occurring natural hazard in BC and account for the second largest portion of disaster recovery costs on an annual basis (Abbott and Chapman 2018).

BC's floodplains are the commercial, social, and ecological arteries of the province. The assets, and communities they support, that sit on these floodplains are subject to damage and disruption when floods occur. We use floodplains for these purposes partly for historic reasons (e.g., for access to fresh water,

¹ A wicked problem in policy, planning, or natural resource management is one that is difficult or impossible to solve. Where competing interests mean that there is no single solution, and because of complex interdependencies, solving one part of the problem will worsen or create other problems.

² In this instance the term 'systemic' is used to describe the widespread impacts of flood that can affect all parts of society, are widespread, and can persist for long periods of time.

transportation, flat and fertile land, etc.), but have continued to grow and entrench our communities into these areas because they are desirable places to live, work and play.

Experiences with flood vary across the province, in part because of the different flood hazards that are faced, but also because of the relative risk of some communities, and their ability to reduce this risk. For example, many Indigenous communities³ are subject to significant risks by virtue of the forced placement of community infrastructure on floodplains. These same communities have historically had fewer resources to reduce risks, and so now are particularly challenged. Although flood hazards are found across the province, the impacts of these floods are particularly severe in some regions.

Mitigating flood risks is key to increasing the resilience of all affected communities and reducing pressures on the public purse. A community can improve its chances of future growth and prosperity by proactively investing in flood mitigation activities, which reduces the risk of significant disaster recovery costs, productivity losses, economic losses, destruction of non-monetary cultural assets, environmental damage, injuries, and deaths. These mitigation activities require good governance to implement.

1.2 Flood Risk Governance in British Columbia

Where governance describes the process by which society organises itself to make decisions, flood risk governance describes this process as it relates to flood hazard, flood risk, and flood resilience (see Section 1.5 for definitions of these terms).

Flood risk governance in the province has shifted over time because of a multitude of intentional and unintentional decisions, political priorities and directions related to larger shifts in governance approaches, and interjurisdictional relations. The occurrence of actual flood events (in the province or elsewhere in the world) have often been the impetus for (mostly reactive) decisions that shape flood risk governance in BC today.

Presently, the overall approach is polycentric, in that authority and responsibility for flood management activities is spread across different levels of government (e.g., Federal, Provincial, Local and First Nation), and across many sectors within each of these governments (e.g., natural resources, infrastructure, etc.). The private sector also implicitly plays a role. For example, major critical asset holders have responsibility to consider the flood resilience of their infrastructure and have financial self-interest in doing so. The insurance and re-insurance industry, who support the financing of residual risk, are explicitly involved in flood risk governance. Simply, there are a lot of actors, who in some cases have overlapping interests, and in other cases, competing interests.

1.3 Drivers for Action on Flood Risk Governance

There are several drivers to explore flood risk governance in BC at this time. Some are a function of existing, arguably failing systems, as well as external pressures that are increasing our risk:

³ Throughout this report the authors' have used the term Indigenous Peoples and/or communities to reflect the language of UNDRIP and DRIPA. However, when referring to their governments, we used the term First Nation.

1. As evidenced by persistent losses and damages associated with flood, as well as recent reckonings of the governance system in post-disaster reviews (e. g. Abbott and Chapman, 2018; Simms and Brandes, 2016) there is a strong argument that there is a **failure of the current flood risk governance system**.
2. The Province has recently legislated a change in its relationship with Indigenous Peoples through the **BC Declaration on the Rights of Indigenous Peoples Act** [2018] (BCDRIPA). Given that issues of flood risk governance are effectively issues of land and water, it is imperative that existing governance structures are adjusted to reflect this legislation. Similarly, the Government of Canada, has recently (December 2020) introduced legislation to implement the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) across the country.
3. **Climate change** is increasing our flood hazard across the board. Sea levels are rising, increasing coastal flood hazard, and inland flood frequency and intensity is expected to increase in many watersheds.
4. Concurrently with increasing hazard from climate change, parts of the province face **increasing development pressures** that are potentially exposing more people, buildings, and critical infrastructure to hazard areas.

Whereas other drivers are opportunistic:

5. Canada and the Province are both recent signatories of the **Sendai Framework for Disaster Risk Reduction**, which sets out global targets and pathways for disaster risk reduction (DRR).
6. BC is currently in the midst of **modernizing the Emergency Program Act** (EPA) [1996] to “support more effective management of emergencies”, which will have obvious implications for flood risk governance.
7. The Province has committed to begin and implement a BC Flood Strategy to “continue to improve flood management and governance for a resilient BC” (Province of British Columbia 2021)

1.4 Investigating Flood Risk Governance for British Columbia

The Fraser Basin Council (FBC) has been retained by the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD) to manage and coordinate research and engagement across a broad range of flood management issues relating to governance, hazard and risk management, forecasting, and emergency response and recovery (see Preamble and full list of Issues in Appendix A). The FBC retained Ebbwater Consulting Inc (Ebbwater) and Pinna Sustainability Inc (Pinna) to conduct research in support of Issue A-1: Flood Risk Governance, one of 11 interrelated projects. The overall objective for this project is to understand the baseline for the governance of flood risk management activities in BC, and to then explore opportunities and obstacles to improve governance. This is being explored through 6 separate investigations as determined by FBC and the Province:

1. Investigation A-1.1: Identify the flood management services provided by each order of government in BC.
2. Investigation A-1.2: Investigate the roles of non-government entities in flood management in BC.

3. Investigation A-1.3: Identify challenges, gaps, and limitations with current service delivery and flood risk governance.
4. Investigation A-1.4: Identify opportunities for improving collaboration and coordination within and across authorities and adjusting non-government entities' roles that would address challenges and improve efficiency and effectiveness.
5. Investigation A-1.5: Recommend changes to support improved collaboration and coordination in flood management, including an analysis of benefits and costs/limitations for each recommendation.
6. Investigation A-1.6: Investigate alternative options for distributing and integrating flood management responsibilities among authorities, including an analysis of benefits and costs/limitations for each option.

This report is interconnected with reporting on other Issues. The analysis and reporting presented here was conducted as one of the last projects in the series (see Appendix A), and therefore leans heavily on the outcomes of earlier work.

1.4.1 Project Scope – Limitations

The primary limitation of the work conducted and reported for this project relates to the project scope, resources, and timelines. This was a limited scope project, conducted over a period of months, also through the provincial interregnum period, which limited access to many government staff. The following limitations associated with timeline and scope are noted:

- Although the authors have tried to be as comprehensive as possible, some portions of the work (e.g., interviews) were conducted on a targeted basis, and therefore the results presented reflect what was heard from interviewees rather than a reflection of the larger group of interested and affected parties.
- This project leveraged work conducted by others for the broader series of investigations. This project relied on these results and did not complete any fact checking.
- As noted earlier in the introduction, the Province is currently in the midst of some larger shifts in governance and policy. Some elements of scope, such as research into the organizational logistics of consolidation of provincial flood services was deemed out of scope until such a time that other pieces of legislation and policy come into force.
- This project focusses on coastal and fluvial flood hazards. There is some limited discussion of the importance of considering other geohazards on the clearwater flood--debris flood—debris flow spectrum, as well as secondary erosion and avulsion hazards. Further, although this report does not specifically address pluvial hazards and urban stormwater management, there are some limited references to where governance of these issues needs to align with flood risk governance.

1.4.2 Project Scope – Evolution

Over the course of the project some shifts in the project scope and objectives occurred:

- The project team recognised that the non-government contributions to flood management are much greater than originally envisioned. The project now includes a discussion of a broad set of non-government actors.
- In recognition that organisational discussions at the Province are underway as the modernisation of the EPA is considered, and DRIPA is acted on, this report does not consider organizational changes at the Province, instead it presents a big picture vision for governance arrangements.

1.5 A Note on Terminology

Many technical terms are used throughout this report. The authors have been deliberate in their use of language, especially for terms that are often used interchangeably or for different purposes in colloquial communication.

This project has a focus on governance, which is a complex and diverse term. For the purposes of this project, the following definitions have been adopted:

Governance describes the process by which society, or groups within it, organizes itself to make decisions (modified from Institute on Governance, no date).

Further, much of the analysis included in this project required a parsing of governance into various distinct, but overlapping, components:

Process Components of Governance in this report are defined as six basic elements, nominally linear, that enable an overall governance framework. These include planning, regulation (i.e., legislated and regulated elements), guidance (e.g., guidelines, incentives), funding, implementation (e.g., creating regulations or constructing flood protection works), and monitoring. Additional information on these elements is found in Section 2.5.

Additionally, it was necessary to consider and define what actions are needed as elements of a governance framework:

Core Competencies are defined as distinct, but often overlapping, actions or elements required to support a flood management framework as well as an overarching governance structure. These include broad foundational tools (e.g., hydrometric networks, flood mapping, etc.) as well as varied risk reduction strategies (e.g., structural flood control, land use controls, etc.) and strategies to increase resilience (e.g., financial recovery)

This document relies on a distinct understanding of the technical terminology associated with DRR. Specifically:

Hazard is a “process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.” (UNDRR 2017; UN 2016)

Risk is “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, vulnerability and capacity.” (UNDRR 2017; UN 2016)

Disaster is a “serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic, and environmental losses and impacts.” (UNDRR 2017; UN 2016)

Capacity is the “combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience.” (UNDRR 2017; UN 2016)

Resilience is the “ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of the essential basic structures and functions through risk management.” (UNDRR 2017; UN 2016)

The above definitions have intentionally been selected to reflect the work in this project and reflect international definitions in the field of DRR. The authors recognise and acknowledge that other definitions are used in the field, in government, and by authors of other reports in this series.

1.6 Summary of Methods

In this section, an overview of methods that are consistent across all investigations is presented. Additional methods as applied to individual investigations are described elsewhere in the report.

1.6.1 Literature Review, Consultations with Practitioners, and Cross-Fertilization with Other Investigations

In order to develop a baseline for good governance for flood and disaster risk reduction, the team conducted a literature review of academic and grey literature using standard techniques (e.g., online literature reviews using academic search engines, google, etc.). The authors also heavily relied on in-house (i.e., Ebbwater and Pinna) digital libraries and materials for efficiency. Relevant reports are cited throughout the document and are listed in Section 10. To validate baseline materials, ground-truthing interviews were conducted with Provincial officials.

The present-day situation for flood risk governance in BC and Canada was in part developed through a literature review, as above. However, the authors also heavily relied on materials previously developed under separate investigations for the overall flood investigations initiative (see preamble and Appendix A).

1.6.2 Policy Mapping

A key component of understanding the baseline for both good governance components as well as the current model in BC was the development of a visual policy analysis and map. This is a new methodology to catalogue and visualise flood risk governance activities; it is further described in Section 2. This is a tailored methodology developed specifically for this project, based on the particular components and

dimensions of flood risk governance in BC, but is broadly based on policy and governance literature (e.g., Office of the Auditor General of British Columbia, no date; Mayer, Van Daalen and Bots, 2004; Hufty, 2009; Gall, Cutter and Nguyen, 2014) as well as current data visualization practices.

A structure was developed to map out ‘who’ currently participates in flood risk governance processes across identified core competencies that are considered required elements of a good flood risk reduction framework. A basic matrix with the actors (i.e., ‘who’) along the top and core competencies (i.e., ‘what’) was developed. Each cell in the matrix was divided into six ‘petals’ that describe the 6 process elements (see definition above). Using the literature review, consultations, and results from other investigations, each cell in the matrix has been populated. This policy map was then used to provide an initial understanding of gaps and potential opportunities for collaboration. Based on this work, interviews were conducted to dig into identified obstacles and opportunities.

1.6.3 Interviews and Discussions

In addition to desktop research and analyses, four sets of engagement interviews were conducted in late 2020 and early 2021:

1. Ground-truthing interviews were conducted with Provincial staff to ensure the overall framework for the project (e.g., the core competencies and interested and affected parties’ lists were complete). Further, a number of discussions occurred with federal and local government staff where frustrations and challenges to governance were discussed. Two private sector discussions were also conducted. Lead authors of other Issue reports were also interviewed and engaged.
2. Structured interviews with Indigenous participants were conducted by Pinna. Please see Appendix C for engagement report, which details engagement methods.
3. Structured interviews with non-Indigenous interested and affected parties were conducted by Pinna. Please see Appendix C for engagement report, which details engagement methods.
4. Additional discussions and ground-truthing of the proposed new flood risk governance framework (see Section 8) were conducted with several local government, provincial government, and ex-provincial government staff.

1.6.4 Indigenous Inclusion

In addition to the interviews of Indigenous Peoples, the project team participated in a parallel process being run by the Province to support the BC Flood Strategy. Lessons learned from this were drawn into this report where there was obvious alignment (see Appendix C for additional information).

1.7 Report Organization

This report has been organized with the expectation that the reader will have a base understanding of the overarching Investigations in Support of Flood Strategy Development in BC (see Preamble). Further, the report is organized with the expectation that readers will read through this as a single comprehensive report. Each investigation (see Section 1.4) has been addressed separately. However, overarching background information that supports all investigations is first presented in Section 2. This is then followed by investigation specific Sections (titles are summarized here for brevity):

- Section 3: Investigation A-1.1: Existing government services

- Section 4: Investigation A-1.2: Existing non-government entities
- Section 5: Investigation A-1.3: Gaps, challenges, and limitations
- Section 6: Investigation A-1.4: Opportunities
- Section 7: Investigation A-1.6: Alternative governance approaches
- Section 8: Investigation A-1.5: Recommendations

These investigation specific sections are then followed by overall concluding remarks in Section 9.

2 Flood Risk Reduction Governance Primer

The introduction lays out the high-level need for effective governance for flood risk reduction in BC. The following provides additional detail and supports the later investigations, discussion, and recommendations.

2.1 Governance

Governance, as described in the introduction, at the highest level, is the process by which society organizes itself to make decisions and includes consideration of who has power, who makes decisions, how decisions are made, and how the ideas of interested and affected parties, and broader society are considered and included in decision processes. This is one of many definitions of the term; it is well-known that there is no consistent or stable definition: it is often used as a synonym for government⁴, as a framework for understanding polycentric systems, or to describe the organizational structure of corporations among other uses (Hufty 2009). For example, the Province describes governance as “deal[ing] with the structures and processes by which an organization is directed, controlled and held to account” (Office of the Auditor General of British Columbia, n.d.).

Recognizing that flood is a wicked and systemic issue that affects all-of-society the authors have elected to consider governance as a societal system of organization and decision-making rather than using a sector specific definition.

2.1.1 Good Governance

To understand the state of flood risk governance in BC it is important to consider what is judged to be good governance. Much of the literature espouses five main principles of good governance; these predominantly stem from a 1997 United Nations Development Program (UNDP) report (United Nations Development Programme 1997) and are described in Table 2-1.

Table 2-1: Principles of good governance (United Nations Development Programme 1997; Institute on Governance n.d.).

Principle	Application and Description
Legitimacy and Voice	<p>Participation: All men and women should have a voice in decision-making, either directly or through legitimate intermediate institutions that represent their interests. Such broad participation is built on freedom of association and speech, as well as capacities to participate constructively.</p> <p>Consensus orientation: good governance mediates differing interests to reach a broad consensus on what is in the best interest of the group and, where possible, on policies and procedures.</p>

⁴ For the purposes of this report, we disagree with this definition, as it does not fully reflect the need to include broader society, especially for issues of water governance (e.g. Brandes and Kriwoken 2006).

Direction	Strategic vision: leaders and the public have a broad and long-term perspective on good governance and human development, along with a sense of what is needed for such development. There is also an understanding of the historical, cultural, and social complexities in which that perspective is grounded.
Performance	Responsiveness: institutions and processes try to serve all interested and affected parties. Effectiveness and efficiency: processes and institutions produce results that meet needs while making the best use of resources.
Accountability	Accountability: decision-makers in government, the private sector and civil society organizations are accountable to the public, as well as to institutions. This accountability differs depending on the organizations and whether the decision is internal or external. Transparency: transparency is built on the free flow of information. Processes, institutions, and information are directly accessible to those concerned with them, and enough information is provided to understand and monitor them.
Fairness	Equity: all men and women have opportunities to improve or maintain their well-being. Rule of Law: legal frameworks should be fair and enforced impartially, particularly the laws on human rights.

These five principles and nine elements of good governance are mostly reflected in the Province’s own guide to good governance (Office of the Auditor General of British Columbia, n.d.).

Table 2-2: Government of BC principles of good governance.

Principle	Description
Accountability	The process whereby organizations, and the individuals within them, take responsibility for their decisions.
Leadership	The setting of the “tone at the top” which is absolutely critical if an entire organization is to embrace good governance.
Integrity	The acting in a way that is impartial, ethical, and not misusing information or resources, which is reflected in part through compliance with legislation,

	regulations, and policies as well as the instilling of high standards of professionalism at all levels.
Stewardship	The act of looking after resources on behalf of the public and is demonstrated by maintaining or improving capacity to serve the public interest over time.
Transparency	The achievement of decisions and actions that are open, meaning stakeholders, the public and employees have access to full, accurate and clear information on these matters.

These are good basic principles on which to consider flood risk governance in BC. However, they do not specifically account for the systemic and wicked nature of flood (and other natural hazards), nor do they explicitly consider the issues of equity (as opposed to equality)⁵; this is particularly important in recognition of DRIPA. Additional discussion on these elements is found in the next section.

2.2 Disaster Risk Reduction and Flood Risk Governance

The systemic and wicked nature of disaster (inclusive of flood disasters) requires that a different lens be applied to governance. It requires a holistic, blue-sky, interpretation of governance that goes beyond classic governmental authority and tools, and encourages collective action by all interested and affected parties (Gall, Cutter, and Nguyen 2014). It is described by Tierney (2012) as “consist[ing] of the interrelated sets of norms, organizational and institutional actors, and practices (spanning pre-disaster, trans-disaster, and post disaster periods) that are designed to reduce the impacts and losses associated with disasters”.

Some specific issues that differentiate disaster governance from broader governance are:

- The conceptual and necessary link to environmental, earth system and risk governance.
- External forces that shape elements of disaster governance including social, economic, and political drivers.
- The necessary all-of-society considerations that encompass both the impacts of disaster but also interested and affected parties and actors who have the capacity to mitigate risks.
- The multiple scales (e.g., micro through global) at which disasters impact and at which governance arrangements must exist.

These add additional challenges and complexity as there are countless interested and affected parties and connections between them. Disaster governance is commonly fragmented as a result (Gall, Cutter, and

⁵ In this case, equality means that everyone has equal access. Whereas, equity “refers to achieving parity in policy, process and outcomes for historically and/or currently underrepresented and/or marginalized people and groups while accounting for diversity” (University of British Columbia Equity and Inclusion Office, n.d.).

Nguyen 2014). Further, disaster risk is often viewed through a lens of emergency management and response, and the governance structures are not well set-up to connect and collaborate broader governmental, civil society or corporate entities (Gall, Cutter, and Nguyen 2014). These broader connections and collaborations are necessary when considering resilience and risk reduction, as opposed to just hazard mitigation. As it relates to flood in particular, the relationship to water and land means that flood risk governance always overlaps with other related governance systems (e.g., land use) and therefore should at a minimum consider these connections, and ideally leverage them (e.g., see Golden Rule #10 in Sayers et al. 2014).

An additional challenge that is pertinent to flood risk governance in particular is our current entrenched pathway in terms of action; resistance-based strategies (i.e. structural or hazards-based strategies, e.g., dikes and dams) are the norm in the world and in Canada, and our governance structures have developed around them (Morrison, Westbrook, and Noble 2018). Further, it is known that these resistance-based strategies are fallible, costly, and unsustainable (Hegger et al. 2014) and therefore flood risk governance needs to consider resilience and recovery under its umbrella. This need to consider multiple possible solution pathways adds complexity to flood risk reduction strategies and governance.

Finally, of particular note in BC, is the challenge of equity outlined in the introduction, and strongly expressed throughout the engagement. Many Indigenous communities face disproportionate risk, because they have been forced to settle on highly hazardous lands. This is exacerbated by having fewer resources to reduce risk and build resilience. Equitable distribution and resources requires that governance systems recognise this challenge and address it head on. This broadly falls under the base principle of “Fairness” but requires an expanded definition to explicitly address issues of equity.

2.2.1 Good Disaster Risk Reduction Governance

Given the additional complexities of disaster risk (and flood risk) governance there are specific additional measures of good governance in the literature (e.g. UNDRR 2017) as described in Table 2-3.

Table 2-3: Principles of good disaster risk reduction governance.

Principle	Description	Notes
Broad Ownership	Adoption of the strategic vision by all stakeholders, particularly high-level governments.	This is specific to disaster and flood risk reduction and is in response to the systemic impacts. It is related to the base principle of legitimacy and voice.
Alignment, Links and Synergies	Ensuring alignment and taking advantage of links and synergies with other related processes, systems and policies (e.g. climate adaptation plans).	The systemic and broad reaching impacts of flood mean that that it is necessary to ensure that flood risk governance is considered in the context of many other processes. This is a specific

		principle for disaster and flood risk, although arguably performance (e.g., efficiency) is related.
Continued Learning	Our current understanding of flood risk is limited, especially with consideration of the complexity of holistic, intangible, and cascading impacts in the face of climate change. Governance of such a dynamic risk requires that continued learning be included as part of any model.	This is a specific principle for disaster and flood risk.

Additional frameworks for good flood risk governance evaluation (e.g. Alexander, Priest and Mees, 2016) are available in the literature. However, they are targeted at local/regional scale problems. With the focus on multiple scales for this report, the above principles, which reflect high-level good governance are used as a benchmark in later investigations.

2.3 External Drivers and Influences on Flood Risk Governance in BC

As discussed above one of the inherent challenges with flood and disaster risk governance are the external forces that affect the system. This includes positive and negative drivers towards good governance for flood. Some major frameworks, legislation, etc. that are affecting flood policy and governance in BC currently are described in Table 2-4.

Table 2-4: External drivers and pressures for flood risk governance in BC.

External Influence	Application and Description
Declaration on the Rights of Indigenous Peoples Act	<p>In 2019, the Province took an important step in legislating a change in their relationship with the Indigenous Peoples of BC. DRIPA, which is founded on principles set out in UNDRIP, sets out important considerations as it relates to land, and therefore flood management and governance. A key tenet of DRIPA is the legislated requirement to “recognize and respect the rights of Indigenous peoples in all areas of life – human rights, environment, language, education and more.” The Government of Canada has also recently tabled similar legislation.</p> <p>This affects Indigenous People as self-determination of decisions related to themselves and their Territories is explicit in this new relationship. Further, given the expansive Territory over which Indigenous Peoples of BC have rights and title, their input into how it is governed, inclusive of elements of flood risk governance, will affect broader society.</p>

<p>Sendai Framework for Disaster Risk Reduction</p>	<p>The Sendai Framework for Disaster Risk Reduction (Sendai) is the global blueprint for reducing disaster risk and increasing community resilience. The goal of Sendai is to “prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures... to strengthen resilience”. The framework is thus multi-disciplinary and follows four priorities (Figure 2-1).</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="background-color: #2c5e8a; color: white; padding: 10px; text-align: center; width: 200px;"> <p>PRIORITY 1 UNDERSTANDING DISASTER RISK</p> </div> <div style="background-color: #e67e22; color: white; padding: 10px; text-align: center; width: 200px;"> <p>PRIORITY 2 STRENGTHENING DISASTER RISK GOVERNANCE TO MANAGE DISASTER RISK</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <div style="background-color: #9b2740; color: white; padding: 10px; text-align: center; width: 200px;"> <p>PRIORITY 3 INVESTING IN DISASTER RISK REDUCTION FOR RESILIENCE</p> </div> <div style="background-color: #27a69a; color: white; padding: 10px; text-align: center; width: 200px;"> <p>PRIORITY 4 ENHANCING PREPAREDNESS FOR RESPONSE, AND TO “BUILD BACK BETTER” IN RECOVERY, REHABILITATION AND RECONSTRUCTION</p> </div> </div> <p>Figure 2-1: Four priorities of the Sendai Framework for Disaster Risk Reduction.</p> <p>Sendai recognizes that humans are at the centre of disasters. I.e., not only are humans responsible for increasing hazards, hazards themselves are not problematic unless they interact with humans. The framework thus places human decisions at the centre of disaster risk reduction, and advocates for a risk-based approach to managing multiple hazards (i.e., all-hazards approach). Sendai also encourages whole-of-society engagement actions, such as “To empower local authorities, as appropriate, through regulatory and financial means to work and coordinate with civil society, communities and Indigenous peoples and migrants in disaster risk management at the local level.”</p> <p>Canada and British Columbia are both signatories to Sendai.</p>
<p>Emergency Program Act Modernization</p>	<p>The Province is currently in the midst of reviewing the <i>Emergency Program Act</i> [1996] and proposing changes to bring it in line with modern best practices. This includes the need to:</p> <ul style="list-style-type: none"> • Demonstrate stronger connections to climate change (see below) and Sendai (see above). • Recognition that additional resources and capacity will be required. • Recognition of a broader definition of emergency management to include mitigation and risk reduction.

	<ul style="list-style-type: none"> • Recognition that DRIPA means that Indigenous Peoples have rights to self-determination over all issues, including emergency management and response. • Streamline government activities.
Climate Change	<p>Climate change, by definition, is affecting climate patterns across the world and in BC; flood hazards are expected to worsen with climate change. And therefore, climate adaptation, as the act of preparing for a future climate, is inherently linked to disaster risk reduction planning.</p> <p>At present there are many initiatives underway, especially at a local government level, to prepare for a future climate. These are not legislated or by any means consistent. However, as climate adaptation is mainstreamed into governance and planning frameworks, there is a need to align DRR governance and planning with them, and potentially an opportunity to leverage or use climate adaptation to move forward on DRR.</p>

For the most part, there is a lot of synergy across the various external drivers. All speak to the need for a paradigm shift in the management and governance of flood risk. Sendai, EPA modernization and the various climate adaptation programs and systems provide a pathway to follow that focuses on disaster risk reduction today and in future. Whereas DRIPA is the proverbial stick that will force change on how decisions related to land and water will be made. As a collection, these external drivers provide a real opportunity for change.

2.4 Principles of Good Governance for Flood Risk in British Columbia

Given the general principles for good governance and for good governance of disaster risk as well as the current drivers for action in BC, a combined list of principles for flood risk governance in BC has been developed for this project; note that the base principles have been adjusted to reflect a modern BC context (e.g., binary definition of men and women has been replaced by people, etc.). These are described in Table 2-5, and are used as a basis for analysis throughout the report.

Table 2-5: 8 Principles for flood risk governance in BC.

Principle	Application and Description
1. Legitimacy and Voice	Participation: All people should have a voice in decision-making, either directly or through legitimate intermediate institutions that represent their interests. Such broad participation is built on freedom of association and speech, as well as capacities to participate constructively.

Principle	Application and Description
	<p>Consensus orientation: good governance mediates differing interests to reach a broad consensus on what is in the best interest of the group and, where possible, on policies and procedures.</p>
<p>2. Direction</p>	<p>Strategic vision: leaders and the public have a broad and long-term perspective on good governance and human development, along with a sense of what is needed for such development. There is also an understanding of the historical, cultural and social complexities in which that perspective is grounded.</p> <p>Scalability: Floods and disasters occur at multiple scales: Local/intensive through global/extensive. Governance systems need to function at all scales concurrently (e.g., at a very local scale informed by the local context, and at regional, national and global scales). This can be achieved in part through a consistent vision and direction.</p>
<p>3. Performance</p>	<p>Responsiveness: institutions and processes try to serve all interested and affected parties.</p> <p>Effectiveness and efficiency: processes and institutions produce results that meet needs while making the best use of resources.</p>
<p>4. Accountability</p>	<p>Accountability: decision-makers in government, the private sector and civil society organizations are accountable to the public, as well as to institutions. This accountability differs depending on the organizations and whether the decision is internal or external.</p> <p>Transparency: transparency is built on the free flow of information. Processes, institutions, and information are directly accessible to those concerned with them, and enough information is provided to understand and monitor them.</p>
<p>5. Fairness</p>	<p>Equity: all people have opportunities to improve or maintain their well-being.</p> <p>Equity for Indigenous Peoples: as recognised in UNDRIP and DRIPA it is integral that Indigenous Peoples of BC be engaged and provide consent (e.g., FPIC) for activities on their Territories.</p> <p>Rule of Law: legal frameworks should be fair and enforced impartially, particularly the laws on human rights.</p>

Principle	Application and Description
6. Broad Ownership	Adoption of the strategic vision by all interested and affected parties, particularly high-level governments, and Indigenous Peoples.
7. Alignment, Links and Synergies	Ensuring alignment and taking advantage of links and synergies with other related processes, systems, and policies (e.g., climate adaptation plans).
8. Continued Learning	Our current understanding of flood risk is limited, especially with consideration of the complexity of holistic, intangible, and cascading impacts in the face of climate change. Governance of such a dynamic risk requires that continued learning be included as part of any model.

2.5 Process Components of Flood Risk Governance

Implementation of flood management requires consideration of various enabling activities. For the purposes of this project, six distinct process components have been considered. This includes high-level activities such as planning/visioning, as well as the monitoring of activities, successes, and failures, along with both positive and negative levers for action (e.g., regulatory sticks and incentivizing carrots). Each of the six process components are described in the next section. These distinct process components are used to understand existing flood management activities as well as gaps that create challenges to good flood risk governance. This framework is used throughout the report, and where appropriate is identified through the following colour key (e.g., see Section 3.2 for illustrations of each in the BC context).

Plan	Regulate	Guide
Fund	Implement	Monitor

Figure 2-2: Colour key for process components of governance.

2.5.1 Plan

The good governance discussion above highlights the need for clear direction (see Principle 2, Table 2-1). This is true for the overall framework for flood risk governance as well as for each individual core competency. For the purposes of this project, direction is a high-level term to describe a spectrum of activities. At one end, the existence of an authority with a well-developed, transparent, and public strategic vision, and at the other end a simple planning document or an individual person or group with a less-well developed concept for action. The act of developing a strategic direction or vision, through engagement or collaboration, is also included in this component.

2.5.2 Regulate

Regulation describes various forms of law and includes legislation and regulations.

A mandate to act on issues of flood is necessary, see for example principles of legitimacy and voice, direction, and accountability in Table 2-1. This is generally enabled through legislation, which both creates authorities (the ‘who’), who carry out flood risk reduction activities, and through the creation of rules for action (the ‘what’). Legislation in BC is enacted by the Federal and Provincial governments through parliamentary processes.

Regulations refer to rules that are enacted by a legislated authority. With regards to flood management in BC, these generally refer to bylaws or other regulations promulgated by a local or First Nation government. The Province also has regulations related to riparian areas and dam safety for example, which are relevant to flood management. A full list of regulations is presented in Section 3.2.

2.5.3 Guide

As opposed to regulations, which are enforceable and prescriptive, guidelines provide passive regulation. Guidelines are documents that are used to interpret legislation and/or regulation and can provide direction on how to comply with a law. They do not however have the force of law behind them.

In BC, guideline documents are produced by all levels of government, as well as non-governmental bodies. A full list of guidelines is presented in Section 3.2.

2.5.4 Fund

An obvious tool for the implementation of most flood management activities is financial investment. Most, if not all, activities require some level of funding, whether it be to resource people, research and development, or physical instruments. A full list of funding programs is presented in Section 3.2.

2.5.5 Implement

This component describes the actual implementation of a flood management activity. For example, the construction of dikes, or the enforcement of a flood bylaw. These are carried out by a wide variety of actors.

2.5.6 Monitor

An element of any good governance process is a measure of accountability (see Principle 4, Table 2-5). Ideally, activities should be monitored and reviewed to see if they are successful in achieving the desired outcome. Activities can also have specific targets, which may or may not have penalties for lack of performance.

2.6 Core Competencies for Flood Risk Reduction Governance

Given the complexity of flood management there are innumerable activities that can or should be conducted to understand the problem and to act on it in a meaningful and effective way. The following provides a summary of core competencies as derived from best practice as well as current practice in the province (see Methods, Section 1). The lists presented below are meant to be comprehensive and therefore include some elements that are not currently practiced in BC or Canada. The core competencies have been divided into three broad groupings. The first being foundational tools that are needed to support actions or decision making. The second being actions or core competencies that can reduce risk, and finally those that increase resilience (please see Section 1.5 for definitions). Note that some core

competencies bridge more than one of the broad grouping categories (e.g., public education can be considered a foundational tool, as well as an element of risk reduction and resilience strategies).

2.6.1 Foundational Tools

To make good decisions to support flood risk reduction many foundational pieces of information and resources are required. These include data, scientific tools, maps, and a stream of qualified people to develop and manage these tools. For the purposes of this project the following elements were considered (see Table 2-6).

Table 2-6: Core competencies for flood management. Part 1: Foundational tools.

	Core Competency	Description
Data	Traditional Knowledge	Knowledge Keepers, especially from Indigenous Communities, hold an extraordinary and rich understanding of natural systems. This information is key to strengthening western-science data, and should inform risk and resilience actions.
	Hydrometric and Climate Data	The various elements required to monitor components of the hydrological cycle as well as ocean conditions (e.g., water survey gauges and the people to manage them and the data).
	Topographic and Bathymetric Surveys	The acquisition of data on land and under water (rivers, lakes, and ocean) to develop mathematical models of the surface of the earth.
	Topographic and Bathymetric Data Dissemination	The data management and provision of topographic and bathymetric data to support flood modelling and mapping.
	Flood Protection Infrastructure Surveys	The acquisition, storage and provision of survey information related to existing flood protection infrastructure (e.g., dike crests, dike fragility, etc.).
	Exposure and Vulnerability Data Development	The acquisition and storage of data sets relevant to understanding the elements at risk from flooding (e.g. census information, critical infrastructure locations and susceptibility to flooding).
	Exposure and Vulnerability Data Dissemination	The provision of exposure and vulnerability data sets to support risk assessment.
	Flood Event Mapping	Systems and protocols to support the collection of hydrometric, bathymetric, topographic, consequence and risk information during and immediately after a flood event.
Science and Forecasts	Climate and Climate Change	Science methods and resources to understand and provide present-day climate (including short-term forecasts), as well future climate change projections and trends.

	Weather	Science methods and resources to provide short- and medium-term weather forecasts.
	River (Flows and/or Levels)	Science methods and resources to understand and provide short- and medium-term forecasts of river flows and levels. Note that this implicitly includes flood monitoring.
	Coastal Conditions	Science methods and resources to understand and provide short- and medium-term forecasts of ocean conditions.
Mapping and Assessments	Hazard - Creation	Science methods and resources to develop flood hazard maps (inclusive of hydrologic and hydraulic modelling).
	Risk - Creation	Science methods and resources to develop flood risk assessments and flood risk maps.
	Compilation/Storage	Data management protocols, schemas, etc. and human resources to collect and effectively store hazard and risk data and maps.
	Publication and Sharing	Methods and resources to support accessibility to flood information.
Education	Post-Secondary Programs	Educational programs at a post-secondary level to support a sustainable stream of suitably qualified professionals to support all other core competencies.
	Professional Programs	Educational programs for existing professionals to strengthen and support the pool of qualified professionals to support all other core competencies.
	Public Education	Educational programs to support the public in understanding the complexities of flood, as well as providing them with suitable information to inform personal decision-making.

Some of the elements are further explored in other projects. For example, climate data is discussed in Issue B-1 (Associated Engineering Ltd. 2021), some elements of hazard mapping are discussed in B-2 (Northwest Hydraulic Consultants Ltd. 2021a), risk assessments and mapping in B-3 (Ebbwater Consulting Inc. 2021), and river forecasting in C-1 (BGC Engineering Inc. 2021). Additional information can be found in the relevant reports.

2.6.2 Risk Reduction

With foundational tools in place, there are many diverse actions that can be taken to reduce risk. Risk reduction can occur through adjustments to its core components of hazard, exposure, and vulnerability (see Issue B-3 (Ebbwater Consulting Inc. 2021) for a full discussion of the components of risk).

Table 2-7 provides a comprehensive list of actions and was developed based on a literature review of best practices in flood management and governance. Some, but not all or even most, have been researched and discussed on other projects as part of the overall investigations, primarily because they are not currently practiced, at least explicitly, in BC or Canada. Appendix B includes a list of the core competencies and cross-references where other Issues have provided additional context and notes gaps that have not yet been considered.

Table 2-7: Core competencies for flood management. Part 2: Risk reduction tools.

	Core Competency	Description
Planning	Flood management plans	The development of local and watershed flood risk reduction plans. The components of these include context and rationale, hazard and risk profiles, risk reduction targets, decision processes, mitigation actions, preferred actions, timelines and identified responsible authorities.
	Maintain natural assets	It is well documented that natural systems are extremely effective at managing the natural hydrologic cycles. Protecting and maintaining existing natural assets (e.g., natural vegetation and wetlands in upper watersheds, riparian areas, natural coastlines) will maintain the hazard profile going forward. Current practices (e.g., land development, hardening of riverine and coastal edges) generally increase hazard.
Land Management	Restore natural assets	Recognizing that many natural systems, that would historically have reduced flood hazards, have been damaged by human activity, it is known that in some cases restoring ecological function will reduce risk over time.
	Dams - Build	The construction of dams (or sea gates) to store and control the release of water is a well-known and commonly applied technique in BC. Many dams serve multiple purposes (e.g., hydro power production, water storage) and very few, if any, in BC were constructed only for flood control.
Hazard Control	Dams – Operate and Maintain	Dams require continual maintenance for safe and continued function. Some larger dam systems also require active operations.
	Dikes - Build	Dikes and appurtenant structures (e.g., pumps) are a commonly used tool in BC that inhibits water from leaving the core river channel and flooding neighbouring areas.
	Dikes – Operate and Maintain	Dikes require continual maintenance for safe and continued function. They also sometimes require upgrades to adjust to new hazard conditions (higher water levels or seismic considerations).
	Channel Maintenance	Channel maintenance (i.e., the dredging of channels to maintain hydraulic capacity) is applied in parts of BC to temporarily maintain flood levels.
Exposure (Land Use)	Acknowledge/Disclose	A precursor to developing land use controls in flood hazard areas, is the recognition, acknowledgement and public disclosure of the existence, extents, etc. of the hazard. Disclosure can also support uptake of other risk reduction or resilience measures (e.g., floodproofing, insurance)

	Avoid	The surest means of limiting risk, is to have no exposure to flood hazard. This is ideally managed by avoiding development in hazard areas in the first place.
	Retreat	The surest means of limiting risk, is to have no exposure to flood hazard. For currently developed areas, managed or strategic retreat can achieve this. This might be total or partial retreat.
	Redistribute	With a risk-based lens, one possible risk reduction measure includes the redistribution of assets across hazard areas. For example, removing highly vulnerable elements from flood hazard areas, or reducing density in highest hazard areas (i.e., floodway), and increasing density in flood fringes or outside the flood hazard area altogether.
Vulnerability	People	Risk reduction can be achieved by reducing the vulnerability or susceptibility of people to flood impacts. For example, ensuring people have the tools to evacuate high hazard areas.
	Culture	Risk reduction can be achieved by reducing the impact or susceptibility of elements of cultural importance to flood impacts. For example, by raising artefacts above expected flood levels.
	Environment	Risk reduction can be achieved by reducing the impact or susceptibility of elements of environmental importance to flood impacts. For example, by practicing habits that will limit contamination of flood waters.
	Critical Infrastructure	Risk reduction can be achieved by reducing the impact or susceptibility of critical infrastructure to flood impacts. For example, by flood proofing critical infrastructure to a high standard.
	Structures	Risk reduction can be achieved by reducing the susceptibility of structures to flood impacts. For example, by flood proofing.
	Economy	Risk reduction to local and regional economies can be achieved by advance preparations that will reduce impacts to consumable goods (e.g. by raising them) and by actions to limit business interruption.

2.6.3 Residual Risk and Resilience

Recognizing that there will always be an element of risk remaining despite actions in place to reduce risk, additional actions are available to support the management of residual risk. Further, there are actions that can support and increase resilience (see Section 1.5 for definition of resilience). A list of core competencies that reflect actions on residual risk and resilience are presented in Table 2-8. This includes a discussion of the financial tools to manage residual risk and measures of resilience that enable a system

or community to absorb, transform and recover from a flood. The table also includes elements of flood response, which is defined in Issue C-2 (Red Dragon Consulting Ltd. 2021a) as “the actions taken in an imminent or occurring emergency in order to manage its consequences”, and of flood recovery as “the phase of emergency management in which steps and processes are taken and implemented to repair communities affected by a disaster; restore conditions to an acceptable level or, when feasible, improve them; and increase resilience in individuals, families, organizations, and communities” (Emergency Management British Columbia 2019).

Like the other core competencies, this list has been developed through a mix of known actions in BC and a literature review of best practices. The technical concept of resilience is a relatively new area of study as it relates to flood and flood risk governance. Therefore, the core competencies listed in Table 2-8 are more high-level and less specific than for the core competencies for risk reduction.

Table 2-8: Core competencies for flood management. Part 3: Tools for resilience.

	Core Competency	Description
Residual Risk	Insurance (Private)	There will always be some residual risk, even when risk reduction measures are in place. The management of residual risk for financial losses can be achieved through private insurance. Insurance and re-insurance companies, with premiums paid by both the public and private sector, cover some financial losses.
	Insurance (Publicly Funded)	There will always be some residual risk, even when risk reduction measures are in place. The management of residual risk for financial losses can be achieved through public insurance. Note that disaster financial assistance, as a primarily reactive program is included below in the Recovery section.
Resilience	Engineering Resilience	Engineering resilience describes activities in the design and operation of technological systems that make them more robust, inclusive of redundancy, flexible and adaptable, and quicker to recover (Bruneau et al. 2003).
	Socio-Ecological Resilience (Adaptive Resilience)	This describes a broader recognition of the systemic links between social and ecological systems and the inherent uncertainty and complexity that results. Thus requiring an adaptive approach to resilience (Zevenbergen, Gersonius, and Radhakrishan 2020). These adaptive approaches are activities that enable socio-ecological resilience for example by understanding adaptation pathways and setting monitoring criteria to trigger actions to change pathway.

Response	Flood Response Plan Development	A flood response plan enables a community to efficiently respond during a flood emergency and limit loss and damages. A plan should include consideration of aims and objectives, triggers and activation, known hazards and risks, etc.
	Flood Response Plan Maintenance	Flood response plans must be updated frequently so that they incorporate new information, and so responders are familiar with materials.
	Monitoring and Warning	Timely response requires that monitoring systems (see also foundational tools) and warning systems are in place so that actions within flood response plans can be triggered.
	Flood Response Training	Trained and up-to-date personnel are necessary for successful flood response. To ensure that personnel are flood ready, regular training and exercises are required. See also Education (Table 2-6).
	Flood Response Resources	Flood response requires physical resources for deployment. This includes space to manage operations (e.g., Emergency Operation Centres (EOCs)), transportation to deploy people and other tools, as well as temporary flood defense barriers, etc. It also includes personnel with appropriate training.
Recovery	Financial Recovery	Programs and processes that support financial recovery for the public and the private sectors. This includes disaster financial assistance programs, where public sector funding is provided to those that have incurred flood losses.
	Engineering/Structural Recovery	Programs and processes that support temporary or permanent re-construction efforts of engineering structures (e.g., critical infrastructure, structures, etc.).
	Social/Cultural Recovery	Programs and processes that support the recovery of individuals and communities (e.g., mental health supports).
	Environmental Recovery	Programs and processes that support the recovery and restoration of environmental systems damaged during flood events (e.g., decontamination).
	Post-disaster planning	Programs and processes that are put in place prior to an incident that support (and/or require) that post-disaster recovery and reconstruction is completed with a mindset of “build back better”. For example, having systems in place to ensure that any rebuilding is done to flood-resilient standards (noting that no such standards currently exist in Canada, although some are in development).

2.7 Summary

Effective and good governance is a precursor for flood risk reduction. However, good governance, especially for the systemic and wicked issue of flood, is extremely challenging. Principles of a good governance system for flood include:

- Legitimacy and voice
- Direction
- Performance
- Accountability
- Fairness
- Broad ownership
- Alignment
- Continued learning

Implementation of flood management within a governance framework requires consideration of various enabling activities. For the purposes of this project, six distinct process components are considered. These include planning/visioning, regulation, guidance, funding, implementation/action and monitoring.

Finally, given the systemic and broad issue of flood, there are innumerable activities and competencies that are required within a governance framework. Foundational tools, tools for risk reduction, and tools for resilience are all important as part of a larger toolbox of actions.

3 Investigation A-1.1: Identify the Flood Management Services Provided by Each Order of Government in BC

3.1 Introduction

As outlined in earlier sections, flood is a systemic challenge, which has naturally led to a situation where governance is sprinkled across multiple orders of government, and within each government, across multiple sectors. This initial investigation is intended to provide a comprehensive picture of the baseline for flood risk governance in BC. It is used in later investigations to understand gaps and overlaps in service delivery.

3.1.1 Research Objectives

The primary objective of this investigation was to establish baseline (current) conditions for flood service delivery in BC. A secondary evolved objective to define a full suite of best practice core competencies for flood risk governance was also conducted under this investigation; the results of this are presented in the previous section of the report.

3.1.2 General Approach

The project was primarily a desktop research and analysis exercise and was conducted based on the following five steps:

1. Scan of international academic and grey literature to define core competencies that should be part of flood service delivery/flood risk governance (see Section 2.6).
2. Desktop scan of available materials to identify who and how core competencies are being delivered in BC.
3. Inclusion of relevant information from engagement with Indigenous and Non-Indigenous parties (see Appendix C for additional information).
4. Coding of all activities.
5. Ground-truthing of information.
6. Development of a visual representation of flood service delivery within government.

3.2 Primary Roles and Responsibilities in BC

The following section outlines the division of roles and responsibilities for flood across four orders of government: Federal, Provincial, Local and First Nations, and for other provincially mandated authorities (e.g., Diking Authorities). For each order of government, enabling legislation or other mandate is provided, along with additional information on regulations, funding or investment programs, and other activities. These are summarised visually in the next section. Additional information is also provided in Issue B-4: Flood Planning (Kerr Wood Leidal Associates Ltd. 2020), Issue B-5: Structural Flood Management Approaches (Northwest Hydraulic Consultants Ltd. 2021b) and Issue B-6: Non-Structural Flood Management Approaches (Northwest Hydraulic Consultants Ltd. 2021c).

3.2.1 Federal Government

Canada is a federalist country, where the central government deals with national and international matters. And, although many issues of flood risk governance are devolved to lower levels of government, the systemic nature of flood means that there are some issues that are governed at the federal level. For example, issues related to national water resources, fisheries, and natural resource extraction and supporting information. The Federal government also provides some guidance related to the foundational tools for flood, in an effort to provide some consistency in public safety across the country. The major legislation, guidelines, funding programs (see Section 2.5 for definitions and descriptions) and lead agencies are presented in Table 3-1 through Table 3-4.

Table 3-1: Federal government activities in flood risk governance. Part 1: Legislation and Mandate (Regulation).

Legislation and Mandate	What	Description
	<i>Fisheries Act</i> [1985] amended in 2019	This modernized act sets out provisions for protecting and restoring fish populations and fish habitat. Recognizing the link between healthy ecological systems and water means that this act is relevant to some flood management actions.
	<i>Emergency Management Act</i> [2007]	This act sets out the leadership and responsibilities of the Minister of Public Safety and Emergency Preparedness, including coordinating emergency management activities among government institutions and in cooperation with the provinces and other entities.
	<i>Species at Risk Act</i> [2002]	This act sets out federal responsibilities for the protection of species at risk, including aquatic species.
	<i>First Nations Land Management Act</i> [1999] amended in 2019	This act, which has recently been updated, allows First Nation governments to opt out of 40 sections of the <i>Indian Act</i> (see below). This enables First Nations to develop their own laws related to land use, environment, and natural resources.
	<i>Canada Water Act</i> [1985]	This act sets out the federal responsibilities relating to water, such as fisheries and navigation. It notes that Provinces are “owners” of water resources within their jurisdiction and have the responsibility for day-to-day management of water.
	<i>Canada Navigable Waters Act</i> [1985]	This act sets out provisions to keep navigable waters open for public use. This has implications for some structural flood management activities. This act is currently under review.
	<i>Canada Land Surveys Act</i> [1985]	This act sets out the responsibility and jurisdiction for the survey of public lands. The foundational tools for flood risk reduction (e.g. land surveys) are governed in part by this Act.
	<i>Resources and Technical Services Act</i> [1985]	This act sets out the responsibility and jurisdiction for the collection of geological, geographical, geodetic, topographical, hydrographic, hydrogeological, oceanographic, and other similar surveys.
	<i>Income Tax Act</i> [1985]	This act includes provisions for the deferral of income for agricultural operators if income is impacted by flood.
<i>Indian Act</i> [1985]	This act sets out the framework for governance of Indigenous People and their land. It provides direction on the powers of Band Council related to land use and infrastructure. This act is under revision.	

Table 3-2: Federal government activities in flood risk governance. Part 2: Guidelines

Guidelines	What	Description
	National Building Code of Canada (2015)	The National Building Code of Canada is developed by the National Research Council of Canada. It is a model code that has no legal status until adopted by a jurisdiction (i.e., Province of BC or City of Vancouver). It does not currently include any provisions for flood resilient design. However, it is a tool that could be used in future. New standards for flood-resilient design are being developed by the National Research Council and Canadian Standards Association, which is the first step to updating the National Building Code.
	Federal Flood Mapping Guideline Series	Public Safety Canada and Natural Resources Canada are co-leads of a program to develop a series of guideline documents associated with flood mapping. These include information on LiDAR acquisition, geomatics, hydrology and hydraulics, and flood damage estimation, as well as case studies. Future guidelines are being prepared on flood risk assessment and land use planning in flood risk areas.
	National Research Council of Canada Guideline Series	The National Research Council of Canada produces many guidelines, some of which relate to flood. Recent relevant publications include Flood Risk Assessment Guidelines for Coastal Areas (Murphy et al. 2020), as well as supporting in the development of the Canadian Standards Association (CSA) Basement Flood Prevention and New Residential Communities Guidelines (CSA Group 2018, 2019).
	Standards Council of Canada Standards Flood Mapping Standards (in progress)	The Standards Council of Canada (SCC) is currently embarking on a process to develop flood mapping standards. This will build on the work of the Federal Flood Mapping Guidelines. Standards, if developed, are not expected for several years.
	Indigenous Inclusion Guidelines	NRCan and ISC are currently working on developing guidelines for Indigenous Inclusion in the Development of the Federal Flood Mapping Guideline Series (Public Works and Government Services Canada 2020). These complement the Federally funded quasi-guidelines from the Centre for Indigenous and Environmental Resources (CIER) Climate Change Adaptation Planning Toolkit for Indigenous Communities, which include a section on flood risk assessment and planning (Carlson, Johnson, and Low 2020).

Table 3-3: Federal government activities in flood risk governance. Part 3: Funding and Investment

Funding and Investment	What	Description
	National Disaster Mitigation Program (NDMP)	<p>The NDMP is a fund with the objective to address rising flood risks in Canada by supporting the development of foundational information (flood maps, flood risk assessments, flood plans, etc.). A key objective of the program was to support the creation of a private flood insurance sector to manage residual risks.</p> <p>The fund has been in place since 2013. In its first 5 years \$200M was available to Provinces and Territories (P/Ts) on a 50/50 cost-sharing model for Provinces. The program has been renewed through March 2022, with an additional \$25M. In addition to the core funding that was used for individual flood projects across the country, the fund was used to invest in tools and educational campaigns to support flood risk reduction.</p> <p>A review of the program in 2019 (Public Safety Canada 2019b) noted that the program had a slow start (potentially due to lack of knowledge of the program or lack of capacity at P/Ts), but had significant uptake towards the end. In the first five years, 82 projects were funded at a cost of \$22.4M (Federal contribution). A noted failure of the program was access for Indigenous communities; some received funds by working with neighbouring jurisdictions. The review also noted challenges associated with capacity (at all levels) to manage the program.</p> <p>The program is expected to continue in some form but will likely evolve. For example, to include an all-hazards rather than a single flood hazard focus.</p>
Disaster Mitigation Adaptation Fund (DMAF)	DMAF aims to strengthen the resilience of Canadian communities through investments in large-scale infrastructure projects, with the intent of reducing risk to people, critical infrastructure, and the economy. This is a \$2B merit-based program that to date has supported a variety projects in the province (e.g. City of Surrey coastal dike upgrades, City of Chilliwack dike upgrades, Cowichan Valley flood infrastructure program)	

Funding and Investment		DMAF projects must have a minimum of \$20 million in eligible expenditures, while NDMP focuses on small-scale infrastructure mitigation projects.
	Disaster Financial Assistance Arrangements (DFAA)	<p>The DFAA is an agreement between the Federal and Provincial governments that sets out funding formula and limits for disaster response and recovery.</p> <p>In addition, the DFAA allows for 15% of funds to be spent on mitigation enhancements after a disaster occurs, while NDMP focuses on mitigating before a disaster. It is the authors' understanding that the build back better component of the DFAA is not commonly, if ever, applied.</p>
	First Nations Adapt Funding	This program supports Indigenous governments to prepare for and adapt to climate change. This includes projects related to sea level rise and other types of flooding. There have been several First Nations Adapt funded programs in BC both on the coast and for inland communities (e.g., Coastal Vulnerability Studies for Core Infrastructure, Okanagan Nation Alliance Flood Risk Assessment, Scw'emex Tribal Council Flood Impacts under Climate Change).
	Various infrastructure funds with a flood mitigation component	Infrastructure Canada's Provincial-Territorial Infrastructure Component (PTIC) provides support for projects of national, local, or regional significance. This includes the \$1 billion Small Communities Fund (PTIC-SCF) to provide financial support to projects in municipalities with fewer than 100,000 residents. This program has been in place since 2014-15. Other programs of note are the First Nation Infrastructure Fund and Emergency Management Assistance Program from Indigenous Services Canada.
	Green Municipal Fund	This is a program run by the Federation of Canadian Municipalities (FCM) through an endowment from the Federal Government. This fund can support up to 50% of project costs and can be used for flood related projects under the 'water' stream. Projects can be plans, feasibility studies and pilot projects as well as capital projects.

Table 3-4: Federal government activities in flood risk governance. Part 4: Lead Agencies.

Lead Agencies	What	Description
	Natural Resources Canada (NRCan)	<p>This agency has several responsibilities related to flood management. This includes being the co-lead agency for the Federal Flood Mapping Framework, as well as being the lead agency for the collection of survey information.</p> <p>The Western Region of the Geological Survey of Canada (GSC) conducts research into Disaster Risk Reduction, primarily for earthquake hazard, but also publishes information and datasets relevant for flood hazard.</p> <p>Under the current government, NRCan has the mandate to “Work with the Minister of Public Safety and Emergency Preparedness and with the provinces and territories and Indigenous Peoples to complete all flood maps in Canada” (Office of the Prime Minister of Canada 2019a) and to “to develop a national climate change adaptation strategy and invest in reducing the impact of climate-related disasters, such as floods and wildfires, to make communities safer and more resilient.” (Office of the Prime Minister of Canada 2021d).</p>
	Environment and Climate Change Canada (ECCC)	<p>This agency has several evolving responsibilities related to flood management. They have been the long-standing coordinating agency for the Meteorological Service of Canada, Water Survey of Canada and the Canadian Hydrographic Service. It is also the proposed co-lead agency for the newly proposed Canada Water Agency, which, if formed, will have the mandate to improve freshwater management across Canada (flood is listed as part of the mandate within discussion documents).</p> <p>Under the current government, ECCC has the mandate to “Work with the Minister of Natural Resources and provinces and territories to complete all flood maps in Canada.”</p> <p>(Office of the Prime Minister of Canada 2018) and “to develop a national climate change adaptation strategy and invest in reducing the impact of climate-related disasters, like floods and wildfires, to make communities safer and more resilient.”(Office of the Prime Minister of Canada 2021a).</p>
	Fisheries and Oceans Canada (FOC)	<p>This agency has a few responsibilities related to flood management, especially coastal flood. Specifically, they house the Canadian Hydrographic Service, which provides hydrographic and hydrometric data for coastal regions. They are also charged with</p>

Lead Agencies		the management of fisheries, including the enforcement of the Fisheries Act, which has implications to some structural and non-structural activities (e.g., the limiting of Harmful Alteration, Disruption and Destruction (HADD) of fish habitat).
	Public Safety Canada (PSC)	<p>PSC is the lead agency for the development of Canada’s Emergency Management Strategy, which aims to reduce losses from disasters across the country and provides a framework for the sharing of responsibilities amongst P/Ts (Public Safety Canada 2019a).</p> <p>PSC currently has the mandate to “create a new low-cost national flood insurance program to protect homeowners at high risk of flooding and without adequate insurance protection, as well as to develop a national action plan to assist homeowners with potential relocation for those at the highest risk of repeat flooding.” (Office of the Prime Minister of Canada 2019b) and to “to develop a national climate change adaptation strategy and invest in reducing the impact of climate-related disasters, like floods and wildfires, to make communities safer and more resilient. In particular, continue working to create a new low-cost national flood insurance program to protect homeowners at high risk of flooding and without adequate insurance protection, as well as to develop a national action plan to assist homeowners with potential relocation for those at the highest risk of repeat flooding.”(Office of the Prime Minister of Canada 2021e).</p>
	Indigenous Services Canada (ISC)	<p>ISC is the federal agency with responsibility for policies relating to Indigenous People in Canada. This includes supporting Indigenous Peoples to be resilient to floods and includes specific responsibility to support on-reserve lands.</p> <p>In 2021, the ISC mandate for the minister was revised to “ expect you and all ministers to pursue complementary partnerships and initiatives that will support our work to exceed our emissions reduction target, seize new market opportunities to create good jobs and prepare our country to adapt to the impacts of a changing climate.” (Office of the Prime Minister of Canada 2021b).</p>
	Infrastructure Canada (IC)	<p>Infrastructure Canada is the agency charged with supporting the development of large-scale public infrastructure in Canada.</p> <p>The 2021 complementary mandate letter includes the statement “to develop a national climate change adaptation strategy and invest in reducing the impact of climate-related disasters, like floods and wildfires, to make communities safer and more resilient. This includes leveraging proposals received for the Disaster</p>

Lead Agencies		Mitigation and Adaptation Fund to accelerate this work.” (Office of the Prime Minister of Canada 2021c).
	National Research Council of Canada (NRC)	National Research Council of Canada is the primary national research and technology organization of the Government of Canada, in science and technology research and development. They have recently supported on the development of guidelines related to flood mitigation (see above).
	Department of National Defence (DND) and Defence Research and Development Canada (DRDC)	<p>This agency is charged with support on flood response for major incidents in Canada if requested by the Province.</p> <p>DRDC runs a research program related to the mandate to respond to national disasters. DRDC is the co-lead (with PSC) for the development of a National Risk Profile (NRP) that considers flood as a priority hazard.</p>

3.2.2 Provincial Government

The Provincial Government has a number of roles and responsibilities related to flood risk governance. The primary role is to set out and enforce legislation related to public safety, water use and land use. The primary agencies with responsibility for flood risk governance are MFLNRORD and EMBC, the BC Ministry of Municipal Affairs (MMA) plays an important role in supporting local governments to manage their responsibilities related to flood risk governance.

The following provides a big picture overview of the mandate, legislation, regulation, and authorities within the provincial government with regards to flood management and was compiled using resources provided by MFLNRORD, reporting from other Issues, and the author’s own knowledge. More detailed information is provided in related reporting. For example, a summary of provincial legislation is also provided in Appendix A of Issue B-6 (Northwest Hydraulic Consultants Ltd. 2021c).

Table 3-5: Provincial government activities in flood risk governance. Part 1: Legislation and Mandate (Regulation).

Legislation and Mandate	What	Description
	<i>Professional Governance Act</i> [2021]	This legislation has only recently come into force. It has created a new government office, the Office of the Superintendent of Professional Governance, and institutes best practices for professional regulators (e.g. Engineers and Geoscientists BC, BC Institute of Agrologists, etc.) to ensure that professionals are held to high technical and ethical standards. As this is a new piece of legislation, the implications for the use of qualified professionals to hold liability for determining areas or building “safe for intended use” is not yet clear (see also <i>Community Charter</i> [2003]).
	<i>Declaration on the Rights of Indigenous Peoples Act</i> [2019]	In 2019, the Province took an important step in legislating a change in their relationship with the Indigenous Peoples of BC. DRIPA sets out important considerations as it relates to land, and therefore flood management and governance. A key tenet of DRIPA is the legislated requirement to “recognize and respect the rights of Indigenous peoples in all areas of life – human rights, environment, language, education and more.”
	<i>Local Government Act</i> [2015]	Creates the authority for a local government to designate a floodplain and to set development controls and construction requirements in these areas. This legislation also enabled the creation of a new local watershed-based authority in the Cowichan Valley.
	<i>Water Sustainability Act</i> [2014] (WSA)	This legislation is used to manage water resources in B.C., including regulation of water levels and flows associated with dams, flood control and other licensed structures. The WSA also enables the Dam Safety Regulation, which outlines requirements for dam owners to inspect and maintain their dams to ensure compliance, and to mitigate the impacts of dam failure.
	<i>Riparian Areas Protection Regulation</i> [2004]	This legislation and related regulation calls on local governments to protect riparian areas and their various functions to maintain stream health and productivity. Although the primary focus is on fish habitat and ecological health, it also is aimed at providing stable streambanks, sufficient space for channel migration (including active and seasonally wetted floodplains).
	<i>Community Charter</i> [2003]	Creates the authority for local governments to issue building permits. Further, it creates the authority for Building Inspectors to require that hazard reports be prepared by a qualified professional.

Legislation and Mandate

<p><i>Environmental Management Act</i> [2003]</p>	<p>This legislation gives the authority to the Minister of Environment to prepare and publish plans related to “flood control, flood hazard management and development of land that is subject to flooding”.</p> <p>This Act also outlines requirements and project triggers for undertaking environmental assessments, which includes large river diking projects under some certain circumstances.</p>
<p><i>Flood Hazard Statutes Amendment Act</i> [2003] and <i>Miscellaneous Statutes Amendment Act</i> [2004]</p>	<p>This legislation tidied the transfer of power on issues of flood from the Province to Local Governments in the wake of changes to the Community Charter and Local Government Acts.</p>
<p><i>Land Title Act</i> [1996]</p>	<p>This legislation creates authority for an approving officer to refuse a subdivision subject to a flood hazard and grants the mandate for an approving authority (e.g. local government) to require a report from a qualified professional that provides for the “safe use of land and building development”, and registers this report with a covenant on title.</p>
<p><i>Land Act</i> [1996]</p>	<p>This creates the authority for the disposition, lease, or use of crown land including for the purpose of flood protection and/or erosion protection.</p>
<p><i>Emergency Program Act</i> [1996]</p>	<p>This legislation grants local governments the authority to be first responders to emergency situations, including flood. MFLRNORD is designated as the lead agency for flood response and corresponding emergency plans and procedures and their implementation. EMBC is given the responsibility to co-ordinate provincial emergency management activities, and Disaster Financial Assistance.</p>
<p><i>Emergency Management Program Regulation</i> [1994]</p>	<p>This regulation outlines roles and responsibilities for Provincial Ministries and Crown Corporations during an Emergency.</p>
<p><i>Dike Maintenance Act</i> [1996]</p>	<p>This legislation creates the position of the Inspector of Dikes who has the statutory authority to establish flood protection standards, monitor management of works by local diking authorities, approve changes to dikes and new dikes and issue orders respecting flood hazard planning</p>

	<i>Drainage, Ditch and Dike Act [1996] (to be repealed)</i>	This document provides authority to independent diking districts (i.e., districts not associated with another jurisdiction) to collect taxes. It is to be repealed once MFLNRORD has transitioned the independent diking assets to local government authorities.
	<i>Municipalities Enabling and Validating Act [1970]</i>	This legislation established the authority for the creation of the Okanagan Basin Watershed Board, a watershed-based organization that plays a coordinating role in flood management.

Table 3-6: Provincial government activities in flood risk governance. Part 2: Guidelines.

	What	Description
Guidelines	<p>Flood Hazard Area Land Use Management Guidelines</p> <p>[2004, amended 2011, 2018]</p>	<p>This presents guidelines for the administration of land use management within flood hazard areas including, official community plans, bylaws, development permits, subdivision approvals, covenants, crown land dispositions, requests for bylaw modifications, and requests for modification of floodplain covenants. In addition, the document provides guidelines for communities to withhold consent where hazard cannot be practically alleviated.</p> <ul style="list-style-type: none"> Provides guidelines for minimum setbacks and minimum elevations or Flood Construction Levels (FCLs) to protect development from flood hazards from the sea, lakes, and rivers (including alluvial fans and debris flows). Coastal FCL updated based on the 2011 coastal flood hazard land use guideline to allow use of either a combined or probabilistic method to calculate water levels. Document defines a 0.5 % AEP (200-year indicative) design standard to be applied to habitable land use, defined as residential, commercial, and institutional land uses. Slightly altered standards are provided for agricultural and industrial uses. Development on high hazard alluvial and/or debris flow fans is discouraged, and land should be retained for no-intensive uses, such as, parks, open- space recreation and agriculture. <p>(Above modified from (Northwest Hydraulic Consultants Ltd. 2021c))</p>

Guidelines

<p>Guidelines for Management of Coastal Flood Hazard Land Use (2011)</p>	<p>This Guideline is intended for local governments, land use managers, and approving officers to develop and implement land use management plans and make land use approval decisions for lands exposed to coastal flood hazards.</p> <p>Presents projections for sea level rise and potential approaches for land use planning within existing and future hazard zones.</p> <p>Historically, coastal FCL’s were determined based on the location of the natural boundary, which is defined by law and can be interpreted as the visible high-water mark, where the presence and action of water has left a distinct variation in the bank, soil, and vegetation characteristics of the shore. For present day water levels, the natural boundary can be established by a professional land surveyor. However, it is not possible to survey the future location of the natural boundary due to the effects of sea level rise and other climate change related factors, or estimate the extreme water levels on lakes. This guideline presents the combined method to determine a coastal FCL based on projections of future conditions.</p> <p>Accompanying document, Draft Policy Discussion Paper, presents risk concepts for flood hazard land use; that is adjusting design event (probability) based on consequence of flooding (i.e. increasing design event to 0.025% AEP, instead of the 0.5% AEP year event typically applied in BC.</p> <p>(Above modified from (Northwest Hydraulic Consultants Ltd. 2021c))</p>
<p>Coastal Floodplain Mapping – Guidelines and Specifications (2011)</p>	<p>This guideline document outlines methods and expected mapping deliverables for coastal flood mapping completed in the BC Coast (Kerr Wood Leidal 2011). It draws from information in guidance documents on sea level rise.</p>
<p>Flood hazard assessments – Guidance for Selection of Qualified Professionals</p>	<p>This is a document on selection of a qualified professional to assess floodplain hazards, but mislabels qualified professionals as being “geotechnical” professional (i.e. focus on ground conditions) instead of qualified professional that could include both geotechnical or hydrotechnical (i.e. focus on water and its interaction with natural and anthropogenic environment).</p> <p>(Above from (Northwest Hydraulic Consultants Ltd. 2021c))</p>
<p>Dike Design and Construction Guide: Best Management</p>	<p>This document outlines the process to build or upgrade a dike in the Province. It provides guidance on hiring a consultant engineer, some design criteria for both hydraulic and geotechnical</p>

Guidelines	Practices for British Columbia (2003, updated in 2011)	considerations and construction best practices. (From BGC Engineering Inc. and Ebbwater Consulting 2017)
	Sea Dike Guidelines (2011)	This document provides guidelines for the design of sea dikes to protect low lying lands that are exposed to coastal flood hazards arising from their exposure to the sea and to expected sea level rise due to climate change (Ausenco-Sandwell 2011).
	Hydrologic and Hydraulic Design Report Submitted in Support of Dike Maintenance Act Approvals (2008).	<p>To support both diking authorities and regional/deputy IODs the province released a series of documents in around 2008 describing the requirements for proper design and documentation to receive a Dike Maintenance Act Approval. One of these documents outlines the minimum requirements for hydrologic and hydraulic designs. Of relevance to the Lower Fraser River is the statement that the Province has an approved design flood profile from 2008 that is nominally based on a 0.2% AEP event. It also notes:</p> <p><i>“A freeboard allowance is applied to flood profile to determine the construction of crest elevation of the flood protection works. Freeboard may be different for local conditions, however, the province historically has applied the following minimum freeboard allowance for open water conditions: The higher of:</i></p> <p><i>600 mm vertical allowance above the calculated 1 in 200-year peak mean daily flow profile, which normally applies to large river systems; or</i></p> <p><i>300 mm vertical allowance above the calculated 1 in 200-year peak instantaneous flow profile. Where the channel is potentially subject to sediment aggradation and/or debris jamming additional freeboard may be required.”</i> (Ministry of the Environment 2008)</p> <p>(From BGC Engineering Inc. and Ebbwater Consulting 2017)</p>
	Seismic Design Guidelines for Dikes (2011, updated in 2014).	In recognition of the high earthquake hazard in parts of British Columbia, this report provides design guidance for “High Consequence” dikes in high earthquake hazard areas primarily, although not exclusively, for the Fraser Valley.
	Diking Authorities for New Dikes Policy (2010)	This document sets out the reasoning and policy requiring that for any new dikes constructed in the province, the diking authority must be a local government. (BC Ministry of Forests Lands and Natural Resources Operations and Rural Development 2010)
	Environmental Guidelines for Vegetation on Flood Protection Works to	The guidelines present minimum standards under the Dike Maintenance Act for vegetation management on flood control structures to protect public safety, and identify opportunities to protect and/or enhance habitat to benefit the environment. (British

Guidelines	Protect Public Safety and the Environment (1999)	Columbia. Ministry of Environment and Canada. Department of Fisheries and Oceans 1999)
	Riprap Design and Construction Guide (2000)	This document outlines guidance for the “design and construction of slope or bank protection works and to provide current information on the design and construction of riprap in BC” (British Columbia. Ministry of Environment 2000).
	Critical Infrastructure Assessment Tool (2016)	“The primary purpose of the Critical Infrastructure (CI) Assessment Tool and associated process is to provide a single venue for participants from various local authority departments/agencies to discuss what services they feel are critical to provide to residents during an emergency, the assets they need to provide those services, and who/what they rely on in order to make those assets available.” (Emergency Management BC, Development Research Defence Canada, and Justice Institute of BC 2016)

Table 3-7: Provincial government activities in flood risk governance. Part 3: Funding and Investment.

Funding and Investment	What	Description
	National Disaster Mitigation Program (NDMP)	BC, unlike any other P/T has cost-shared half the NDMP program. EMBC works with other Provincial agencies to screen and put forward applications to PSC. Successful applicants can receive 100% of project costs through this program. See Table 3-3 for more information on the program.
	Community Emergency Preparedness Fund (CEPF)	The CEPF program has been in place in some form since 2017. Since 2018 it has been operated by the Union of BC Municipalities (UBCM). It provides grant funding (with no cost-sharing) for various project streams. The four streams echo the project types within the NDMP; these have a maximum fund cap of \$150,000. Additional funding streams available in 2021 include: <ul style="list-style-type: none"> • Structural Flood Mitigation (cap of \$750,000) • Indigenous Cultural Safety and Cultural Humility Training • Emergency Support Services • Emergency Operations Centres and Training • Evacuation Route Planning
	Disaster Financial Assistance Arrangements (DFAA)	Like the parallel federal program, BC provides emergency funding post-disaster under specific criteria. Namely that a disaster must first be declared eligible, and losses must not be otherwise insurable. The cost-sharing model between the Province and Federal government varies depending on the severity of the disaster.

	Gas Tax Fund (Strategic Priorities Fund)	The Gas Tax Fund, administered by UBCM, has been in place since 2005. It provides a “stable funding source to local governments for investment in infrastructure and capacity building projects”. Some flood projects (e.g., Okanagan floodplain mapping) have been partially funded through this program.
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Table 3-8: Provincial government activities in flood risk governance. Part 4: Lead Agencies.

	Who	Description
Lead Agencies	MFLNRORD	<p>MFLNRORD is one of the lead agencies and an important player in acting to reduce flood risk in the province.</p> <ul style="list-style-type: none"> • <i>Environmental Management Act</i> – Under Section 5(f) (i), the Minister has broad powers and authority over local governments to establish guidelines, regulations, and flood hazard management plans with respect to flood control, flood hazard management, and the development of land subject to flooding. • <i>Local Government Act</i> – MFLNRORD currently publishes “Flood Hazard Area Land Use Guidelines” that must be considered by local governments when enacting floodplain bylaws (see also Table 3-6). • <i>Dike Maintenance Act</i> – The ministry’s Inspector of Dikes and Deputy Inspectors of Dikes have the statutory authority to establish flood protection standards, monitor management of works by local diking authorities, approve changes to dikes and new dikes and issue orders respecting flood hazard planning. • <i>Drainage, Ditch and Dike Act</i> – The ministry is responsible for supporting the transition of the assets and responsibilities of five diking districts to local governments prior to the repeal of the Act. • <i>Water Sustainability Act</i> – The ministry is responsible for this legislation which is used to manage water resources in B.C., including regulation of water levels and flows associated with dams, flood control and other licensed structures. The Dam Safety Regulation, also under the WSA, outlines requirements for dam owners to inspect and maintain their dams to ensure compliance and mitigate the impacts of dam failure. • <i>Emergency Program Act</i> – FLNR is designated as the lead ministry for flooding and any corresponding emergency plans and procedures and their implementation. • <i>Land Act</i> – Disposition, lease, or use of crown land for the purpose of flood protection and/or erosion protection. • <i>Riparian Areas Protection Act and Riparian Areas Regulation</i> – The ministry is responsible for this legislation which calls on local

Lead Agencies

EMBC, Lead Agency for Emergency Management operating under the Ministry of Public Safety and the Solicitor General (PSSG)

- governments to protect riparian areas and their various functions to maintain stream health and productivity. Although the primary focus is on fish habitat and ecological health, it also is aimed at providing stable streambanks, sufficient space for channel migration, and community flood protection.
- The Provincial Flood Emergency Plan: FLNR is mandated to provide the required technical expertise to support EMBC including flood forecasting (River Forecast Centre), imagery and data tools (GeoBC), the Fraser River flood level modelling (Flood Safety Section), flood assessors and observers, and deployment of BC Wildfire staff for construction of emergency flood protection works.
 - Legacy Floodplain Mapping: MFLNRORD and Ministry of Environment maintain access to the legacy floodplain maps and data developed during the 1987 to 1997 Federal/Provincial mapping program.

(Information provided by MFLNRORD)

- Specifically, with respect to flooding and the Provincial Flood Emergency Plan, which was updated under EMBC leadership in 2019, the provincial coordination of this plan rests with EMBC and includes mitigation, preparedness, response and recovery.
- Emergency prevention and preparedness is a shared responsibility in collaboration with all levels of government and British Columbians and is also instrumental in keeping our communities safe – EMBC coordinates these activities for a variety of hazards including flood and other hydrologic events.
- As legislated in the Emergency Management Regulation, EMBC must prepare Provincial emergency plans and provide a 24-hour capability to direct requests from local governments and First Nations for emergency assistance which are often in response to flooding or other hydrologic events.
- EMBC administers all provincial and federal government disaster mitigation funding programs, including the former National Disaster Mitigation Program and the Disaster Mitigation and Adaptation Fund.
- EMBC is the lead, in partnership with MOTI, for access to federal infrastructure programs for disaster mitigation.
- Since 2008, EMBC has led and managed the Fraser River Sediment Management Program, to maintain the current flood profile of the Fraser Gravel Reach (Mission to Hope). However, this program has not removed gravel since 2012.

Lead Agencies		<ul style="list-style-type: none"> EMBC also manages (contracts out operation) the Fraser River Debris Trap which intercepts large volumes of natural wood debris during freshet. <p>(Information provided by MFLNRORD)</p>
	Ministry of Transportation and Infrastructure (MOTI)	<ul style="list-style-type: none"> Under the Land Title Act, MOTI development approving officers must consider flood hazards in the approval of subdivisions (within regional districts electoral areas). The Provincial Flood Emergency Plan: MoTI is primarily responsible for the safety and protection of provincial public highway, road and bridge infrastructure. The first priority of the ministry is to ensure that provincially-owned infrastructure is intact which includes maintaining command at the site level of events impacting provincially managed infrastructure. <p>(Information provided by MFLNRORD)</p>
	Ministry of Health (MoH)	<ul style="list-style-type: none"> The Provincial Flood Emergency Plan: support the local health authorities to maintain the delivery of health services. If required, the MoH Health Emergency Coordination Centre (HECC) may be activated to provide a coordinated response across all health system stakeholders. <p>(Information provided by MFLNRORD)</p>
	Ministry of Environment and Climate Change Strategy (MECCS)	<ul style="list-style-type: none"> The Provincial Flood Emergency Plan: During a provincial response to floods, the main supporting role of ENV is to respond to hazardous materials and other threats to the environment. ENV is responsible for coordinating the operation and maintenance of the provincial hydrometric network (water and snow gauges) and data quality provided by these gauges. These gauges are used by the RFC in FLNRORD to provide seasonal forecasts and bulletins as well as flood advisories. <p>(Information provided by MFLNRORD)</p>
	Ministry of Agriculture (MoA)	<ul style="list-style-type: none"> The Provincial Flood Emergency Plan (2019): Support to EMBC including: facilitating relocations of commercial livestock, providing support to farmers, aqua culturalists and fishers for the protection of crops, livestock and provincially managed fish and marine plant stocks, and advanced planning which may include mass livestock carcass disposal planning. MoA offers a variety of funding programs to flood impacted communities. <p>(Information provided by MFLNRORD)</p>

	Ministry of Municipal Affairs (MMA)	<ul style="list-style-type: none"> • May approve special operating authority/funds for local authorities (in an emergency event). Specifically, the Minister may “ratify” a borrowing by-law under the Emergency Program Act (13(6)) if a local state of emergency is declared. • The Provincial Flood Emergency Plan: In support of local authority recovery, provide guidance and assistance to local authorities regarding infrastructure. <p>(Information provided by MFLNRORD)</p>
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3.2.3 Local Governments

Local governments in BC get their authority from the Province (see above), and include municipalities and regional districts, who each have slightly different roles, responsibilities, and policy tools. For the most part these are guided by the *Community Charter* [2003] and the *Local Government Act* [2004] except for the City of Vancouver, which has its own Charter (*Vancouver Charter* [1953]) and is able to operate with more autonomy than other local governments.

Local governments are extremely diverse, from small rural villages with very limited capacity, to large metropolitan centres with significant populations, tax base and operations. Local governments generally have a larger role and greater responsibilities than regional districts, who are obligated only to consider emergency management, regional solid waste planning, and some broader governance for electoral areas (Province of British Columbia, n.d.).

The following provides a big picture overview of the mandate, legislation, regulation, and authorities used by local government with regards to flood management and was compiled using resources provided by MFLNRORD, reporting from other Issues (esp. Northwest Hydraulic Consultants Ltd. 2021a), engagement interviews, reviewers comments, and the authors’ own knowledge.

In general, local governments, especially municipalities, have a lot of authority and responsibility for flood management because they are the lead agencies for land use planning (and therefore exposure to flood hazard), are able to modify and enhance building controls (i.e., vulnerability), and also are the lead agencies for initial emergency response. Local governments also have some authority over flood protection infrastructure.

Table 3-9: Local government activities in flood risk governance. Part 1: Legislation and Mandate (Regulation).

Legislation and Mandate	What	Description
	Regional Growth Strategy Bylaw (Regional Districts)	Regional Growth Strategy (RGS) Bylaw: Is a strategic plan that defines a regional vision for sustainable growth. Policies can be incorporated into an RGS to prepare for climate change and to consider natural hazards.
	Official Community Plan Bylaw (Local Governments)	An Official Community Plan (OCP) is a guiding policy document used to inform land use decision. OCPs can include policies in hazard management, community resilience and climate adaptation.
	Development Permit Areas (DPAs)	DPAs are designated areas requiring special treatment. An Official Community Plan may designate DPAs for specified purposes, including the protection of development from hazardous conditions like flood. Hazard DPAs are generally triggered by alterations to the land associated with development activities. DPAs must include contributions or objectives that justify the designation and must also provide guidelines for developers and homeowners to meet the requirements of the DPA.
	Flood Bylaw	If a local government considers that flooding may occur on land, the local government may adopt a bylaw to designate a floodplain area and specify flood levels for it, establish setbacks and construction elevations for habitable space for new buildings and structures, and for landfill within the flood hazard area [Section 524]. Most often, applications for building permits trigger flood bylaw requirements.
	Zoning Bylaw	Land use zoning bylaws are used to regulate the use of individual parcels of land, including parcel configuration, the density of the land use, and siting and standards of buildings and structures [Section 479]. These bylaws have been used historically for flood hazard areas to ensure public safety is maintained by limiting the types of uses associated with those lands.
	Subdivision Bylaw	Standards for subdivision design that take into consideration climate change and flood hazards can be established by local governments. In the case of the electoral areas of Regional Districts, the Approving Authority for subdivision is the Ministry of Transportation and Infrastructure, who is required to consider the FHALUMG to determine the conditions for subdivision approval.

	Building Bylaw	There is also provision under [Section 694] of the <i>Local Government Act</i> for a local building bylaw or permit process to require floodproofing. Generally, these are no longer used as the updated BC Building Code has some provisions for floodproofing and any additional conditions can also be integrated into a flood bylaw. It should also be noted that the National Research Council of Canada and partners are working to incorporate new floodproofing standards into future iterations of the Canadian Building Code.
	Emergency Program Bylaw	Local Governments and Regional Districts are the primary responsible governments for Emergency Management. Emergency Program bylaws create the authority to develop and maintain an emergency program through an Executive Committee. An Emergency Program Bylaw specifies the organisation and concept of operations of an emergency program, delegates authority to an emergency program Executive Committee and outlines the responsibility of the local authority. Regional Districts must pass an additional bylaw to extend their services through all electoral areas with their district.
	Drainage Bylaws	Local governments have authority to create bylaws relating to drainage and sewerage works under the Community Charter. This includes developing rules and regulations related to the construction of works to “maintain the proper flow of water in a stream, ditch, drain or sewer in the municipality”.

Guidelines

Local governments can and do create guidelines in support of flood management initiatives. For example, the District of North Vancouver has guideline documents for homeowners and professionals in support of their Hazard DPAs. However, for the most part, local governments rely on guidelines prepared by others. In many cases, local governments are required to implement guidance enabled by regulations from senior governments.

Funding and Investment

Local governments have access to funds through property taxes and other revenues (e.g., parking fees). Some local governments in BC have used these general revenues to support flood management initiatives, either in whole (e.g., Phase 3 of the City of Vancouver Coastal Flood Risk project was conducted using internal funds), or more commonly in part, to match or cost-share other granting programs provided by the Province or Federal government.

Some local governments have developed additional taxation opportunities (e.g. City of Surrey Drainage Parcel Tax) to support flood mitigation activities.

Organization and Roles

Local governments organise themselves in diverse ways to implement their responsibilities as set out by senior governments (e.g., land use, emergency management, etc.); the variation in organisation is in part dependant on the size of the local government. Most local governments have engineering and planning departments, which can vary from one person through teams of dozens.

The department or sector charged with managing flood varies significantly. In some small local governments, flood falls under the general responsibilities of the Chief Administrative Officer (CAO) (especially for very small communities e.g., Village of Sayward), in others it falls under Engineering Services or Planning, and in still others under Emergency Services. Only three of the larger municipalities have staff members whose sole responsibility are issues of flood and/or drainage (based on knowledge of authors). The size, organizational structure, and mandate of any group is dependent on the level of hazard, the size of community, historic practices, and more recently funding avenues. For example, the recent NDMP and CEPF programs that are lead provincially through EMBC has shifted responsibility to Public Safety and Emergency Planning departments in some local governments.

Some local governments act as diking authorities and have responsibility for the ownership, operation, and maintenance of dikes within their jurisdiction. It is planned that all diking authorities will eventually be placed under the authority of local governments (see *Drainage, Ditch and Dike Act* [1996] in Table 3-5).

Local governments also have emergency responders and co-ordinators to support in flood response and recovery.

Some local governments have organised themselves into regional groups to support on some aspects of flood management. For example, the Integrated Partnership for Regional Emergency Management (IPREM), in the MetroVancouver Region, is a 50/50 intergovernmental partnership between local governments and MetroVancouver that was created to coordinate regional and sub-regional activities on emergency response.

3.2.4 First Nation Governments

Under Canadian legislation, First Nation Band Councils get some authority from the *Indian Act* [1953] (see Table 3-1), which provides limited powers. This Act is very dated and under review. Under the *Indian Act*, authority for issues of land management, and therefore flood management, are held by the crown, with Indigenous Services Canada (ISC) providing operational resources.

In 1999, and amended in 2019, the *First Nations Land Management Act* [1999] allows First Nation governments to opt out of approximately 40 sections of the *Indian Act*. This enables First Nations to develop their own laws related to land use, environment, and natural resources. A First Nation government transitions to this state by first becoming a signatory to the Framework Agreement on First Nation Land Management (the Framework Agreement), which sets out the principal components of

governance of reserve land (Westbank et al. 1999). First Nation governments can ratify the Framework Agreement by enacting a Land Code, which then returns authority for land management from the Crown to the First Nation. In Canada, as of 2019, 165 First Nations have become signatories to the Framework Agreement and 91 have fully enacted Land Codes (First Nations Land Management Resource Centre 2019), many of which are in BC.

First Nations that have fully enacted Land Codes have authority to:

- **Make laws** (i.e., regulations as described in Section 2.5.2) with “respect to the development, conservation, protection, management, use and possession of First Nation Land. This includes laws on zoning, land use, interests and licenses, environment and assessment and protection, services...” (First Nations Land Management Resource Centre 2019).
- **Manage land** within their jurisdiction related to natural resources, including leasing, managing revenues and expenditures.
- **Environmental protection** through the authority to require environmental assessments and environmental protection through the implementation of First Nation laws.
- **Exchange lands** of equal area and quality if advantageous to the First Nation.

Given the evolving nature of First Nation governance, and the large number (198) of individual First Nations in BC there is huge variation in the approaches and tools used by individual First Nations to consider issues of flood risk governance.

For example, the Okanagan Nation Alliance (ONA), has taken a leadership role in flood (*tíkt*) for the Syilx Okanagan Territory, which covers more than 15,000 km² of lands in the southern Okanagan and Similkameen watersheds (Ebbwater Consulting Inc. 2019b). They have developed a plan that has the objective to “understand the risk due to *tíkt* and debris flows within the Okanagan and Similkameen Basin in order to support flood risk mitigation planning” and explicitly includes collaboration with local governments within the watersheds. This project is still in its infancy and no on the ground implementation of flood policies has yet occurred, but foundational information that was developed by weaving traditional knowledge and western science has been created and shared.

Other First Nations have policies and tools that are similar or parallel policies to those developed by local governments. For example, the Tsawwassen First Nation (a Treaty Nation), has community area plans, and a Development Permit Area regulation to require that new buildings in the floodplain be built to appropriate standards on reserve lands (Tsawwassen First Nation 2021).

Some Nations have limited policies, for example, developed during an emergency (e.g. the Declaration of a Local State of Emergency under a Band Council Resolution (BCR) for the Okanagan Indian Band (Louis and Louis 2017)).

Other Nations have partnered with non-Indigenous jurisdictions to develop flood management plans (e.g., Squamish Nation and District of Squamish, and Cowichan Tribes and Cowichan Valley Regional District) for reserve areas.

Finally, many others are just beginning to consider flood management governance and planning, many under the auspices of Climate Change Adaptation Planning. For example, with the support of ISC, Coastal [Flood] Vulnerability Studies, are being conducted for dozens of coastal Nations and communities (Indigenous Services Canada 2021).

With regards to Emergency Response, many First Nations have ISC funded Emergency Co-ordinator positions to support the development of emergency plans. Many flood projects funded under the CEPF of NDMP are led by these co-ordinators (anecdotally, based on authors' experience and targeted engagement).

ISC has service agreement with EMBC, to provide emergency services; EMBC is the lead in support First Nations with response activities (Indigenous Services Canada 2021).

Guidelines

Research conducted for this project did not yield any flood specific guidelines developed by First Nation governments. However, other levels of government and non-government organisations have developed guidance documents to support First Nations (e.g. Comprehensive Community Planning for First Nations in British Columbia (Indian and Northern Affairs Canada 2006)) in managing flood. Many of the more recent guidance documents have been developed recently in support of climate adaptation (e.g., Carlson, Johnson, and Low 2020).

Some First Nations have declarations or statements to clarify the Nation's relationship with land or water. For example, the ONA, have a *siwɬkʷ* Water Declaration, which recognises the strong connection between the Syilx people and *siwɬkʷ* (water), and specifically highlights the power and importance of water (Okanagan Nation Alliance 2014). This, and other similar documents, provide important guidance on how to approach flood management and flood risk governance.

Funding and Investment

For the most part, First Nation Governments have limited taxation powers and other revenue sources (Crown Indigenous Relations and Northern Affairs Canada, n.d.). As a result, at this time, they rely on funding and investment from other orders of government (see Table 3-3 and Table 3-7).

Organization and Roles

Given the diversity of governance set-ups in First Nations across BC (see above), there is no consistency in organisation and roles as it pertains to flood risk governance. Further, messaging from the engagement process, highlighted the resourcing challenges associated with flood management; many First Nations have no one in this role, even as a small component of a larger role (this is further discussed in Section 5).

3.2.5 Other Authorities

In addition to government, there are a number of other authorities (e.g., an agency with legislated authority) that play a role in flood management. These include diking authorities, crown corporations, and watershed boards. Each of these is briefly described below.

3.2.5.1 Diking Authorities

The *Dike Maintenance Act* [1996] defines a diking authority as:

- (a) the commissioners of a district to which Part 2 of the Drainage, Ditch and Dike Act applies,
- (b) a person owning or controlling a dike other than a private dike,
- (b.1) if the final agreement of a treaty first nation so provides, the treaty first nation in relation to dikes on its treaty lands,
- (c) a public authority designated by the minister as having any responsibility for maintenance of a dike other than a private dike, or
- (d) a regional district, a municipality, or an improvement district

There are more than 100 diking authorities, the majority of which are within the jurisdiction of regional, local, and First Nation governments (Northwest Hydraulic Consultants Ltd. 2021b). A small, but significant portion of diking authorities are outside any other government structure (Northwest Hydraulic Consultants Ltd. 2021b).

The *Dike Maintenance Act* [1996] gives the IOD and Deputy IODs power to supervise the construction and maintenance of dikes and to require a diking authority to maintain, improve, remove a dike among other powers.

Some of these authorities have taxation authority and fund some or all of the operations and maintenance of the dikes within their jurisdiction.

3.2.5.2 Dam Owners

Under the *Water Sustainability Act* [2014], holders of water licenses related to dams are considered Dam Owners. These Dam Owners have the responsibility for conducting regular inspections, maintenance, and other duties necessary for safe operations.

Most, if not all, dams in BC, are not primarily operated for flood control. They have been built to create hydropower or for water storage.

Dam owners are extremely diverse, ranging from private individuals, through agricultural non-profits, through large hydro-power operators (e.g., BC Hydro).

3.2.5.3 Crown Corporations

There are several crown corporations in BC, that are owned by the Provincial Government and the People of BC but are operated independently. Four crown corporations who have authority, or who fund or actively implement core competencies related to flood management include:

1. **BC Hydro (BCH)** owns and operates many large-scale dams across the province. Some of these (e.g., the Columbia System, John Hart, etc.) have operational rules that have a flood management component. BCH also holds significant resources that support foundational understanding of flood in the province. Specifically, BCH owns and operates hydrometric, climate, and other related (e.g., snow pillow) data stations. They also have a large team of hydrologists and forecasters who have significant capacity to support other government officials. Finally, BCH has invested significantly in climate data and forecasting that is shared outside the corporation.
2. **BC Assessment** is an agency with the primary mandate to collect information and prepare analyses related to property values across the province. Although not specifically engaged in flood management operations, their datasets are widely applied to flood risk assessments (Ebbwater Consulting Inc. 2021).
3. **The Columbia Power Corporation**, much like BCH, develops, owns, and operates hydro power projects, but within the Columbia Basin. Its assistance of flood science is through the Columbia Basin Trust (see below). It operates some of its dams in support of flood mitigation, especially for downstream communities in the U.S. under the current Columbia River Treaty (which is due to expire in 2024).
4. The **Columbia Basin Trust** has a broad mandate to support the ideas of the people of the Columbia Basin. They have supported flood management initiatives, specifically related to the development of model policies for natural hazard management (Curran et al. 2015) and to the education of Local Government Officials through a flood mapping workshop in 2015.

3.2.5.4 Water Boards

There are two water boards within BC that have been given authority through provincial legislation: The Okanagan Basin Water Board (OBWB) in 1970 and Cowichan Water Board in 2010. Both these Boards have participated in flood management activities. The OBWB for example has recently played a coordinating role in the development of flood maps for the mainstem system. The Cowichan Water Board has participated in activities related to the Cowichan Memorandum of Understanding on Flood Management (Cowichan Tribes et al. 2010; NHC 2009), and more recently on operational rules for the Cowichan Lake Weir. Only the OBWB has taxation authority and provides funding to various water (and flood) management activities in the region.

3.3 Visual Summary of Flood Management Services

The above summary of flood management activities in the province makes clear that there are many governmental roles and responsibilities. To more simply understand how each level of government and authority acts to reduce flood risk, a visual representation of activities was prepared for this project. This visualization methodology was developed specifically for this project by Ebbwater (see Section 1.6.2) and was limited by resources. It should be considered as a baseline assessment that could be refined and improved in future iterations to support additional analysis.

The visualization is simply a matrix, where linkages between Core Competencies (see Section 2.6, in rows) are considered for each order of government (in columns). Each cell in the matrix is further divided into the six process components of governance (see Section 2.5) in a “petal diagram”, where each petal represents a component of governance.

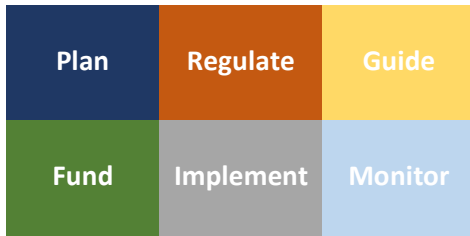


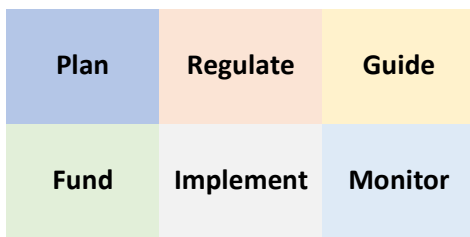
Figure 3-1: Petals for process components of governance.

To simplify the graphic and analysis, activity is recorded as either being present or absent. For example, because the Federal government invests money into running the hydrometric network, activity in the appropriate cell (Federal Government/Hydrometric and Climate Data) under “Fund” is considered present. The individual cells have been scored (as either being active or not) based on the research presented earlier in this section of the report and based on feedback from report reviewers. It is meant to be comprehensive and accurate, but given the large volume of information and data sources, as well as author and reviewer bias, it should be viewed as a tool for understanding big picture themes and messages rather than for fine scale understanding of individual policies.

A future refinement of the analysis and visualization could include additional information on the amount of involvement and the effectiveness of a given activity, however this would involve considerably more effort to develop measures of success (e.g., a likert scale for each core competency and/or governance process element) and to validate the methodology and results. This is beyond the scope of this project.

To differentiate between the absence or presence of activity in the graphic, the shading of the cells is adjusted. Where there is no activity, the shading is light and washed out, where activity is present, the colours are dark. Note that the analysis is digital, and actual binary coding, along with additional notes on the rationale for the colouring is also available.

No Known Activity



Some Known Activity

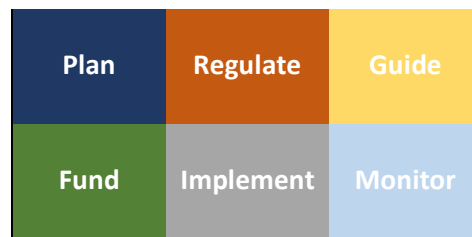


Table 3-10: Visual summary of flood risk governance activity for Government. Part 1: Foundational Tools.

Core Competencies/Sector (Agency)			Government				Other Authorities			
			Federal	Provincial	Local	First Nation	Diking Authorities	Dam Owners	Crown Corporations	Water Boards
Foundational Tool	Data	Traditional Knowledge	■	■	■	■	■	■	■	■
		Hydrometric and Climate Data	■	■	■	■	■	■	■	■
		Topographic and Bathymetric Surveys	■	■	■	■	■	■	■	■
		Topographic and Bathymetric Data Dissemination	■	■	■	■	■	■	■	■
		Flood Protection Infrastructure Surveys	■	■	■	■	■	■	■	■
		Exposure and Vulnerability Data Development	■	■	■	■	■	■	■	■
		Exposure and Vulnerability Data Dissemination	■	■	■	■	■	■	■	■
		Flood Event Mapping	■	■	■	■	■	■	■	■
	Forecast	Climate and Climate Change	■	■	■	■	■	■	■	■
		Weather	■	■	■	■	■	■	■	■
		River (Flows and/or Levels)	■	■	■	■	■	■	■	■
		Coastal Conditions	■	■	■	■	■	■	■	■
	Mapping	Hazard - Creation	■	■	■	■	■	■	■	■
		Risk - Creation	■	■	■	■	■	■	■	■
		Compilation/Storage	■	■	■	■	■	■	■	■
		Publication and Sharing	■	■	■	■	■	■	■	■
	Education	Post-Secondary Programs	■	■	■	■	■	■	■	■
		Professional Programs	■	■	■	■	■	■	■	■
		Public Education	■	■	■	■	■	■	■	■

Table Key

No Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

Some Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

Table 3-11: Visual summary of flood risk governance activity for Government. Part 2: Risk Reduction Tools

Core Competencies/Sector (Agency)			Government				Other Authorities			
			Federal	Provincial	Local	First Nation	Diking Authorities	Dam Owners	Crown Corporations	Water Boards
Risk Reduction Tools	Plan-ning	Flood Management Plans	■	■	■	■	■	■	■	■
		Land Management	Maintain Natural Assets	■	■	■	■	■	■	■
	Restore Natural Assets		■	■	■	■	■	■	■	■
	Hazard Control	Dams - Build	■	■	■	■	■	■	■	■
		Dams - Operate and Maintain	■	■	■	■	■	■	■	■
		Dikes - Build	■	■	■	■	■	■	■	■
		Dikes - Operate and Maintain	■	■	■	■	■	■	■	■
		Channel Maintenance	■	■	■	■	■	■	■	■
	Exposure	Acknowledge/Disclose	■	■	■	■	■	■	■	■
		Avoid	■	■	■	■	■	■	■	■
		Retreat	■	■	■	■	■	■	■	■
		Redistribute	■	■	■	■	■	■	■	■
	Vulnerability	People	■	■	■	■	■	■	■	■
		Culture	■	■	■	■	■	■	■	■
		Environment	■	■	■	■	■	■	■	■
		Critical Infrastructure	■	■	■	■	■	■	■	■
		Structures	■	■	■	■	■	■	■	■
		Economy	■	■	■	■	■	■	■	■

Table Key

No Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

Some Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

Table 3-12: Visual summary of flood risk governance activity for Government. Part 3: Tools for Resilience.

Core Competencies/Sector (Agency)			Government				Other Authorities														
			Federal	Provincial	Local	First Nation	Diking Authorities	Dam Owners	Crown Corporations	Water Boards											
Tools for Resilience	Residual Risk	Insurance (Private)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
		Insurance (Publicly Funded)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Resilience	Engineering Resilience	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Adaptive Resilience	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Response	Flood Response Plan Development	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Flood Response Plan Maintenance	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Monitoring and Warning	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Flood Response Training	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Flood Response Resources	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Financial	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Recovery	Engineering/Structural	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Social/Cultural	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Environmental	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
		Post-disaster planning	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Table Key

No Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

Some Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

3.4 Conclusions

The visual summary as well as the cataloguing of activities at different levels of government and authorities clearly shows the polycentric and distributed model currently in play in BC. Summarized high-level conclusions are:

- The governance of foundational tools is relatively distributed.
 - Primary planning function remains with the Federal government, although the Provincial government plays a strong role in some elements of data collection and analysis.
 - There are next to no regulations, although there are a number of guidelines that have been developed by both the Federal and Provincial governments.
 - Funding comes from many diverse sources and is administered by all levels of government.
 - There are some overlaps (some intended, some unintended) in the implementation of foundational tools.
 - Minimal monitoring is occurring, especially with consideration of success towards previously defined public targets.
- The governance of risk reduction strategies has a different governmental focus than the foundational tools.
 - The Federal government only plays a small role, and Local and Provincial authorities are the main actors.
 - There is a fair amount of regulation and/or guidelines to support some, but not all risk reduction strategies.
 - Funding comes from many diverse sources and is administered by all levels of government.
 - There are many activities that have limited or no governance at this time.
 - Minimal monitoring is occurring, especially with consideration of success towards previously defined public targets.
- The governance of residual risk and recovery in the public sector has a clear focus on response, some on recovery and limited activity on resilience. This is especially true for regulation of activities.
 - Overall, there is limited regulation and guidelines in this domain.
 - There are considerable funding contributions from all sectors, especially to response and recovery.
 - Minimal monitoring is occurring, especially with consideration of success towards previously defined public targets.

Additional analysis, that includes results from Indigenous and non-Indigenous engagement, is provided in Section 5 and Section 6. Recommendations are provided in Section 8.

4 Investigation A-1.2: Investigate the roles of non-government entities in flood management in BC.

4.1 Introduction

As highlighted in the introduction, flood and disaster management is an all-of-society concern given the systemic nature of flood impacts. As a result, non-government entities play a role, either explicitly or implicitly, in flood management in BC. This section describes the actors and roles that they are currently playing to enhance or fill in the gaps of government activities.

4.1.1 Research Objectives

The primary objective of this investigation was to establish baseline (current) conditions for flood service delivery in BC by non-government entities.

4.1.2 General Approach

The project was a mix of desktop research and targeted engagement. The approach follows the following broad steps:

1. Builds on previous investigation.
2. Exploration of information with private sector through author's knowledge and targeted interviews.
3. Coding of all policies.
4. Development of a visual representation of flood service delivery within non-government entities.

4.1.3 Limitations

This investigation, like all within this Issue report, was limited by resources. It is recognised that it may not be comprehensive, and not all non-government actors, are identified. Further, the investigation is focussed on groups and organisations rather than individual members of the public.

4.2 Primary Roles and Responsibilities in Civil Society

Civil society, meaning “the space for collective action around shared interests, purposes and values, generally distinct from for-profit actors” (World Health Organization, n.d.), is an important stakeholder group for flood management in BC. Professional Associations, Non-Governmental Organisations (NGOs), and Post-Secondary Institutions are discussed below.

4.2.1 Professional Associations

As discussed in the previous section qualified professionals play an important role in delivering services and complying with standards. Also noted above is that some professional associations are undergoing changes as a result of the recent promulgation of the *Professional Governance Act* [2018]. Organisations that fall under this Act, such as Engineers and Geoscientists BC (EGBC) are mandated to ensure that their members meet technical and ethical standards. This is relevant to flood management, as engineers and geoscientists play an important role in many aspects of flood management. Other professional associations have a less clear mandate to direct their members, but still provide valuable services related to guidance and advocacy.

EGBC has authored two Professional Practice Guidelines related to flood:

- Flood Mapping in BC (EGBC 2017)
- Legislated Flood Assessments in a Changing Climate in BC (EGBC 2018)

EGBC is also working collaboratively with the Province to develop new guidelines related to Seismic Assessment and Seismic Dikes, which are expected in 2021.

Members of EGBC, who work in related fields and on related projects are required to read and acknowledge these non-prescriptive guidelines. As guidelines, professional engineers are not required to follow them to the letter. The association and its members hold a large responsibility (and associated liability) for certain flood management actions. For example:

- Members are often asked to sign off on site reports with a “safe for intended use” statement. This is rarely, if ever a one hundred percent, certainty.
- Flood maps, which are signed and sealed by engineers, are used for multiple purposes. When used in a bylaw, where there is a chance that an individual will dispute the bylaw because they cannot use the land as they had originally intended, then the engineer may become liable for loss of property value (pers. comm. Lorena Staples, QC).

In addition to the EGBC guidelines, other professional associations provide useful information for practitioners and users of flood information. For example, the BC Real Estate Association (BCREA), who are active advocates for the improvement of flood mapping coverage in BC, have produced Flood Mapping Funding Guidebook (BC Real Estate Association, SSG, and Ebbwater Consulting, 2019) to support local governments to properly scope and to source appropriate funding to complete mapping projects. The BCREA advocates for flood mapping on behalf of realtors and the realtors’ clients, who benefit from understanding hazard conditions prior to making real estate purchases.

The Planning Institute of British Columbia also plays a small role in flood management. They have hosted or sponsored numerous learning opportunities for their members to better understand issues related to flood.

In summary, professional associations play an important role in filling some gaps in government roles and responsibilities. Specifically, EGBC provides guidance for qualified professionals, where no such guidance is provided by the Province (although it is noted that the Province funded the guideline development). Further, the BCREA has played an important role in advocating for better flood mapping coverage.

4.2.2 Non-Governmental Organisations and Trusts

Several Non-Governmental Organisations (NGOs) play important roles in the landscape of flood risk management in BC. For example, the **Fraser Basin Council** (FBC), in the absence of a regional co-ordinating body or authority, has played an integral role in co-ordinating dozens of interested and affected parties in the development of the forthcoming Lower Mainland Flood Management Strategy (LMFMS).

Other example NGOs that contribute to flood management include:

- **West Coast Environmental Law**, who have advocated for new sea level rise science and standards, and who are active participants on several initiatives to whom they bring their expertise on jurisdictional issues. They also convened a collaborative learning group to work on issues of sea level rise centred on Burrard Inlet.
- The **Red Cross** are very active players in flood recovery.
- **The Land Conservancy** and **Ducks Unlimited Canada** advocate for the protection and restoration of riparian areas and wetlands.
- The **BC Heritage Emergency Response Network**, which is a network of volunteers and professionals, who will respond to emergencies across the province to save or salvage art, culture, and heritage collections (see graphic below). They are also building capacity and connections so support preparedness and mitigation activities. It is funded through grants and volunteer time.

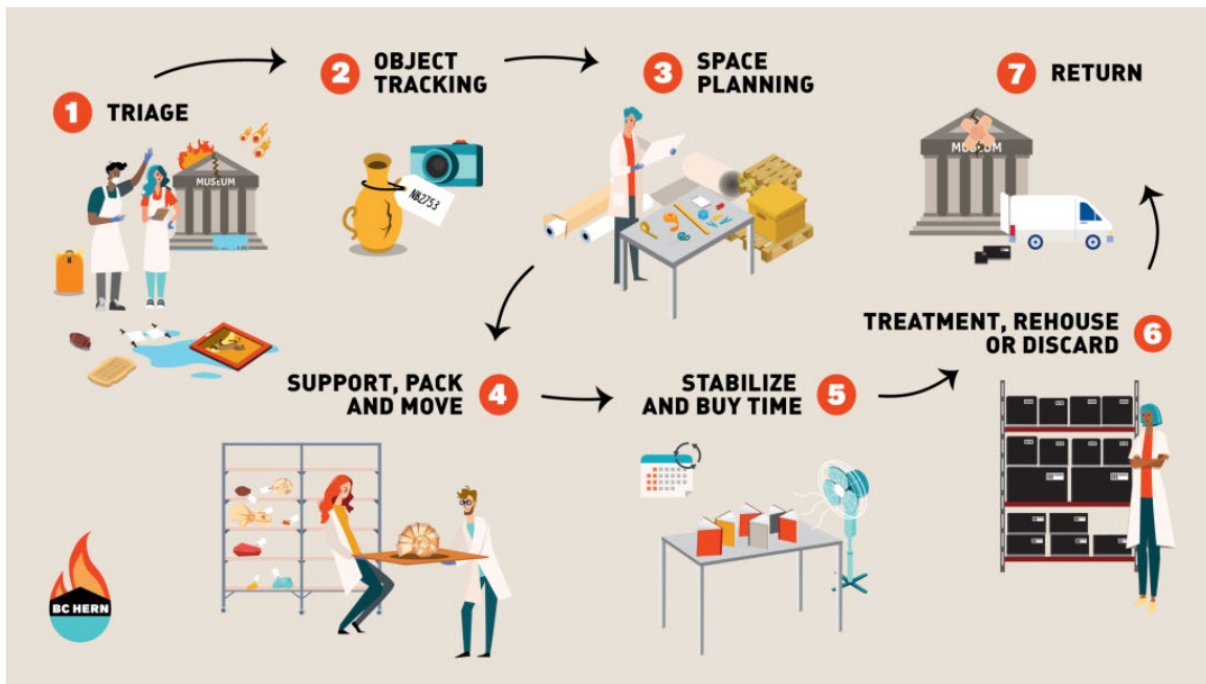


Figure 4-1: Response activities of BC Heritage Emergency Response Network (used with permission).

With regards to funding, NGOs, for the most part do not have sustainable funding that supports flood initiatives. However, there are some Legacy Trusts that support actions in specific regions or sectors. For example:

- The **TransMountain Legacy Fund** has supported local initiatives (e.g. in the Fraser Headwaters) on emergency planning and response (Red Dragon Consulting Ltd. 2021a).
- The **BC Real Estate Fund** has supported numerous flood related initiatives including the development of the flood mapping guidebook for local governments (BC Real Estate Association, SSG, and Ebbwater Consulting, n.d.), Public Education initiatives (e.g. [PROJECT SPOTLIGHT VIDEO](#)), and BC Flood Map Inventory Reports (Parsons and British Columbia Real Estate Association 2015).

4.2.3 Post-Secondary and Related Institutions

Post-secondary institutions (Universities and Colleges) play a couple of important roles in flood management in BC. Specifically, they nurture and develop future practitioners through certificate programs, undergraduate degrees, and graduate degrees. This ranges from emergency response training at the Justice Institute of BC, through surveying (with some hydrometric) programs at BC Institute of Technology (BCIT) and other colleges, through engineering, geoscience, geography, and planning degrees at the larger, well recognised institutions (University of British Columbia (UBC), Simon Fraser University (SFU), University of Northern British Columbia). Royal Roads University is one of three institutions in Canada offering degree programs in emergency planning and response, and it is also currently taking a lead role in support professional development of practitioners through the Adaptation Learning Network.

All these programs provide for the creation of future interdisciplinary teams of practitioners to support on flood management. However, there is no existing program that focusses specifically on flood management, and explicitly addresses the need for holistic training and/or skills to support interdisciplinary work environments. These types of certificate and degree programs do exist elsewhere. For example, on a scan of the internet, there are two dozen masters' degrees programs in flood or flood risk management around the world. IHE-Delft (Netherlands) and the University of Hull (UK) are the oldest institutions to offer these programs. There is a significant benefit in having graduates of these types of programs work in flood, both because of the specificity of their training, and the interdisciplinary skill sets. For example, graduates from the University of Hull are now found throughout the UK Environment Agency (the UK agency with the mandate for flood risk reduction) and are able to readily implement policy directives because they have knowledge of the rationale for policy and understand effective actions to implement policy.

Further to developing flood professionals, the research programs at some Universities provide some of the foundational tools for flood management. For example, the Storm Surge BC model, which provides forecasts of coastal conditions in the Georgia Strait originated at the UBC. Also at UBC, within the Faculty of Engineering and the School of Regional and Community Planning, are researchers in disaster science and policy. The University of Victoria (UVIC) houses important climate adaptation institutions like the Pacific Consortium for Climate Impacts (PCIC), which provides climate projections across BC, and is widely used in flood analysis and flood mapping. SFU houses the Adaptation to Climate Team (ACT), who are active participants on policy research related to climate change and extreme weather. UBCO has a nascent team of researchers working in flood policy.

In summary, post-secondary institutions play an important and expected role in training future flood practitioners. They also play an extremely important role in research and development, especially research that is locally relevant.

4.3 Roles and Responsibilities in the Private Sector

The private sector also plays a role in flood management in BC. This includes asset owners, who are self-interested, to protect their assets from flood damage, consultants and advisors who work in the field and provide capacity to 'do' many of the required tasks, and finally the insurance industry, who helps manage

residual financial risks. A brief summary of the players and their actions in the flood space is presented below.

4.3.1 Asset Owners

Asset owners, as defined as anyone or any corporation that owns and operates assets in flood hazard areas have a vested interest in protecting their assets from harm. They therefore have an obvious role in flood management and should be considered as stakeholders in any flood mitigation planning process.

Second, given the criticality of some assets (gas plants and distribution, electricity plants and distribution, rail, and port, etc.) and the potential damage, service interruption and consequential societal and economic impacts, that would be incurred during a flood, it is important that asset owners understand this risk and work to mitigate it.

Others, such as commercial real estate holders, agricultural asset owners and other asset owners, have a clear vested interest to limit damage to their assets, and in the absence of ‘protection’ provided by others, can make decisions and take a leadership role to limit damages.

There are no regulations associated with reducing risk and increasing resilience to critical infrastructure, although there are provisions within existing legislation (e.g., *Emergency Program Act* [1996]) that could support action through the development of a provincial emergency plan that specifically addresses critical infrastructure. And there may be changes in future if the EPA is successfully modernised and enacted.

The Province has developed guidelines to support action on critical infrastructure risk mitigation. Specifically, EMBC has developed a Critical Infrastructure Assessment Tool (Emergency Management BC, Development Research Defence Canada, and Justice Institute of BC 2016).

Asset owners are generally for-profit corporations, and therefore have a revenue model. Many projects related to resilience and risk reduction are self-funded (and with competing concerns, not necessarily appropriately funded). Some funding is available from senior governments to cost-share activities (see Section 3).

Some asset owners are investing in risk and resilience actions because they recognise the long-term financial benefits of this approach. For example, a real estate investment firm with a significant portfolio in Canada is currently developing a base understanding of the present day and future risk from flood to their properties. This understanding and associated tool will be used to support investment decisions, including decisions to divest from properties in high-hazard areas (Pers. Comm. with employee at investment firm). Further, this group envisions sharing their tools and information with the broader community and the public to support community resilience – if their properties survive an event but are surrounded by destroyed communities – it will affect their investment, and to show leadership in their sector.

Asset owners are a disparate group with different mandates, values, flood risk, etc. This creates a challenge with regards to legislating or providing guidance across this diverse sector to support flood risk

reduction and/or resilience. There is no lead agency or group to support action. There are however some regional activities that are enabling co-ordination and action (see IPREM in Section 3.2.2).

4.3.2 Advisors/Consultants

In terms of human resources (capacity and expertise), a very important group in flood management in BC are private sector consultants. This includes planning, engineering and geoscience, and emergency professionals, as well as some smaller representation from other groups (foresters, biologists, lawyers, etc.).

For the most part, the mandate for these private sector consultants, is focused on profit, while also providing service to community. This, at a gross level, can create conflict, where profit may in some instances direct the type of advice that these groups give to governments and others. However, there are regulations in place to mitigate this to some degree, and for the most part, consultants are driven to provide good advice that supports community risk reduction and well-being. Some private sector consultants work on slightly different principles. For example, as social enterprises, where motives related to long-term ecological and social are the primary drivers of business decisions (e.g., Ebbwater Consulting Inc.); profit or at least financial stability are important to this businesses model too.

Activities played by this private sector consultants includes:

- Developing foundational tools (e.g., expanding the hydrometric network, conducting science, developing flood maps and risk assessments).
- Conducting and publishing (in peer-reviewed and other media) science, planning and policy case studies.
- Some limited public education and ‘front-counter’ services for local and First Nation governments (e.g., Ebbwater Pet Projects, which especially during freshet, garner significant traffic and queries from the public).
- Supporting on the development, engagement, and implementation of flood mitigation plans.
- Designing and constructing flood protection infrastructure.
- Designing and supporting on the development of regulations.
- Etc.

This is an important group to consider going forward as much of the expertise for flood risk management currently resides with the private sector.

4.3.3 Insurance

The private insurance market plays an extremely important role in managing residual financial risks for the public and private sector.

Private sector insurance is a relatively new market in Canada that was enabled in the wake of the 2013 Calgary and Toronto flood events. Since the first offerings of overland flood insurance in around 2016, there is now good market penetration and coverage for most Canadians (Sigma Risk Management 2017). However, the highest-risk properties (e.g., those within high hazard and high likelihood floodplains) remain uninsurable, as the costs are deemed too high for the market to bear.

Some leadership on insurance issues presently comes from the Federal Government through PSC, who in 2021 announced a Task Force on Flood Insurance and Relocation with a mandate to examine options for developing an insurance program to manage the highest-risk properties, and to also design a plan for assisting the relocation for properties at “highest risk of recurrent flooding” (Public Safety Canada 2020).

Most insurance agents in Canada fall within the umbrella of the Insurance Bureau of Canada (IBC), however some significant players (e.g., Co-Operators Insurance) do not. The IBC has co-ordinated some large projects that have supported the development of an insurance market in Canada and BC. Specifically, they have worked with several international hazard and CAT (Catastrophe) firms to develop high-level hazard mapping for Canada. This information is then used to support actuarial models within individual insurance firms. It should be noted that this hazard data is often at odds with publicly available or funded mapping (e.g. Minano et al. 2021); this can create policy challenges when incentives for action are different for individuals, governments and insurers because of different understanding of hazards.

Insurance firms are ultimately profit-driven, and therefore may be at odds with the holistic best practices for flood management, but they play an integral and necessary role in supporting the financing of residual risk. Further, re-insurance firms operate with the idea of being profitable across the world and across sectors. Therefore they can work with imperfect data at the local level (see Issue B-3, (Ebbwater Consulting Inc. 2021)), which does not affect their mandate, but can affect decisions by others. For example, an incorrect flood map and insurance quotation might discourage an individual property owner from making a good decision (to not buy or invest in a property, or to not buy insurance).

Further, because of profit-driven mandates, Insurance firms will not insure high-risk properties (see above). This is an excellent future incentive for managed/strategic retreat, however in the short-term this leaves many property owners without the ability to manage residual risks.

Overall, insurance is an extremely important private sector entity that needs to be included in governance models and conversations. However, this sector is in flux at the moment, and it might be prudent to wait until PSC and the IBC finish their initial studies and make recommendations, prior to adapting programs in BC. Additional information on the insurance sector as it relates to flood recovery is found in Issue C-3 (Red Dragon Consulting Ltd. 2021b).

4.4 Visual Summary of Flood Management Services for Non-Government Entities

As for government agencies, a visual summary of flood management services within non-government entities has been prepared.

Table 4-1: Visual summary of flood risk governance activity for non-government entities. Part 1: Foundational Tools.

Core Competencies/Sector (Agency)			Civil Society			Private Sector		
			Professional Associations	NGO	Post-Secondary	Asset Owners	Advisors/Consultants	Insurance
Foundational Tool	Data	Traditional Knowledge	■	■	■	■	■	■
		Hydrometric and Climate Data	■	■	■	■	■	■
		Topographic and Bathymetric Surveys	■	■	■	■	■	■
		Topographic and Bathymetric Data Dissemination	■	■	■	■	■	■
		Flood Protection Infrastructure Surveys	■	■	■	■	■	■
		Exposure and Vulnerability Data Development	■	■	■	■	■	■
		Exposure and Vulnerability Data Dissemination	■	■	■	■	■	■
		Flood Event Mapping	■	■	■	■	■	■
	Forecast	Climate and Climate Change	■	■	■	■	■	■
		Weather	■	■	■	■	■	■
		River (Flows and/or Levels)	■	■	■	■	■	■
		Coastal Conditions	■	■	■	■	■	■
	Mapping	Hazard - Creation	■	■	■	■	■	■
		Risk - Creation	■	■	■	■	■	■
		Compilation/Storage	■	■	■	■	■	■
		Publication and Sharing	■	■	■	■	■	■
	Education	Post-Secondary Programs	■	■	■	■	■	■
		Professional Programs	■	■	■	■	■	■
		Public Education	■	■	■	■	■	■

Table Key

No Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

Some Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

Table 4-2: Visual summary of flood risk governance activity for non-government entities. Part 2: Risk Reduction Tools.

Core Competencies/Sector (Agency)			Civil Society			Private Sector													
			Professional Associations	NGO	Post-Secondary	Asset Owners	Advisors/Consultants	Insurance											
Risk Reduction Tools	Plan-ning	Flood Management Plans																	
		Land Management	Maintain Natural Assets																
	Restore Natural Assets																		
	Hazard Control	Dams - Build																	
		Dams - Operate and Maintain																	
		Dikes - Build																	
		Dikes - Operate and Maintain																	
		Channel Maintenance																	
	Exposure	Acknowledge/Disclose																	
		Avoid																	
		Retreat																	
		Redistribute																	
	Vulnerability	People																	
		Culture																	
		Environment																	
		Critical Infrastructure																	
		Structures																	
		Economy																	

Table Key

No Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

Some Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

Table 4-3: Visual summary of flood risk governance activity for non-government entities. Part 3: Tools for Resilience.

Core Competencies/Sector (Agency)			Civil Society			Private Sector														
			Professional Associations	NGO	Post-Secondary	Asset Owners	Advisors/Consultants	Insurance												
Tools for Resilience	Residual Risk	Insurance (Private)																		
		Insurance (Publicly Funded)																		
	Resilience	Engineering Resilience																		
		Adaptive Resilience																		
	Response	Flood Response Plan Development																		
		Flood Response Plan Maintenance																		
		Monitoring and Warning																		
		Flood Response Training																		
		Flood Response Resources																		
		Financial																		
	Recovery	Engineering/Structural																		
		Social/Cultural																		
		Environmental																		
		Post-disaster planning																		

Table Key

No Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

Some Known Activity

Plan	Regulate	Guide
Fund	Implement	Monitor

4.5 Conclusions

Although not as active as governments, non-governmental entities play an extremely important role in the flood sector. Some of these roles are expected and are well within the mandate of the institutions or organisations. For example, post-secondary institutions providing education for flood professionals, or insurance and re-insurance companies that have created a market to share financial risks from flood. Further, there are NGOs for whom flood management directly aligns with their broader mandate. For example, the Red Cross, who support on flood recovery.

Others are involved in flood management out of necessity to protect themselves or their assets. For example, private critical asset owners (e.g., railways) have good reason to at least participate in discussions related to flood risk reduction.

Finally, there are a group of non-governmental actors who are accidental or incidental players. For example, the BCREA, who started advocating for better flood mapping coverage in the province, when they realised their membership was not able to provide sound advice related to flood hazards and risks to potential home buyers.

Non-government entities are more active in the development of foundational tools than in the implementation of disaster risk reduction and resilience strategies, which is not a surprising finding.

5 Investigation A-1.3: Identify Challenges, Gaps, and Limitations with Current Service Delivery and Flood Risk Governance

5.1 Introduction

5.1.1 Research Objectives

The primary objective of this investigation was to identify gaps, overlaps, challenges, and limitations with flood management service delivery in BC.

5.1.2 General Approach

This investigation builds on the previous ones and, in the first instance, uses the visual summary of flood management services to identify gaps and limitations. The results of the desktop analysis were then used to inform engagement interviews with targeted individuals. Finally, the results of the desktop analysis and the engagement were merged into a summary of major issues.

It should be noted that the challenges, gaps, and limitations noted here are related to governance and are necessarily more high-level. There are many additional more specific challenges, gaps, and limitations that are noted in other Issue reports. Where possible, references to these reports have been made.

5.2 Challenges, Gaps, and Limitations Identification by Core Competency

To develop a preliminary and high-level understanding of the challenges and gaps in flood risk governance in BC, the overall activity for each core competency was reviewed, and a brief commentary provided. The comments are a mix of simple analysis of the presence/absence of activity across a core competency combined with the rationale for the original scoring (which is provided in the digital version of the visual summary). Comments from the engagement and review process are also implicitly incorporated into this analysis.

As for earlier sections, the results are summarised in three tables: for foundational tools (Table 5-1), risk reduction tools (Table 5-2), and tools for resilience (Table 5-3).

For each table, the first column lists the core competency. This is followed by a simple graphic that shows the presence (filled in) or absence (empty) petal diagram for the six process elements, and finally by a summary of key activities (green) and gaps (red). These tables were also provided to the client in a digital format; there is significantly more information in the digital versions, including different approaches and groupings of activities (e.g., activity by government/non-government).

5.2.1 Foundational Tools

Table 5-1: Summary of strengths and gaps by core competency. Part 1: Foundational Tools.

Core Competencies		All Actors Activity	Activities		
				Gaps	
Foundational Tool	Data	Traditional Knowledge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Broad awareness, new and forthcoming guidelines. Some, but limited funding. Limited practical implementation.
		Hydrometric and Climate Data	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Current activity across most process elements. Limited/inadequate funding.
		Topographic and Bathymetric Surveys	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Current activity and some funding. No guidelines. Inadequate funding. Limited planning.
		Topographic and Bathymetric Data Dissemination	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Current activity and some funding. Limited planning and monitoring.
		Flood Protection Infrastructure Surveys	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Some activity including planning and guidelines. Inconsistent/adhoc funding.
		Exposure and Vulnerability Data Development	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Some activity including planning and guidelines. Adhoc and limited funding. Many actors.
		Exposure and Vulnerability Data Dissemination	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Some limited activity. Adhoc and limited funding. Many actors.
		Flood Event Mapping	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Limited activity. A handful of examples. Adhoc funding. No guidelines. No plan.
	Forecast	Climate and Climate Change	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Current activity including guidelines and funding. No monitoring.
		Weather	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Strong current activity. No known monitoring of success.
		River (Flows and/or Levels)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Some activity including planning and funding. No guidelines. Inadequate funding. No monitoring.
		Coastal Conditions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Some activity including funding and limited planning. No guidelines. Inadequate/limited funding.
	Mapping	Hazard - Creation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Limited planning, guidelines and funding. Government planning limited. No known government audit.
		Risk - Creation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Limited planning, guidelines and funding. Government planning limited. No monitoring.
		Compilation/Storage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Some planning, and funding for future accessibility. Limited development across all components.
		Publication and Sharing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Some planning, and funding for future accessibility. Limited development across all components.
	Education	Post-Secondary Programs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Some planning and funding, albeit for non-targetted programs. No targetted programs.
		Professional Programs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Some limited activity on specific subjects. Activity is limited, and not holistic.
		Public Education	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Some activity from many actors. No consistent plan or vision.

Key for “Activity”

Plan	Regulate	Guide
Fund	Implement	Monitor

Overall, there is a fair amount of activity for foundational tools. However, much of this is adhoc and/or not comprehensive, or inadequate (e.g., funding). The limited monitoring of the success or failure to

develop foundational tools is rarely occurring, this is both a gap on its own, but also makes understanding the gaps in the other process elements more challenging to fully comprehend (i.e., if monitoring was occurring it would identify gaps and challenges).

More specific gaps and challenges for some of these are laid out in other Issues (B-1: Impacts of Climate Change (Associated Engineering Ltd. 2021), B-2: Flood Hazard Information (Northwest Hydraulic Consultants Ltd. 2021a), B-3: Flood Risk Assessment (Ebbwater Consulting Inc. 2021), C-1: Flood Forecasting Services (BGC Engineering Inc. 2021)).

5.2.2 Risk Reduction Tools

Table 5-2: Summary of strengths and gaps by core competency. Part 2: Risk Reduction Tools.

Core Competencies			All Actors Activity	Activities
				Gaps
Risk Reduction Tools	Plan ning	Flood Management Plans	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Some activity especially from senior government. No regulation or monitoring. Limited guidance.
		Maintain natural assets	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is considerable activity. Activity is not specifically targetted at flood. Incidental.
	Land Management	Restore natural assets	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There are lots of small scale adhoc examples. Planning and funding is limited and adhoc.
		Dams - Build	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is considerable activity. Dams are not often used, nor regulated, for flood.
	Hazard Control	Dams - Operate and Maintain	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is considerable activity. No known gaps related to flood.
		Dikes - Build	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is considerable activity. No consistent monitoring of overall system occurs.
		Dikes - Operate and Maintain	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is considerable activity. There are many known gaps and challenges related to implement.
		Channel Maintenance	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is some activity. There are no guidelines, and limited information on efficacy.
		Exposure	Acknowledge/Disclose	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
	Avoid		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There are many opportunities to avoid exposure. Policy and governance options are rarely used.
	Retreat		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There are some opportunities to enable managed retreat. Lack of regulation and funding impedes effective implementation.
	Redistribute		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Limited to no activity. There are conceptual examples in BC, and pilots in Canada.
	Vulnerability	People	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is significant activity, primarily broadly targetted at all-hazards. Tools with respect to flood are limited.
		Culture	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is emerging activity to consider the vulnerability of culture. There is limited funding, planning and implementation.
		Environment	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is significant activity, primarily broadly targetted at all-hazards. Implementation of business interruption is not widespread.
		Critical Infrastructure	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is some activity from the government and pricate sector. There is no regulation or guidelines for flood specifically.
		Structures	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is growing activity especially related to science and guidelines. There is limited implementation of property-level-protection.
		Economy	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	There is significant activity, primarily broadly targetted at all-hazards. Tools with respect to flood are limited.

Some risk reduction measures are better covered and presumably more successful than others; there is considerable activity related to hazard control. But, at the other end, there are many gaps related to non-

structural elements, especially explicit consideration of vulnerability and the less tangible elements (e.g., people, culture, etc.) of flood risk.

More specific gaps and challenges for some of these is laid out in other Issues (B-4: Flood Planning (Kerr Wood Leidal Associates Ltd. 2020), B-5: Structural Flood Management Approaches (Northwest Hydraulic Consultants Ltd. 2021b), B-6: Non-Structural Flood Management Approaches (Northwest Hydraulic Consultants Ltd. 2021c).

5.2.3 Tools for Resilience

Table 5-3: Summary of strengths and gaps by core competency. Part 3: Tools for Resilience.

Core Competencies			All Actors Activity	Activities
				Gaps
Tools for Resilience	Residual Risk	Insurance (Private)	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	This is in flux, but some activity exists. In flux.
		Insurance (Publicly Funded)	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	This is in flux, but some activity exists. In flux.
	Resilience	Engineering Resilience	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	Some guidelines being developed. Incidental resilience through redundancy. Very limited activity that is explicitly resilience focussed.
		Adaptive Resilience	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	Some incidental activity related to implementation. Very limited activity overall.
	Response	Flood Response Plan Development	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Well developed core competency with significant activity. Few gaps.
		Flood Response Plan Maintenance	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Well developed core competency with significant activity. Few gaps.
		Monitoring and Warning	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Some activity across most process elements. Inconsistent support across province.
		Flood Response Training	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Relatively strong activity primarily provincial. Greatest activity tied to high flood threat years.
		Flood Response Resources	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Relatively strong activity across most process elements. Some targeted gaps.
	Recovery	Financial	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Well developed system in place, albeit in flux. Limited monitoring of long-term effectiveness.
		Engineering/Structural	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	Funding and implementation activities post-disaster. Limited strategic planning and monitoring.
		Social/Cultural	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Activity mostly related to broader disaster planning. Not flood specific. Limited overall activity.
		Environmental	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Activity mostly related to broader disaster planning. Not flood specific. Limited overall activity.
		Post-disaster planning	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Some limited activity in this new area of consideration. Much work to be done to get this into full force.

There is strong activity and limited gaps related to flood response (please see related Issues for more details – C-2: Emergency Response (Red Dragon Consulting Ltd. 2021a) and C-3: Flood Recovery (Red Dragon Consulting Ltd. 2021b)). In contrast, there are significant gaps in activities related to resilience, primarily related to this being a relatively new concept (as distinct from risk reduction). There are however indications that activity is increasing. The management of residual risk through insurance has many gaps (see also C-3: Flood Recovery (Red Dragon Consulting Ltd. 2021b), but there is strong activity in the sector to understand and hopefully address these in the near future.

5.3 Summary of Gaps and Challenges by Governance Principle

The following presents a series of gaps and challenges, grouped by governance principles (see Section 2.4). These have been drawn from the visual summary analysis, as well as from the engagement. Note that some gaps and challenges are deemed a weakness of more than one governance principle, this highlights the need to address these gaps, and the great benefit across multiple principles of good governance of doing so.

5.3.1 Legitimacy and Voice

Many gaps and challenges related to legitimacy and voice were found in desktop analyses and from engagement. These are summarised below.

1. **Roles and responsibilities are unclear.** A clear and common theme throughout the engagement was the challenge of unclear roles and responsibilities across orders of government, but also within them. This is particularly true for non-structural elements of risk reduction and resilience building, where there is a lack of clarity on balancing legislated responsibilities of local governments against guidance from provincial government. Further, local and First Nation governments noted that they did not always know where to get relevant information at the Province or within the Federal Government (e.g., the Emergency Planning Secretariat when looking for information related to anticipated water levels for the coming freshet noted “I’m not sure who to ask” (Pers. Comm. Project Coordinator, 9 April 2021)).
2. **Competing mandates and relationships challenge good governance.** Given the systemic nature of flood and the many actors in the space (see Section 3 and 4) it is unsurprising that there is friction in some of these relationships. Some key issues are noted below:
 - a. **Federal-Provincial Relations.** The Federal Government is very conscious that water and flood issues are predominantly the domain of Provinces and Territories. The authors heard from federal staff, through the engagement, that there is fear of developing prescriptive federal guideline documents (and thereby overstepping their authority). This can create inefficiency at the Provincial/Territorial level when new more specific and prescriptive guidelines need to be created to support local and First Nation governments and other practitioners. And, where provincial guidelines are not developed, can create a chaotic environment. The authors also note that Federal and Provincial governments are not always aligned on resourcing. For example, the Province was challenged to manage available funds under the NDMP when it was first announced and released because they did not have appropriate staffing and provincial priorities were focussed elsewhere at the time; this was a persistent issue across many provinces (Public Safety Canada 2019b).
 - b. **Local Government aspirations and Provincial guidance are sometimes at odds with each other.** For example, interview participants noted that sometimes they are not able to implement best practice or novel flood management concepts. These types of concepts are not reflected in provincial guidelines (e.g., FHALUMG), and although these are not “regulatory” they have weight in the eyes of senior decision-makers, who are concerned about liability, and in the eyes of funders, who may not fund projects that vary from provincial guidance.
 - c. **First Nation and other government values are often mismatched.** For example, several Indigenous participants in the engagement noted that their belief systems that consider

long-term stewardship of their Territories, are not reflected in current flood policy (see also Appendix C). As mandates are adjusted to align with DRIPA, and therefore inclusive of Indigenous voices, which may be different from neighbouring jurisdictions and the status quo, we will be challenged to ensure that there is one overall direction for flood management (see also below and next section).

- d. **Competing voices between private and public sectors.** For example, there is an explicit expectation from the Federal Government (Public Safety Canada 2019b), and implicit from the Province that the private sector will manage residual financial risk. However, the insurance company mandates are to be profitable, and therefore they do not necessarily align their pricing models to align with government policy, but more so to ensure financial stability; they may not be willing to finance residual risk in high-risk situations.
3. Current **light-touch regulation** leads to inactivity and lack of forward movement (i.e., lack of direction). The visual summary and engagement both show that there is limited regulation outside structural flood management activities and flood response. Where there is regulation noted outside these areas, it is often incidental, or weak (e.g., although there are regulatory tools within local governments to disclose flood hazards to the public and other interested parties, local governments often choose not to disclose, because there is no Provincial regulation to enforce it). There was an expressed desire by most local government interviewees to increase regulation (primarily related to flood mapping and disclosure, as well as land use planning) so that flood management becomes a core service that ‘just gets done’ rather than being side-lined.
4. **Broad participation**, especially for First Nations (with consideration of DRIPA and Free, Prior and Informed Consent (FPIC), in flood management activities is and will continue to be a large challenge because of capacity (see also principle of Fairness and Appendix C).
5. **Consensus-oriented initiatives require patience and resources.** It takes time and resources to hear different voices, to educate interested and affected parties, to discuss trade-offs, and finally to come to a robust vision that works for most interested and affected parties. There is generally not resources or patience to do this type of work as focus tends to be on quick tangible wins. The engagement process highlighted the time it takes to participate in good collaborative processes, and that this is not always available, especially for government staff.
6. **The current “voice” for flood risk governance does not respect the land.** Indigenous participants in the engagement process noted that the “respect for lands” is not currently reflected in policy or activities related to water and flood (see Appendix C for additional information).
7. **Without meaningful reconciliation** there will be continued challenges around legitimacy. Some Indigenous participants noted that other jurisdictions do not necessarily understand the very real challenges they face (e.g., the forced placement of First Nations communities on hazardous lands), and that conversations with other jurisdictions sometimes result in defensive reactions as opposed to helpful dialogue.

5.3.2 Direction

Direction (vision) is a large gap at all levels of government and across most core competencies. And, where there is direction, it is sometimes conflicting. Some specific challenges include:

1. Although both the Province and Federal governments are signatories to the Sendai Framework, this has yet to be transformed into **clear guiding policy statements** with practical mechanisms for implementation.
2. Most core competencies (i.e., a nested model, where core competencies are subsumed under higher-level systems) have **no vision or lead agency** (see visual summary graphics).
3. Current systems (e.g., weak guidelines) has created **inconsistent approaches to flood management** across the province (Kerr Wood Leidal Associates Ltd. 2020; Northwest Hydraulic Consultants Ltd. 2021b, 2021a; Ebbwater Consulting Inc. 2021).
4. **Inertia** is a large problem. Current government vision and direction, where it exists, is mostly derived from flood management practices from 70 years ago (see for example evolution of flood management in Issue B-3, (Ebbwater Consulting Inc. 2021), and Section 2.2); there are entrenched pathways in terms of approach that make implementation of best practice challenging.
5. Direction and activity are still largely **reactive rather than proactive** as evidenced by significant activity under recovery and response, and more limited activity related to planning and foundational tools. This gap was also a theme in engagement interviews.
6. **Derailment of initiatives** is also a challenge. Even when good systems are in place, it is common for them to be side-tracked when competing priorities become more important or visible.
7. There are **no operational targets** for risk reduction or increased resilience. It is challenging to move forward without understanding what the goal is.
8. The **ad hoc nature of most funding programs** makes it challenging for local governments to develop strategic priorities and plans. For example, the City of Vancouver noted that although they have a strategic plan that lays out mitigation activities for sea level rise over decades based on risk reduction priorities, they implement projects based on available funding and these projects may, or more often, may not align with the prioritised list of projects.

5.3.3 Performance

The current governance system is arguably underperforming. Gaps, challenges, and obstacles that have been identified include:

1. **Regulations are** in some instances **weak** (e.g., voluntary application of land use controls, see Issue B-5: Non-Structural Flood Management Approaches (Northwest Hydraulic Consultants Ltd. 2021b)), and in others **unclear** (e.g., application of setbacks). This yields a system where flood risk reduction activities sometimes do not occur (e.g., where local governments choose not to disclose hazard in bylaws, or where confusion leads to paralysis around setback requirements) because they are challenging to understand and implement.
2. On the flipside to the first issue, some interviewees noted that flood management initiatives are sometimes **impeded by competing regulations**. The systemic nature of flood means that flood management projects often touch other sectors and require permits and/or approvals. This is especially true for any instream works. It can take years to work through various approvals, in part because many different agencies are involved, and the process is not streamlined according to local government interviewees.
3. **Guidelines are limited and non-prescriptive**. Although the Province and other associations have developed guidelines to support some components of flood management, these are deemed inadequate (see Issue B-2: Flood Hazard Information (Northwest Hydraulic Consultants Ltd. 2021a) for more information related to hazard mapping guidance). Further, the visual summary

showcases how many core competencies currently have no guidelines, especially for non-traditional/non-structural elements. And, where new guidelines are being developed (e.g., Federal guideline on the incorporation of Indigenous Knowledge in flood mapping) they are delayed and not yet widely available. The lack of good prescriptive guidance means that the quality of work produced using these guidelines (or in some cases in ignorance of these guidelines) is poor and the overall performance of the system is reduced.

4. **Funding is adhoc and managed without adequate technical expertise and/or resources.** Current flood and emergency management funds that support local and First Nations governments (e.g., NDMP, CEPF, First Nations Adapt) provide a necessary pot of money. However, these programs do not provide sustained funding, which creates perverse and competing incentives to chase money when it is available, even if projects are not well thought through (in need, scope, or budget). Further, these programs have provided monies with limited technical oversight. This has created a scenario where many funded projects do not meet basic standards (Northwest Hydraulic Consultants Ltd. 2021a; Ebbwater Consulting Inc. 2021). Further, it was noted in the engagement interviews, that although successful in obtaining some monies, larger regions (e.g., the Regional District of Kootenay Boundary) were not able to properly fund research projects and relied on their consulting team providing free services to deliver a complete and useful product. It also necessitated a reduction in scope related to the incorporation of Indigenous Knowledge, creating an important and challenging gap.
5. **Lack of capacity and expertise in all areas impedes good flood risk management.** Like the issue of lack of expertise and capacity to manage funding programs, there is a general lack of high-quality experts inside and outside government to support flood management initiatives. Prior to 2015 or so there was very limited activity in flood in Canada (Ebbwater Consulting 2017) and the body of practitioners was reduced (Poujol and Lyle 2018). This continues to impede action on best practice for flood risk reduction. There is considerable activity in the arena at this time, and capacity is growing fast, but senior experts and local experts are still few and far between.
6. **High turnover of staffing impedes capacity and program success.** In many government and non-government positions, flood roles and responsibilities are done on a part-time basis or are positions that are not seen to be desirable or long-term. This results in significant turnover (see Issue B-5: Structural Flood Management Approaches, Northwest Hydraulic Consultants Ltd. 2021b for an example related to dike maintenance). The continued turnover means that valuable experience and capacity is lost, and additional resources are needed for training.
7. Infrequent flooding in combination with high turnover rates in local contexts means that local staff, including emergency operations, may be **inexperienced** with response. This issue in particular was highlighted by the City of Grand Forks, who recently experienced a flood event.

5.3.4 Accountability

Accountability is a large overall challenge. This is in part, because floods are uncertain, and can be ignored until an event occurs; it is not obvious until it is too late if systems are effective. No clear accountability frameworks exist at any level of government, or from non-government entities.

1. **There are no clear targets or enforcement mechanisms** for government or other interested and affected parties. Therefore, there is nothing to measure progress against. This lack of accountability creates a situation where external influences play a larger role than would be

expected if flood management governance systems had strong legitimacy and accountability and became more of a core government service.

2. **Existing regulation, especially for non-structural activities, is voluntary.** Without a planning or land use regulation to meet, and no scrutiny of guidelines by higher order governments, there is no accountability for local governments (see Issue B-6: Non-Structural Flood Management Approaches (Northwest Hydraulic Consultants Ltd. 2021c) for additional information).
3. **There are many loopholes and unclear roles and responsibilities.** For example, the downloading of responsibility to local governments in 2003 reduced accountability at the provincial level. Further downloading of some responsibility to qualified professionals has further fragmented accountability and liability and increased uncertainty around liability for flood risk strategies and decisions. For example, one local government interviewee noted that they were required to rely on self-declared qualified professionals to make decisions related to the design and siting of structures in the floodplain, which has resulted in physical damages to structures from flood and erosion where the professional did not perform due diligence.
4. **There are perverse incentives related to accountability on action related to land use and flood risk reduction,** especially for local governments. Local governments get a large portion of their income from property taxes, which is sometimes at odds with the need to sterilize hazardous lands (i.e., limit the tax base). This is exacerbated by the fact that accountability for recovery (for damaging flood events) is generally perceived to be held by the senior governments. There is a mismatch in responsibility and accountability.
5. **Some current processes are opaque,** which reduces buy-in and the accountability of those delivering the services. For example, there are no public merit-criteria for funding programs (CEPF, NDMP). Anecdotally, this creates a lot of frustration amongst local and First Nation governments.

5.3.5 Fairness

A strong message from engagement with Indigenous communities and with others highlighted issues of fairness and equity as it relates to flood risk management. Other Issues (e.g., Issue B-5: Structural Flood Management Approaches, Northwest Hydraulic Consultants Ltd. 2021b) and engagement highlighted the diversity across the Province. This relates both to physical circumstances (i.e., the type of hazard and risk that is of concern), as well as capacity and resources.

1. **Existing risk for some communities (especially First Nations) is extremely high because of past decisions.** In BC, we have a large equity gap to fill because of past practices. For example, historic funding and infrastructure programs have resulted in many Indigenous communities being on the riverside of dikes that protect settler communities. Further, many Indigenous communities are in particularly hazardous parts of the province because they were moved onto reserve lands on floodplains by the Crown. There was a strong message from the coastal communities that were consulted in the engagement process that they are challenged by having existing homes and structures built in the floodplain. Finally, Indigenous communities are known to be more vulnerable to disaster, as has been clearly shown throughout the COVID-19 pandemic; although not the same hazard, it is possible, even likely, that the heightened vulnerability of Indigenous communities is true for all hazards (see for example Yumagulova 2020 for a discussion of inequitable distribution of disaster risk in Metro Vancouver).

2. **Participation in flood risk governance processes is not-equitable due to capacity and knowledge.** In general, small communities, including many First Nation governments, are not able to fully participate in flood management activities, and therefore their voices and needs are not always met. There was a sentiment in the engagement from Indigenous participants that their own members were not resourced enough to participate in processes, and that they were instead chasing money to fund others to do the job for them.
3. **Accessibility to funding is not equitable due to capacity and knowledge.** Like the broad issues of participation, accessibility to funding is also impeded by capacity. Smaller communities without expertise or capacity are less likely to know about funding programs and successfully apply for them. Anecdotally, the most successful communities with regards to funding are generally those that have a strong in-house champion of flood management who also understands granting systems. Further, some Indigenous participants highlighted that the funding does not serve their needs (e.g., broader holistic assessments and plans that consider Indigenous Traditional Knowledge), and that the criteria used to determine eligibility are hard to achieve given existing information and capacity.
4. Even if there is an understanding that equity needs to be addressed in collaborative initiatives, there are **no systems and tools to help operationalise UNDRIP and FPIC**. The City of Vancouver highlighted this as a particular concern as they continue to feel out how to work with the local Indigenous People.
5. A final issue connected to fairness relates to recovery. In areas where DFA is used to support in the financial recovery, **individuals and communities that have lower property values and/or incomes receive less financial support to recover**, when arguably they need more as they have fewer other resources to support themselves.

5.3.6 Broad Ownership

A large challenge associated with flood management, which is systemic, is bringing all affected parties on board with activities and direction. Currently, there are many obstacles to this in BC:

1. **Public understanding is very low** with regards to the existence of flood risks (Partners for Action 2014), and possibly even lower as it relates to good practice for risk reduction. It is hard to convince the public to act, either as advocates for good practice, or to decrease their own vulnerability if the problem is not well understood.
2. **Private sector understanding is mixed.** Although there are many private sector entities that take an active role in flood risk reduction (see Section 4), many others do not. Flood management activities will affect everyone in some way, and it is important that all affected parties can play a meaningful role in decisions.
3. **The issue of flood can be overwhelming and there can be challenges in educating community members.** The engagement process highlighted the stress associated with flood and with flood communication by band councils. In the same vein, the challenge of **talking about future impacts when there are no current impacts** was presented in juxtaposition to the need to plan for the future and think about future generations.

5.3.7 Alignment

As noted at the outset of this report, there are external drivers that affect flood management activities. There are endless potential connections with other initiatives (e.g., climate adaptation, EPA modernization, OCP updates, etc.). There are numerous challenges associated with alignment:

1. The first challenge is **to understand what all these potential alignments and synergies are**, which will be different in each part of the province. The results presented in Sections 3 and 4 highlight how many agencies and actors have a role in flood risk governance and provide the beginnings of a list of potential interested and affected parties. But, there is no simple checklist of potential groups that should be consulted or engaged on flood projects in a given region.
2. A second challenge is to **actively engage and collaborate**. This is a resource intense activity. One interviewee noted that it is hard to get resources to enable collaboration when there are competing priorities inhouse for what are often deemed more important and/or tangible activities.
3. Further, **resources/expertise that enable good collaboration (e.g., trained facilitators) are not generally available** to support these initiatives. One interviewee noted that in Local Governments communication across disciplines and groups is challenging when the goals of each group are different and “they speak different languages”. It is particularly challenging to align flood initiatives with planning and policy initiatives, as engineers who generally lead flood initiatives, do not have training or expertise in policy or planning.
4. **Geographic boundaries are a further challenge**. Where, natural and physical watershed boundaries do not match the anthropogenic boundaries of jurisdictions. For example, interjurisdictional planning and collaboration often occurs at a regional district scale. In some cases, this is too large to manage the physical diversity of flood hazards and watersheds (e.g., Regional District of Kootenay Boundary), whereas in others too small (e.g., MetroVancouver). In all cases, the boundaries do not reflect natural systems.
5. Further, although alignment with other initiatives might seem ideal, it **may lead to competition** as individual initiatives have different goals and objectives and are bound by different governance systems.

5.3.8 Continued Learning/Adaptive Governance

The current model of flood risk governance in BC has developed an entrenched pathway (see also principle of Direction). Many of the new challenges associated with flood risk governance in an age of climate change will require an adaptive approach that is able to function despite uncertainty (see also core competency of adaptive resilience, Section 2.6.3). The current model and experience was described by one interviewee as “rigid” and not flexible enough to allow for an expanded toolbox of risk reduction and resilience options.

5.4 Conclusions

The above analysis highlights the extent of challenges, gaps, and limitations associated with the current governance model for flood risk in the province. There are dozens of identified challenges associated with governance alone. This is on top of more specific gaps and challenges identified in other Issue reports. The number and breadth of these challenges provides a solid explanation for why the province

continues to incur flood damages, and supports the hypothesis that this will continue, and arguably increase in future with climate change.

6 Investigation A-1.4: Identify opportunities for improving collaboration and coordination within and across authorities and adjusting non-government entities' roles that would address challenges and improve efficiency and effectiveness.

6.1 Introduction

6.1.1 Research Objectives

The primary objective of this investigation was to build on previous investigations and explore areas of success and identify where improved collaboration or coordination would support improved efficiency.

6.1.2 General Approach

This investigation builds on the previous one and draws from engagement as well as the results of all other investigations. Much like the previous investigation, these were developed from a mix of a desktop analysis combined with ideas and thoughts provided through the engagement process.

6.2 Results

Throughout the research and engagement for this project many opportunities to improve services were found and/or discussed. The opportunities described below describe short term easy wins that leverage existing ideas or networks. A larger long-term vision for flood risk reduction in the province is presented in Section 8.

The majority of the identified opportunities are directed at the Province, although there are some incidences where other affected parties have an opportunity to improve the efficiency and effectiveness of the flood service delivery in the province.

As per the challenges, opportunities are organised based on the eight principles of good governance outlined at the outset of the report. Opportunities and strengths according to core competencies were also considered, and are presented briefly (along with challenges) in the previous investigation (see Table 5-1, Table 5-2, and Table 5-3). Additional detail on opportunities related to specific core competencies are also found within the other Issue reports.

6.2.1 Legitimacy and Voice

The current lack of legitimacy and voice is a serious impediment to action, and certainly to a paradigm shift in best practices. The following opportunities to strengthen legitimacy and voice have been identified:

1. **Strengthen relationships between Federal and Provincial government** and clarify the balance of power and support. The Province and Federal government have been building new relationships in the last few years that can be leveraged to improve and sustain these links. Through dialogue, the Province can confirm with the Federal government where the province is looking for support, and where they wish to be autonomous.

2. **Acknowledge competing interests.** At present many of the competing interests, whether it be inter-governmental, or inter-departmental are not explicit. Acknowledging these competing interests will support managing trade-offs in the future.
3. **Model and build on existing initiatives that are being led by Indigenous communities.** Through the engagement, some Indigenous participants noted that they are proactively reaching out to their neighbours and to senior governments to build relationships and support flood risk governance more generally. The examples that were provided are notably mostly around response activities, where the common need to help all communities in a time of crisis, can be a catalyst to work together. The Regional District of Kootenay Boundary noted a similar theme related to response and recovery activities related to the 2018 floods.
4. **Leverage work conducted in support of the BC Flood Strategy.** In parallel with the investigations conducted under the direction of the FBC, the Province has been working on the development of a new BC Flood Strategy. Much of the work conducted by provincial staff (e.g., the development of guiding principles) should be continued and combined with the results of the work conducted through the FBC.

6.2.2 Direction

The current lack of clear direction is a large impediment to good flood risk governance as discussed in the previous section. There is a strong desire to have a more consistent vision. The following opportunities to strengthen direction have been identified:

1. **Widely communicate the adoption of the Sendai Framework and its principles.** In the short-term, while alternative visioning exercise are happening (see Section 8), the principles of Sendai are a solid no-regrets basis on which to plan. Although adopted since 2018, it is not pervasive in government communications, and local governments are not necessarily able see the advantage of aligning with these principles. Simple communication with First Nation and local governments, the private sector and the public around these principles will support the development of a common vision.
2. **Widely communicate the adoption of DRIPA.** DRIPA will be a catalyst for change in the province. It is important that all those who work in flood are ready to adapt to this change. In the first instance, it is important for practitioners to understand what DRIPA is and how it will affect projects and relationships going forward.
3. **Support non-Indigenous communities in meaningful reconciliation and to implement DRIPA.** Throughout engagement there was a definite desire from non-Indigenous participants to have a better relationship with their Indigenous neighbours. They are just lacking the tools to support this. It is important that this enthusiasm is capitalised.
4. **Be ready to take advantage of the policy windows following a flood event.** As noted elsewhere, activities in the flood space tend to be reactive. By working on messaging to the public, media, and decision-makers prior to an event, the Province (and others) could quickly turn negative messaging to messages of hope.
5. **Do not be afraid to set rules.** Although local governments like autonomy over many issues, many, after 20 years of devolved control, are looking to have clear direction (and even regulations) to support flood management decisions and activities. It is important to take advantage of this appetite for change.

6.2.3 Performance

In the previous section, many challenges related to the existing regulations, funding system, and overall technical capacity were identified as concerns related to performance. To counter some of these, the following opportunities to strengthen performance have been identified:

1. **Capitalise on strengthened relationship with Federal government** (see also principle of legitimacy) leverage their support:
 - a. By, being ready to act on any federal funding. With prior knowledge of likely timelines and criteria, the Province can be more ready to manage funding programs.
 - b. By providing input on advisories and guideline documents, the chances that these guidelines will be directly applicable to BC are greatly increased. If Federal guidelines can be adopted wholesale, rather than having to be re-worked to the BC context, many efficiencies can be realised.
2. **Build on existing guideline model and create additional guidelines and make existing guidelines more prescriptive.** Additional guidelines and *de facto* regulation will clarify roles and responsibilities, which should smooth Government to Government relations.
3. However, we must also be brave and **allow for a transition from design criteria to guiding principles or risk-reduction objectives.** In the short-term this means encouraging practitioners to understand and accept the uncertainty of flood planning with climate change. This could be enabled by working closely with professional associations to develop professional development courses that highlight the need for this shift.
4. **Improve funding programs with standards, enforcement, and repercussions.** Arguably, the existing system, albeit improved in recent years, has resulted in squandered dollars that in the authors' and some engagement participants' opinion, have been partially spent on sub-standard projects and products. This needs to be fixed immediately, so that further funding is well spent on activities that will result in risk reduction and will not create liabilities associated with engineering projects that are implemented based on sub-standard information.
5. **Adjust funding programs to be more flexible** to match the needs of the project (scope, funding allocation and schedule) rather than having consistent funding rules for all projects regardless of their resourcing needs. One particular note provided through engagement was the need to have funding programs that work at different scales, for example the scale of an Indigenous Territory that then can reflect Indigenous values.
6. **Adjust existing funding to be stable** so that communities can plan for the long-term and not jump on dollars when they are available, even if they are not prepared to spend the money wisely.
7. **Be opportunistic as research collaborations and initiatives develop.** There are significant ongoing activities at BC's post-secondary institutions and in federal research institutions (e.g., GSC, NRC). There is an opportunity to strengthen relationships with researchers, and to support their initiatives. This is a simple steppingstone towards a bigger vision for the involvement of post-secondary institutions outlined in Section 8.

6.2.4 Accountability

In the previous sections several challenges related to accountability were identified, including the current lack of clarity in roles and responsibilities and the opaqueness of some processes related to flood risk governance. To counter these, the following opportunities, given existing systems, to strengthen accountability have been identified:

1. **Adopt Sendai Targets** as a first step to developing customized targets and indicators. These [targets](#) are admittedly high-level and not specific but provide a decent starting point for action. This is an easy no-regrets activity while more refined targets are developed (see Section 8).
2. **Learn from communities that have advocated for and funded roles** with accountability for flood risk governance. Given that in many local governments, there are not individuals with clear responsibility for hazard, nor are there enough human resources to manage them, the resourcing and staffing of such positions are an obvious way to improve accountability. There are a few examples of smaller, less well resourced communities making the case for these types of people. For example, the Regional District of Kootenay Boundary held a referendum to create a position of Watershed Co-ordinator, under whom flood risk is managed.

6.2.5 Fairness

In the previous section the issue of fairness was deemed a large challenge due to the heterogeneity of existing risk, especially for Indigenous communities, who were forced into hazardous areas. This is coupled with inequity in resourcing and funding. Through the engagement process, the following opportunities to strengthen fairness have been identified:

1. **Highlight Indigenous-led projects.** Filling the equity gap is overwhelming. In order to flip the messaging to be positive, highlighting successful stories of Indigenous-led projects (e.g., the Okanagan Nation Alliance (ONA) Ti'kt Project, or the Preparing Our Homes initiatives) should buoy others to make progress on flood risk reduction. The ONA project, for example, could be used to highlight that Indigenous communities can take the lead in flood management in their Territory, and invite non-Indigenous communities to participate.
2. **Leverage and update existing funding programs to make them more fair and transparent.** See above.
3. **Leverage** existing peer-to-peer alliances and opportunities with smaller communities and especially Indigenous governments. There are already existing networks, for example under the umbrella of climate change (both mitigation and adaptation), that could be leveraged to improve peer-to-peer learning on flood risk management.

6.2.6 Broad Ownership

As noted earlier, there is not broad ownership of the issue of flood management, mostly because it is out of sight and mind. It is a priority to educate broader society so that action has more legitimacy, and flood management decisions consider and integrate a more holistic set of values. The following opportunities to strengthen broad ownership have been identified:

1. **Leverage existing public communications.** For example, the LMFMS [FloodWise website](#) provides a good resource that could be used across the province.
2. **Leverage ongoing activities related to flood hazard disclosure.** For example, PSC and researchers are working to better understand the impact of flood hazard disclosure on property values, which is often cited as a reason for inactivity (see previous Section). Once results and publications from this initiative are public they should be widely used to inform residents and others about their flood risk.
3. **Showcase private sector activities** when available and aligned with larger vision.

4. **Make new flood maps accessible to the public.** Working with NRCan and the National Flood Hazard Data Layer project team, work to support a system where BC's publicly funded flood maps are available. The Federal government has invested in the development of a Schema, which could be efficiently used to get this completed in BC.

6.2.7 Alignment

In the previous section, it was highlighted that there are innumerable initiatives to identify and potentially align, which creates many challenges. Alignment with other related initiatives is daunting because there are so many, and some have competing mandates. In the short-term the following opportunities to strengthen alignment have been identified:

1. **Prioritise relationships with key groups with the Province.** For example, Provincial agencies working more directly in flood (MFLNRORD and EMBC) should strengthen and continue existing relationships with the Climate Action Secretariat, who are working towards similar goals.
2. **Leverage existing watershed or regional relationships** to support regional networks for flood management and expertise learning and sharing. For example, regional planning committees or forums, where individuals have already established relationships could potentially be expanded to consider some elements of flood management. And, where there are watershed organisations, use these.
3. **Build on existing community initiatives such as climate resilience.** Several Indigenous participants engaged in this project mentioned that they were already working on resilience plans for their communities and Territories. Some are already considering flood under this umbrella; others could add it to their existing broader initiatives.

6.2.8 Continued Learning/Adaptive Governance

The following opportunities to strengthen adaptive governance have been identified:

1. **Acknowledge the knowledge gaps and need for change.** Recognising and declaring that we do not know everything is a first step towards innovation.
2. **Support existing pilot projects.** Learning often takes the form of trying (and failing). The support of pilot projects, whether it be green infrastructure (see (Northwest Hydraulic Consultants Ltd. 2021b), or small-scale policy tests (e.g. disclosing flood hazard in one region), will support a culture of continued learning. There are existing projects within the province that fall under this category that should supported and monitored (e.g., living dikes project in Surrey, living breakwaters project through UBC).
3. **Build on existing initiatives that are already increasing professional capacity.** As highlighted in Section 4.2.3, many post-secondary institutions are already building programs for professionals to increase their knowledge and skills, primarily related to climate resilience. With simple dialogue between the Province and these groups, it should be possible to ensure that any new programming supports the overall goals of the BC Flood Strategy going forward.

6.3 Conclusions

The many identified challenges and obstacles within the existing system creates an overwhelming sense for the need to change. Fortunately, there are many existing programs and relationships that can be leveraged to support a shift in flood risk governance in BC. These exist within government and non-

government entities and in many cases merely require continued support and celebration of their successes.

The opportunities described are further evolved in a proposed new model for flood risk governance that is described in Section 8. This new model also includes additional new activities, as opposed to this section, which highlights existing initiatives that should be leveraged and celebrated.

7 Investigation A-1.6: Investigate alternative options for distributing and integrating flood management responsibilities among authorities, including an analysis of benefits and costs/limitations for each option.

This investigation has the objective of understanding the benefits and costs/limitations of different models of governance distribution (e.g., consolidated/centralised through polycentric/devolved). This was explored by considering how others govern flood risk; Canadian examples are used, as they also sit within the same Federal context as BC.

As described at the outset of this report, Canada is a federalist system, where Provinces and Territories retain a fair amount of authority on many issues including most related to hazard management. To support a discussion on different archetypal governance models for flood in Canada, a high-level jurisdictional scan of other Provinces and Territories was conducted. Much of this was drawn from a recently completed jurisdictional scan of Flood Mapping practices prepared for NRCan (Ebbwater Consulting Inc. 2020) as part of the National Flood Hazard Data Layer project, work conducted for PSC to examine flood mapping as it relates reduction in exposure and risk across 10 Canadian cities (Ebbwater Consulting 2017) and a draft of the Land Use Guide for Flood Risk Areas (Ebbwater Consulting Inc. 2019a). Some additional notes related to broader governance issues were added from the authors' knowledge and from other Issues, B-4: Flood Planning (Kerr Wood Leidal Associates Ltd. 2020) and B-6: Non-Structural Flood Management Approaches (Northwest Hydraulic Consultants Ltd. 2021c). Due to resourcing constraints no discussion on Emergency Management approaches is provided.

7.1 Summary of Approaches

There are three broad archetypal models for flood risk governance in Canada, and one Province that is undergoing transition (Québec). The three models are described below, with additional information provided on each Province. A discussion and comparison of approaches against the 8 principles of good governance is provided in Section 7.3.

7.1.1 Consolidated Model

Within a consolidated model all governance activities, other than Federal responsibilities, lie with the Province. Local governments are not very involved, and there is limited private sector activity other than insurance. Prior to 2003, the Province of BC, was predominantly a consolidated model (please see Issue B-6: Non-Structural Flood Management Approaches (Northwest Hydraulic Consultants Ltd. 2021c) for additional context).

A fully consolidated model currently exists only in the Atlantic provinces (Newfoundland and Labrador and Prince Edward Island), where the provincial governments have maintained control over the development of foundational tools, structural flood protection, and land use planning as it pertains to flood hazard.

- **Newfoundland** maintains control of designated flood hazard areas and has legislated authority to prohibit development in flood plains. In Newfoundland, the Province has the authority to carry

out flood mapping and to designate “flood risk areas” and “flood control areas” and to regulate development within those areas under the *Water Resources Act*. The 37 communities in Newfoundland and Labrador identified as being at flood risk during the FDRP are subject to the Provincial Flood Plain Management policy (2014). Under the Flood Plain Management Policy, written Ministerial approval is required for development within a designated flood risk area, flood plain or climate change flood zone. The floodplain is defined as the area encompassed by the 1% AEP flood extents. Within the floodplain, the floodway is defined by the 5% AEP flood extent, and the flood fringe is defined as the area between the 5% AEP and 1% AEP flood extents. The climate change flood zone is defined as an extension of the current floodplain which considered to be likely impacted by climate change. The floodplain, floodway, floodway fringe and climate change flood zones are used to determine what kinds of development will be permitted in those areas.

Flood hazard mapping in Newfoundland and Labrador is managed by the Newfoundland and Labrador Department of Environment, Climate Change and Municipalities. This is a relatively small team, which is responsible for flood map planning, coordination, and land use approvals.

- **Prince Edward Island** has minimal flood activity at present (as riverine hazards are not considered to exist, and coastal hazards are newly worsening with climate change), and therefore continues to manage all flood issues centrally by default. Flood hazard mapping in Prince Edward Island is the responsibility of the Department of Environment, Water and Climate Change. In collaboration with the Department of Justice and Public Safety, they are currently working on a project to produce coastal flood maps for the whole island.

It should be noted that the existence of this model in the Atlantic provinces is enabled due to specific geographic elements that are not relevant in BC. Namely, these are smaller provinces both in terms of geography and population. Further, the systems are more homogenous, Newfoundland acknowledged for the National Flood Hazard Data Layer report that they were able to be efficient and manage everything centrally because all their river systems are relative short, incised channels with similar hazard, vulnerabilities, and exposures. Further, each of these Provinces exists within a unique legislative framework that has evolved over time, that is different to BC’s current situation.

7.1.2 Devolved Model

At the other end of the spectrum are Provinces that have devolved and spread authority and responsibility across multiple levels of government (e.g., a polycentric approach). This includes BC (which is described in detail in Section 3), but also Ontario and Nova Scotia:

- **Ontario:** Within the provincial government, the responsibility for flood hazard management lies with the Ontario Ministry of Natural Resources and Forestry (OMNRF). Responsibility for flood risk governance in Ontario is shared among the provincial government, municipalities, and conservation authorities (where they exist). Conservation authorities are unique to Ontario and were established in the 1940s. Conservation authorities are local watershed management agencies that are responsible for delivering services related to water and natural resources. There are 31 conservation authorities in Southern Ontario and 5 in Northern Ontario (Conservation Ontario 2020). Conservation authorities are coordinated at a provincial level by Conservation Ontario.

The *Planning Act* and the Provincial Policy Statement (PPS, (Ministry of Municipal Affairs and Housing 2014)) sets out the requirements for land use planning in Ontario’s municipalities. Municipal planning documents are required to be consistent with PPS policies. In terms of flood hazard, regulatory flood extents are set as whichever is the greater of 1% AEP or the highest observed flood (usually in relation to major storm events such as Hurricane Hazel or the Timmins storm). The most recent version of the PPS also requires that municipalities “consider the potential impacts of climate change that may increase the risk associated with natural hazards” when setting policies to regulate development on hazardous lands. Municipalities can regulate within the flood hazard area using either a one zone (floodplain) or two zone (floodway and flood fringe) concept. In a floodway, development is generally prohibited. In the flood fringe or one zone floodplain, development may occur under certain conditions. OMNRF provides detailed guidance on assessing the flood hazard limits in line with the requirements of the PPS.

Conservation authorities have delegated authority to ensure that the natural hazard policies in the PPS are adequately transposed into municipal planning; municipal plans must gain approval from the conservation authority before they can be adopted. More broadly, conservation authorities have a mandate for water resource management within a watershed area.

Municipalities that lie within a conservation authority often rely on conservation authorities to undertake flood mapping and therefore flood mapping in Ontario is largely undertaken by conservation authorities (i.e., conservation authorities are typically the body that develops flood maps in their jurisdiction). Of Ontario’s 444 municipalities, 159 are located outside a conservation authority (and 285 are located within a conservation authority). However, approximately 95% of Ontario’s population lives in an area managed by a conservation authority, as the conservation authorities are located all across southern Ontario and in the most populated areas and urban centres in the north. In the area outside of a conservation authority, local government is responsible for producing their own flood maps and often contract consulting engineering firms to complete flood mapping.

As of 2020, Ontario is in the process of forming a Flood Mapping Technical Committee with representatives from provincial ministries, municipalities, conservation authorities and the federal government. It will be responsible for coordinating a number of initiatives designed to improve the state of flood mapping in Ontario, including the production of provincial flood mapping guidelines.

- **Nova Scotia:** The Provincial *Municipal Government Act*, most recently amended in 2018, gives municipalities in Nova Scotia the authority to regulate development in the floodplain. Schedule B of the Act (Statement of Provincial Interests) identifies flood hazard areas as those communities designated under the FDRP, but also requires municipalities to address locally known flood hazards not designated under the FDRP. Schedule B requires municipal planning documents to identify any flood hazard areas and provides guidance on how to regulate flood hazard areas. For planning purposes, the flood hazard area is defined as the area encompassed by the 1% AEP flood elevation, the floodway is defined as the area within the 5% AEP elevation and the floodway fringe

the area between the 5% and 1% AEP elevations. Development restrictions are based on the location within the flood plain.

Other Provincial supports to flood management include a Provincial Flood Risk Infrastructure Investment Program (FRIIP). The FRIIP was in place until 2017 to provide support to municipalities for flood mapping and flood mitigation projects. Another flood management program is the provincial Flood Mitigation Framework. The framework was a five-year program (2013-2018) which provides financial and technical support to municipalities for flood risk assessment, investment in flood risk infrastructure, improvements to existing defences, provision of data, and through development of engineering and design standards, planning support tools, changes to approvals processes and coordination of actions carried out under the framework. Support for climate change planning also exists at Provincial level. As part of the Federal Gas Tax Transfer Agreement, in order to qualify for gas tax credits municipalities, have to produce a Municipal Climate Change Action Plan. The Province provides guidance to municipalities for developing climate change action plans through the “Municipal Climate Change Action Plan Assistant” (2012). This includes guidance on planning for adaptation to the effects of climate change; for example, increased potential for flooding.

The responsibility for producing flood hazard data in Nova Scotia currently resides with local governments as mandated under the *Municipal Government Act* Statement of Provincial Interest administered by the Nova Scotia Department of Municipal Affairs and Housing. This statement of interest mandates that municipalities and local governments must act, should they be aware of a flood hazard. There is a desire by the provincial government to take more ownership in the production of flood hazard data. This would include producing and storing flood hazard data centrally.

7.1.3 Hybrid Model

Other provinces have a hybrid model where Provinces centrally manage and support the development of foundational tools, but where risk reduction and resilience activities are for the most part devolved to local governments. This includes Alberta, Manitoba, and New Brunswick:

- In **Alberta**, the provincial government takes responsibility for flood mapping, building on the work of the FDRP through the Flood Hazard Identification Program (FHIP), which has been in place since 1999. The *Municipal Government Act* generally gives municipal or district planning authorities powers to control development in areas at risk of flooding, although exercising this power is not a requirement. These powers also include the power to define the meaning of the term “floodway”. A 2013 amendment to the Act (the 2013 Floodway Development Regulations) gives the Province responsibility for regulating development in areas identified as being at flood risk through the FHIP.

The authority for planning and managing flood hazard data lies with the provincial government (the Alberta Ministry of Environment and Parks). Alberta has invested heavily in flood hazard mapping over the last five years and in the development of their online Flood Awareness Map Application. This is the system used in Alberta to host and manage flood mapping. Flood mapping has been led by the provincial government since the time of the FDRP, and flood maps are held

centrally. Flood hazard modelling and mapping is conducted by consultants, but they are overseen by the provincial government.

Alberta's hazard system is heavily centralized, which supports consistency across the province. However, the implementation of hazard maps and the development of risk reduction and resilience strategies and regulations lies with local authorities. There is wide variation in approaches.

- In **Manitoba**, provincial influence over flood risk management in municipal planning appears to be primarily through the *Planning Act* and amendments to that Act through the Designated Flood Areas Regulations. The *Planning Act* gives responsibility to the municipalities for controlling development with respect to flood hazard. However, the Designated Flood Area Regulations allow the Province to identify and then regulate areas subject to flood hazard. When the Province designates a flood area, it is then specified within the regulations, allowing the Province to regulate land-use planning within the designated area. The current version of the *Planning Act* and regulations specifies parts of the Red River corridor as coming under Provincial jurisdiction. Outside of designated areas, the wording of the *Planning Act* gives municipalities the power to create bylaws with respect to development of flood prone lands but does not make this a requirement. Therefore, at local level, it appears to be at the discretion of the municipalities as to if and how they identify flood hazards for the purposes of planning.

The Technical Services & Operations Division of Manitoba Infrastructure has the responsibility for planning and managing flood hazard data in Manitoba. Manitoba Infrastructure consults with local government when producing flood hazard data. The production of post-FDRP flood maps has occurred over the last 3 years, and Manitoba therefore continues to develop best practices for flood hazard data management. Regional and local governments have the authority to use and implement the information.

- Provincial influence on flood risk management in **New Brunswick** comes from the 2005 *Community Planning Act* (last amendment, 2017), which gives municipalities responsibility to regulate development in hazardous areas. However, the Act empowers the Province to designate land as a flood risk area at the request of local government. It is therefore at the discretion of local authorities to identify areas considered to be hazardous, and at the Province's discretion to provide an official "flood risk area" designation. Flood hazard data in New Brunswick is managed centrally at the provincial level by the Department of Environment and Local Government and by the Service New Brunswick: Land Information Infrastructure Secretariat. The Land Information Infrastructure Secretariat is a separate institution from the Government of New Brunswick, but the two agencies are linked.

7.1.4 Transitional Model

Finally, of note is the Province of Québec, where they are in transition. Up until very recently they had a devolved model similar to BC, where local governments had the responsibility and authority to manage flood and other natural hazards. However, in the wake of severe and damaging floods in 2016 and 2018,

the Province is transitioning to bring authority back under provincial control. This is very much a work in progress, and so not many lessons can be learned at this time.

7.2 Engagement Summary

In addition to the summary of options provided by reviewing other models in Canada, it is possible to consider the efficacy of the polycentric model through commentary on the current state of governance in BC.

Responses from a broad survey co-ordinated by FBC (in summer 2020) and reported in Issue B-4: Flood Planning (Kerr Wood Leidal Associates Ltd. 2020) noted that “almost half of the respondents reported that a lack of tools, standards, and policy direction from the Province is a barrier to effective flood management planning”. And, in engagement conducted for this report, a similar message was found. With one interviewee noting they were “strongly dissatisfied with a decentralized approach” and another noting that functionally it makes sense to have a provincial authority to have a mandate and responsibility for flood. However, another respondent noted that they like to have local control, and do not know that a more centralized approach would be effective.

7.3 Analysis

There are advantages and disadvantages to each of the approaches described above is summarised in Table 7-1.

Table 7-1: Comparison of archetypal governance models against governance principles.

Principle	Consolidated	Polycentric	Hybrid
Legitimacy and Voice	Without significant effort, open participation in flood risk governance is limited under this model, and consensus (of all-society or interested and affected parties) is unlikely to be achieved.	With a fully polycentric model, there can be good participation, but without central leadership and direction, it would be difficult to achieve consensus.	Participation and consensus orientation are both possible under this model. However, it requires significant and targeted resources, and well thought-out organizational structures. Arguably, none of the provinces with this model currently have strong legitimacy and voice.

Principle	Consolidated	Polycentric	Hybrid
Direction	This model has potential for robust direction if the central organization has the resources and capacity to develop a vision and lead progress towards it.	<p>Consistent vision and direction is near impossible with a polycentric approach. Competing values and priorities of interested and affected parties will inhibit direction.</p> <p>This model does however allow for place-based, local input to flood risk decisions.</p>	Good direction is possible within a hybrid model. However, this requires dedicated effort and resources to build and implement. Arguably, none of the provinces with this model currently have strong direction across all aspects of flood risk governance.
Performance	In some cases, a consolidated model, is an effective and efficient governance structure.	<p>Arguably, a polycentric approach creates opportunity for responsiveness as there is redundancy in the system, it is however generally inefficient as there can be (as is the case in BC) overlapping efforts and innumerable actors requiring lots of communication.</p> <p>However, with downloading of responsibilities in this type of system, there can be a real or perceived lack of resources to support real action on flood risk.</p>	A hybrid model offers a good opportunity for robust performance if there are clear roles and responsibilities (and direction) so that interested and affected parties know where to go to get the information they need.

Principle	Consolidated	Polycentric	Hybrid
Accountability	A consolidated model makes roles and responsibilities clear, and therefore accountability is simpler. It is, however, not naturally transparent, as fewer players are involved.	A polycentric model is very challenged on the principle of accountability. Much like direction, the many interested and affected parties, values, and priorities can create a culture where it is assumed that someone else is or can do an activity; no one is directly accountable for overall direction. Further, transparency is challenged, again primarily because of the number of actors and lack of direction.	The success of a hybrid model on the measure of accountability and transparency would be dependent on the strength of direction as well as the organizational structure. Based on a cursory review of the hybrid models in Canada, none seem to offer a clear model for success.
Fairness	A consolidated model faces some challenges on the measure of fairness, if good mechanisms are not in place to allow for broad voices and ideas, as a consolidated model will naturally tend towards a more consistent and narrow focus.	A polycentric model could be challenged on the principle of fairness in the absence of clear roles, responsibilities, and systems in place to ensure that all voices are heard by the right people. However, this model does create an opportunity for equity by virtue by naturally including a broader set of actors at the outset.	A hybrid model does not naturally create fairness but does create space and opportunity to enable equity. The hybrid models from elsewhere in Canada do not have a solution to achieve this.
Broad Ownership	A consolidated model, which naturally has buy-in from high-level government, can create an opportunity for broad ownership if there is also broad engagement and consideration of interested and affected parties' views.	A polycentric model, with a strong vision, will naturally tend towards broad ownership.	A hybrid model offers a good opportunity for broad ownership through strong leadership and direction from senior government, with inclusion and consideration of all other interested and affected parties in implementation decisions.

Principle	Consolidated	Polycentric	Hybrid
Alignment, Links and Synergies	A consolidated model only offers opportunities for synergies if other sectors also follow a consolidated model. This model is less likely to create chance or purposeful synergies by virtue of having fewer people and ideas as part of the system.	A polycentric model offers a good opportunity to align with similar sectors, as there will be broad networks that will naturally engage with more people. However, ensuring alignment will require that all actors have a consistent vision, and clear roles and responsibilities so that they can act on creating synergies.	A hybrid model, if working with a strong direction and clear roles and responsibilities offers a good opportunity to create alignment and synergies.
Continued Learning	There is good opportunity for continued learning within a consolidated model with appropriate resources in place. However, it should be noted that this model is potentially more brittle, and a change in higher-level government policy or downsizing of government may actually undo any existing capacity and learning.	There is good opportunity for continued learning with a polycentric model. The many, diverse, players in this model will naturally tend towards some innovation amongst those that are more risk tolerant of novel ideas and approaches.	Like both the consolidated mode and the polycentric model, there is good opportunity for continued learning within a hybrid model. It does however require that systems and leadership is in place to foster learning and to allow for risk taking.

Based on the brief analysis above, a hybrid model, albeit with strong direction and legitimacy from a centralised source does appear to be preferred. Centralization of some activities was also a consistent theme in other Issue reports (B-2, B-3, B-6, C-2). There is however, no clear suitable example of a Province or Territory with a hybrid model of governance for flood risk, that could be followed in BC.

7.4 Conclusions

BC tried a consolidated approach from the late 70s to the early 2000s (see Issue B-6: Non Structural Flood Management Approaches (Northwest Hydraulic Consultants Ltd. 2021c), which was abandoned due to several issues as well as political priorities in favour of a fully devolved approach. It is clear from the analysis presented in this report that the devolved approach is not working, and the pendulum needs to swing back towards a partially centralised model. There is good reasoning to have some centralization of activities and to build a hybrid model, that arguably has much better potential to satisfy all the core principles of good

flood risk governance identified here. It could also be hypothesised that the level of consolidation is less important than a commitment to the principles for good governance.

8 Investigation A-1.5: Recommend changes to support improved collaboration and coordination in flood management, including an analysis of benefits and costs/limitations for each recommendation.

8.1 Introduction

The current model for flood risk governance in BC is imperfect. The province and its residents continue to face damages, losses, and misery associated with flood events. And, existing governance systems do not meet most principles for best practice. Further, there is an appetite for change from all levels of government as well as from non-government entities.

With this baseline in mind, along with an understanding of existing challenges and opportunities, as well as best practice governance concepts and models from similarly governed jurisdictions **a new concept for flood risk governance is proposed**. While this is a new model, it recognizes and leverages the important services that are currently being delivered by governments and the private sector as identified earlier in this report (Sections 3 and 4).

8.2 A New Concept for Flood Risk Governance in BC

At a high-level the new concept shifts from the polycentric model of governance currently in place to a hybrid model, where some key competencies are returned to the Provincial government. Further, this model works across the full emergency management cycle, and mitigation and preparation are brought together with response and recovery. Finally, the new concept addresses the principles of good governance (see Section 2.4), most notably by creating strong direction and accountability mechanisms.

The proposed new model has four main elements:

1. **A strong vision** that will acknowledge reconciliation with Indigenous Peoples and set direction and support future accountability.
2. **A central knowledge hub** within the Provincial government, which will support collaboration with the Federal government, will provide technical services and funding in a consistent and efficient manner, and will develop guidelines and tools to enable consistent and best practice flood management approaches across the province.
3. **Regional hubs** that will support collaboration on a regional and watershed basis, and will provide expertise and support to all, but especially underserved communities.
4. **Reliable and adequate funding for locally-driven flood mitigation activities** that will leverage local knowledge and processes and work towards a common provincial vision.

The model also has supporting enabling elements:

1. Continued and evolved support from professional associations.
2. Strengthened post-secondary programs to support the development of a diverse community of flood management professionals that are equipped to navigate the systemic and wicked nature of flood.

Rationale for this approach is provided below, and more detailed information on each of the elements is provided in Section 8.4.

8.3 Rationale for New Concept

The earlier investigations outlined the challenges with the existing model for flood risk governance in BC and highlighted some of the opportunities and strengths in the system as well. These earlier investigations provide the rationale for the newly proposed concept. This rationale is laid out in Table 8-1, where challenges from Section 5 and the opportunities in Section 6 are paired with elements of the new concept by governance principle.

Table 8-1: Rationale and expectations for new governance model by governance principle.

Principle	Description	Identified Gaps/Challenges in Existing Model	Identified Opportunities in Existing Model	Rationale/Expectations for New Model
Legitimacy and Voice	<p>Participation: All people should have a voice in decision-making, either directly or through legitimate intermediate institutions that represent their interests. Such broad participation is built on freedom of association and speech, as well as capacities to participate constructively.</p> <p>Consensus orientation: good governance mediates differing interests to reach a broad consensus on what is in the best interest of the group and, where possible, on policies and procedures.</p>	<ul style="list-style-type: none"> • Roles and responsibilities are unclear. • Competing mandates and relationships challenge good governance. • Light-touch regulation leads to inactivity. • Broad participation is not currently occurring and will be challenging in future. • Consensus-oriented activities require patience and resources. • The current “voice” for flood risk governance does not respect the land. • Although steps have been taken towards reconciliation the process of reconciliation will be long and require a persistent effort that is not clearly outlined with regards to flood risk governance. 	<ul style="list-style-type: none"> • Leverage and strengthen existing Federal-Provincial relationships. • Acknowledge competing interests. • Model and build on existing initiatives led by Indigenous communities. • Leverage work already conducted in support of the BC Flood Strategy. 	<ul style="list-style-type: none"> • Acknowledges that participatory processes are important and resource intensive and expands resources and funding for this. • Acknowledges and resources system to manage Federal-Provincial relationship to ensure alignment of goals and access to Federal funding in BC. • Aims to manage inequity in participation through resourcing and enabling for under-resourced First Nations and local governments. • New guidelines will improve clarity of messaging and regulations will enable implementation of best practice flood risk reduction activities at a local level.
Direction	<p>Strategic vision: leaders and the public have a broad and long-term perspective on good governance and human development, along with a sense of what is needed for such development. There is also an understanding of the historical, cultural and social complexities in which that perspective is grounded.</p>	<ul style="list-style-type: none"> • There are no clear guiding policy statements or mandates at Province or Federal level that align with best practice (e.g., Sendai). • Many core competencies have no lead agency or vision/target. • Inertia continues to impede movement towards best practice in implementation of flood risk reduction. • Activities continue to be reactive rather than proactive. • Initiatives are often derailed when competing priorities become more visible. • There are no operational targets for risk reduction. • Adhoc funding makes strategic planning for local governments and First Nation governments a challenge. 	<ul style="list-style-type: none"> • Province and Canada have adopted the Sendai Framework and its principles. • The Province has adopted, and Canada has tabled legislation to empower UNDRIP in Canada. • Policy windows open during and post-flood. • Many First Nations and Local Governments are looking for additional regulations to support action and funding at a local level. • Leverage Indigenous Knowledge and generosity of Indigenous community members to create a holistic vision. • Take advantage of policy windows following flood events. 	<ul style="list-style-type: none"> • A new visioning process will clearly set out direction as well as targets for risk reduction. This will leverage the Sendai commitments, and work already completed by the Province as part of the BC Flood Strategy. • The new model is expected to be charged to an individual minister with a mandate to deliver on the targets. • The new model includes an Assistant Deputy Minister (ADM) position with a mandate to deliver on targets, and to limit derailment of flood issues to competing priorities. • New model includes the development of new guidelines (and long-term new legislation/regulation) to support Local Governments and First Nations to act on implementation of flood risk reduction.
Performance	<p>Responsiveness: institutions and processes try to serve all interested and affected parties.</p> <p>Effectiveness and efficiency: processes and institutions produce results that meet needs while making the best use of resources.</p>	<ul style="list-style-type: none"> • Regulations are weak and unclear. • There are competing regulations. • Guidelines are non-prescriptive. • Funding is adhoc and managed without technical expertise. • Lack of capacity and expertise in all areas impedes good flood risk management. This is exacerbated by high turnover of staff within 	<ul style="list-style-type: none"> • Capitalise on strengthened Federal-Provincial relations to increase efficiency and to acquire Federal funding for the province. • Build on existing guideline model. • Leverage current appetite for additional and more prescriptive guidelines. • Improve existing funding programs to perform better on measures of risk reduction and equity. 	<ul style="list-style-type: none"> • The new model includes considerably more expert resourcing at the central hub, and locally knowledgeable resources at regional hubs that will support on developing robust flood management initiatives. • The new model includes stronger, more prescriptive guidelines, that will support overall performance.

		government roles.	<ul style="list-style-type: none"> • Be opportunistic as research and collaborations and initiatives develop. 	<ul style="list-style-type: none"> • The model includes a reimagined funding program that is more prescriptive in quality, but more holistic in breadth.
Accountability	<p>Accountability: decision-makers in government, the private sector and civil society organizations are accountable to the public, as well as to institutions. This accountability differs depending on the organizations and whether the decision is internal or external.</p> <p>Transparency: transparency is built on the free flow of information. Processes, institutions and information are directly accessible to those concerned with them, and enough information is provided to understand and monitor them.</p>	<ul style="list-style-type: none"> • There are no clear targets or enforcement mechanisms. • Existing regulation, especially for non-structural activities, is voluntary. • There are many loopholes and unclear roles and responsibilities. • Some processes are opaque. 	<ul style="list-style-type: none"> • Adoption of Sendai targets as an interim measure. • Learn from communities that have funded positions that have created accountability at the local government level. 	<ul style="list-style-type: none"> • The new model includes several layers of accountability: <ul style="list-style-type: none"> ○ The new Direction creates clear targets (and potentially penalties) for accountability of overall strategy. ○ At the Province, a responsible minister and ADM are proposed to ensure overall accountability to targets. ○ An overhaul of the funding programs to improve transparency (and therefore accountability) is proposed. ○ The overall system creates a clear line of responsibility from Local and First Nation Governments to regional hubs to central hub and to a Minister.
Fairness	<p>Equity: all men and women have opportunities to improve or maintain their well-being.</p> <p>Rule of Law: legal frameworks should be fair and enforced impartially, particularly the laws on human rights.</p>	<ul style="list-style-type: none"> • Existing risk for some communities is extremely high because of past decisions. • Participation in flood risk governance processes is not equitable. • Accessibility to funding is not equitable. • There are no systems to operationalise UNDRIP and FPIC. • Financial recovery is related to past economic standards. 	<ul style="list-style-type: none"> • Highlight existing Indigenous-led flood management projects. • Leverage existing funding programs but make them fairer and more transparent. • Leverage existing peer-to-peer alliances to support overall equity. 	<ul style="list-style-type: none"> • The new model includes Provincial scale targets that will nominally be risk-based, thereby ensuring that highest risk communities become priorities. • The new model includes an overhauled funding system that is transparent and therefore increases fairness. • The new model includes resourcing, especially at regional hubs, to support communities with less of their own expertise or resources. • The new model includes Indigenous liaison roles at the central and regional hubs to ensure that Indigenous communities have access to all resources, and that their views inform all activities within their Territories. • The new model includes the development of guidelines to support the operationalising of UNDRIP and FPIC.
Broad Ownersh	Adoption of the strategic vision by all interested and affected parties, particularly high-level governments.	<ul style="list-style-type: none"> • Public understanding is very low. • Private sector understanding is mixed. • Flood is a challenging and overwhelming topic for many. 	<ul style="list-style-type: none"> • Leverage existing public communications. • Leverage ongoing activities related to flood hazard disclosure. • Showcase private sector activities. 	<ul style="list-style-type: none"> • The proposed model includes and considers public communications at all levels. • At the central hub, specific roles and responsibilities related to public communications are proposed. • The implementation of risk reduction actions is

				still proposed to occur as grassroots activities led by local and First Nation governments, as such there is expected to be public engagement (also to be highlighted within new Flood Planning guideline).
Alignment, Links and Synergies	Ensuring alignment and taking advantage of links and synergies with other related processes, systems and policies (e.g., climate adaptation plans).	<ul style="list-style-type: none"> • There are innumerable potential initiatives with which to align, • Resources to enable good collaboration are generally not available or funded. • Natural systems do not match jurisdictional boundaries. • Other initiatives may have competing priorities. 	<ul style="list-style-type: none"> • Prioritize relationships with key groups. • Leverage existing watershed or regional relationships. • Capitalise on inertia around climate risk and resilience. 	<ul style="list-style-type: none"> • One of the central themes of the proposed model is collaboration. • A role(s) is proposed at the central hub that would have the responsibility to ensure alignment with the Federal government and across provincial agencies. • A key proposed role within the regional hubs to a co-ordination role that will also ensure alignment with other regional initiatives. • The regional hub model is presently designed to align with MFNLRNORD regions, which have some consideration of natural physical boundaries, as well as existing jurisdictional systems.
Continued Learning	Our current understanding of flood risk is limited, especially with consideration of the complexity of intangible and cascading impacts in the face of climate change. Governance of such a dynamic risk requires that continued learning be included as part of any model.	<ul style="list-style-type: none"> • Current system is entrenched and rigid. 	<ul style="list-style-type: none"> • Acknowledge the gaps and need for change. • Support pilot projects. • Build on existing initiatives that are already increasing professional capacity. 	<ul style="list-style-type: none"> • The overall concept of the model is conscious of the need for adaptive resilience. • The proposed new model includes strengthened relationships with academic institutions. • The new mode also includes an opportunity for safe failure through the support of pilot projects. • The new model is scalable, in that additional related hazards, could be added or subsumed into the model.

8.4 New Concept Elements

As outlined in the introduction the new concept for flood risk governance in BC includes four main elements as well as some supporting elements. Each of these is summarised here.

8.4.1 Strong Direction

8.4.1.1 Summary

A clear, positive, future-looking vision for flood management in BC will set the tone for action as well as create legitimacy and direction and support on accountability.

This should leverage existing values like Sendai and DRIPA, and leverage the considerable effort already completed to develop principles for the BC Flood Strategy, to create some legitimacy and be explicitly conscious of issues of equity.

The overall tone of this new document should be positive, by reframing the vision to be resilience focussed rather than flood control or flood risk reduction focussed. A positive framing will enable broad support and engagement in a visioning process.

In addition to the big picture vision, clear objectives and targets will be set. This will support long-term performance and accountability.

8.4.1.2 Rationale

There is a need to have a consistent vision and direction so that all levels of government and all members of broader society can understand what the intent and purpose of flood risk governance and future flood strategies are. This was an identified gap in the current model.

The development of larger vision and framing documents will be a first step. But, there is also a need to develop more detailed operational targets that will support future accountability and set the other components of the new concept model on a good course. Without real targets for risk reduction and detailed operational targets it will be challenging to monitor the success of this new approach.

This proposal assumes that existing work can be leveraged, but notes that there will be a need for hard work and relationship building at the outset of any work to develop a vision. This type of effort takes time and resources and is challenging because it is often not seen as important ‘action’. The inclusion of a broad group in the development of a direction and targets will support buy-in, accountability, and future performance; investment in this step will limit missteps and obstacles in the implementation of the new concept model.

The development of a vision and targets, if done thoughtfully and robustly, will have a co-benefit of increasing overall understanding and capacity across the broader community.

8.4.1.3 Components

A robust process will be required to develop a legitimate vision, objectives, and targets. Broad ownership of the vision will enable its success later, and therefore a broad diverse group of interested and affected parties should be involved in the development of the vision/strategy.

It is assumed that this process will be led by the Province and will leverage all the work already completed in support of the BC Flood Strategy along with information provided in the Investigations in Support of the Strategy.

Key tasks that are anticipated include:

1. Identification of interested and affected parties (i.e., a stakeholder map). This will include all groups identified in Section 3 and Section 4 at a minimum.
2. Initial engagement to build capacity within these groups so they are capable of engaging in challenging conversations in later stages.
3. The use of varied media (e.g., in-person workshops, community conversations, print workbooks, social media, surveys, etc.) and forums to understand key values that inform elements of flood risk governance. By starting with values as opposed to solutions there is an opportunity to find common-ground and reduce tensions when the direction is implemented.
4. Roundtable opportunities for interested and affected parties with potentially competing interests and priorities to understand potential trade-offs and find common ground. This will and should be a resource intense activity.
5. Development of preliminary vision, objectives, and targets. Objectives and targets are seen as a key component of this work. In the first instance, Sendai targets can be adopted, but these need to be refined to include measurable targets that are assigned to individuals or groups on a defined timeline (i.e., SMART goals).
6. Confirmation, through engagement, of the vision, objectives, and targets.
7. Launch and implementation of vision and targets.

8.4.1.4 Cost

High-level costs for the development of a new Strong Direction have been developed and are presented in Table 8-2. These costs, along with others developed for other Issues will be refined in Issue D-1 (AECOM Canada Ltd. 2021).

Table 8-2: Costs associated with the development of a new vision and operational targets.

Element	Assumptions	Estimate
Provincial Staffing	Assume 2 FTE leads from MFLNRORD and EMBC. 0.5 FTE to support on Indigenous Engagement planning and 0.5 FTE for communications and marketing. 2 years	3 FTE Professional Positions @ \$100k for 2 years = \$600k
Contracting	Assume contract support on some elements of process. Content development, facilitation, etc.	\$750k*

Enabling	Financial support to enable a broad interested and affected parties to participate. For example, travel costs for small local governments, honoraria for Indigenous participants.	\$500k
Total		\$1.85M One-time cost

*Estimated based on approximate costs for large visioning/public engagement exercises for flood conducted in province (City of Vancouver and City of Surrey)

Constraints and Issues:

- Although some work on visioning can be conducted immediately, waiting for the completion, or alternately ensuring alignment with, of other moving parts in the system (e.g., EPA modernisation, roll-out of DRIPA, BC Flood Strategy) is prudent. This will ensure that any new flood risk governance system will work within other legislative frameworks.

8.4.2 A Central Knowledge Hub

8.4.2.1 Summary

A central knowledge hub within the Provincial government that will support collaboration with the Federal government, will provide technical services and funding for local and First Nation governments in a consistent, efficient, and equitable manner, and will develop guidelines and tools to enable consistent and best practice flood management approaches across the province.

8.4.2.2 Rationale

The new concept for flood risk governance has been developed to both answer the identified gaps and challenges and consider best practices principles for governance. Gaps of legitimacy, direction, performance, accountability, fairness, and alignment are intended to be lessened through this central knowledge hub. This knowledge hub also answers many concerns outlined throughout engagement, where many local and First Nation governments highlighted the need for more technical expertise at the Province.

Returning core expertise to the Provincial government will have many benefits. First, it will create strong legitimacy and clarify roles and responsibilities, a key identified gap. Second, accountability will be greatly enhanced, ideally with the leadership of a Minister and ADM, and by the development of operational targets and plans (see Direction above). Third, a core group of experts will increase overall performance, efficiency, and quality of flood projects across the province. This central hub will also have the expertise and resources to ensure active and continued collaboration with the Federal government, and support on improving relations with Indigenous Peoples. This core team will also have the resources and expertise to develop, manage and monitor multiple programs to ensure success of the broader flood risk goals and targets.

8.4.2.3 Roles and Responsibilities

The following activities and responsibilities are imagined for this central hub:

1. Create a strong leadership and direction for flood risk governance in the province.
2. Have resources to properly engage with other levels of government, with special attention to evolving government to government relations with Indigenous Peoples.
3. Develop, manage, and monitor foundational tools to support management. E.g.,
 - a. Hydrometric networks and flood forecasting.
 - b. Flood mapping programs and public accessibility through open data.
4. Ensure connections across disciplines and sectors, specifically directly connecting emergency response with mitigation planning and pulling together technical and policy teams into one flood focused group.
5. Reimagine, manage, and monitor funding programs to be more equitable, and to allow for more flexibility to consider best practices (e.g., buyouts for managed retreat), and to encourage novel approaches (e.g., requirements around adopting non-structural regulations when applying for structural or non-structural funds). Three funds are envisioned (see Section 8.4.4).
6. Develop and refine guidelines:
 - a. Indigenous Relations Guide (especially related to FPIC for planning, and for inclusion of Indigenous Knowledge in technical projects) to be co-developed with Indigenous Peoples.
 - b. Topographic and Bathymetric survey data and data management guidelines.
 - c. Inclusion of Climate Change in Hydrology, Hydraulics and Mapping.
 - d. Flood Mapping Guidelines (River): Make more prescriptive.
 - e. Flood Mapping Guidelines (Coast): Develop.
 - f. Flood Planning Guide, with example decision frameworks and processes and consideration of climate uncertainty leveraging work within Issue B-4.
 - g. Newly reimagined dike design guidelines that consider novel approaches (green dikes, flood walls, etc.).
7. Research and advocate for changes to legislation and regulation (e.g., update weak regulation related to land use and disclosure, correct issues related to the definition of qualified professionals, etc.).
8. Conduct relevant research and pilot projects, for example:
 - a. Develop a province-wide flood risk assessment to support prioritisation and allocation of resources.
 - b. Research and pilot projects in support of ecosystem-based flood management strategies (that include financial return-on-investment calculations).
 - c. Conduct research into financial sector to explore incentives and opportunities to have private sector shoulder more costs (could be done with post-secondary institution).
 - d. Conduct research into the benefits and costs associated with disclosure of hazard information and the perceived barriers of Local Governments to disclosing this information.

In order to accomplish the above, a high-level staffing concept has been developed. This is presented in Figure 8-1 and Table 8-3.

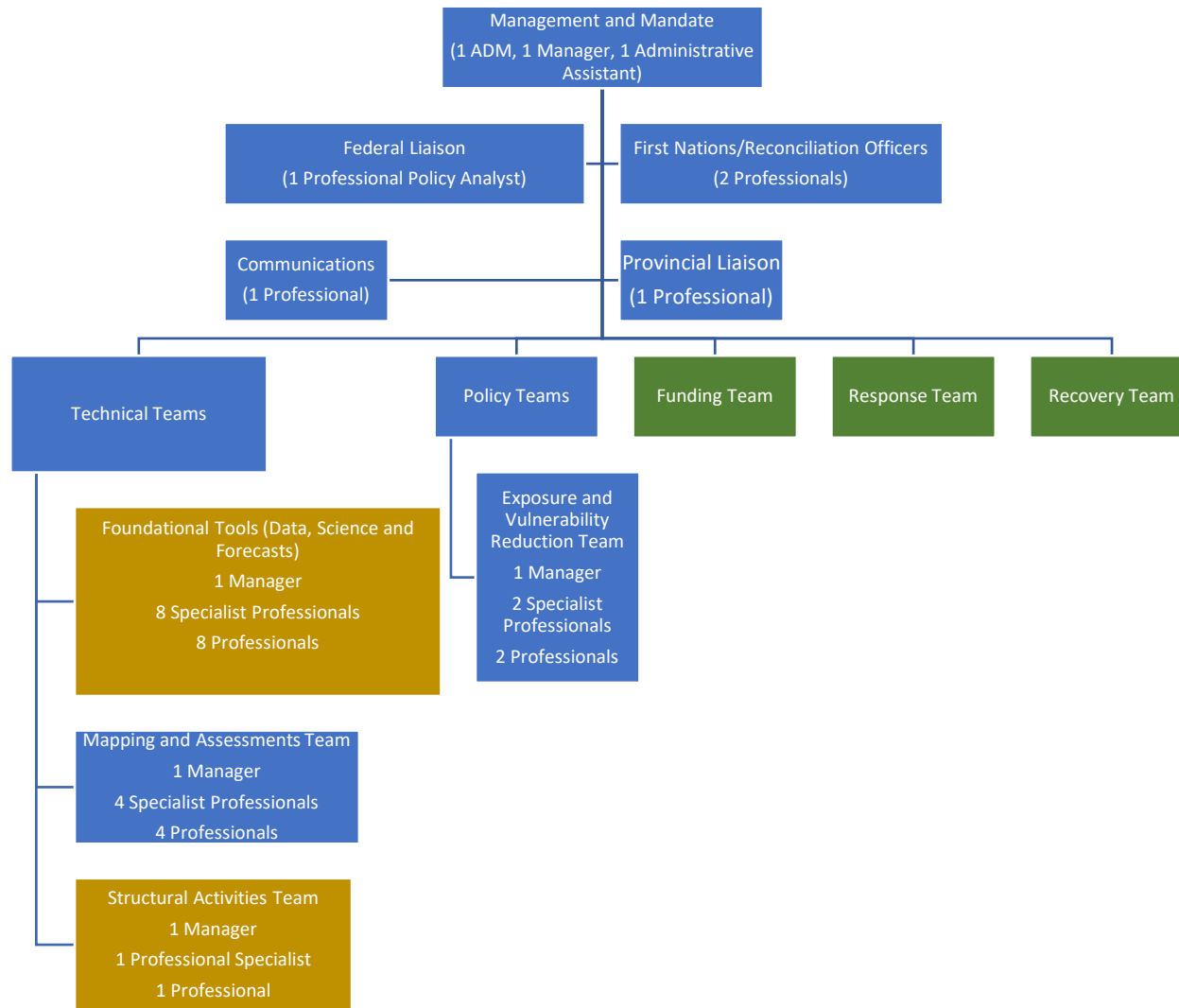


Figure 8-1: Proposed roles and broad organisation of central knowledge hub. Blue are new positions/groups, yellow are evolved from existing positions, and green are existing.

Table 8-3: New and expanded roles and responsibilities within central knowledge hub.

Number	Role	Responsibility
1	Assistant Deputy Minister	<ul style="list-style-type: none"> Overall responsibility for program and mandate Liaise with elected officials. Liaise with other provincial agencies (e.g., GeoBC, Wildfire Service). Responsibility to meet operational and risk reduction targets.
1	Manager (Management and Mandate)	<ul style="list-style-type: none"> Overall management of operations. Support ADM in all responsibilities.
1	Administrative Assistant	<ul style="list-style-type: none"> Support top team.
1	Federal Liaison Officer	<ul style="list-style-type: none"> Be consistent point person for inter-governmental relations with Federal government. Ensure streamlining and efficiency of processes (i.e., provide input on federal guidelines so they are more directly applicable to BC). Ensure alignment of policy to gain better access to Federal funds.
1	Provincial Liaison Officer	<ul style="list-style-type: none"> Point person for communications with other provincial agencies (e.g., Municipal Affairs, GeoBC, etc.) with overlapping mandates. Provide support to private sector actors to continue their activities as appropriate.
2	Reconciliation Officers	<ul style="list-style-type: none"> Ensure that principles of UNDRIP and FPIC are upheld across all operations. Liaise with other similar roles in other provincial agencies, Support regional reconciliation officers in their duties and ensure consistency (and equity) of activities across all regional hubs. Develop guideline: <ul style="list-style-type: none"> Indigenous Relations Guide (especially related to FPIC for planning, and for inclusion of Indigenous Knowledge in technical projects)

Number	Role	Responsibility
1.5	Communications Professionals	<ul style="list-style-type: none"> Support overall team on public (i.e., media relations) and internal communications. Prepare and manage public education and communication programs.
1	Manager (Data, science, and forecast)	<ul style="list-style-type: none"> Overall responsibility for data, science and forecast team mandate and operations. <p>Note: this role already exists, but this would be an expanded role.</p>
16 (8,8)	Data, science, forecast professionals	<ul style="list-style-type: none"> Responsibility to carry out operations of data, science, and forecast team. Liaise with Federal agencies related to data (e.g., ECCC, DFO). Set-up systems to collect, manage and disseminate data (see core competencies list). Develop (or co-ordinate with others who develop) climate science and data. Subsume and slightly increase existing River Forecast Centre (RFC). Develop Guidelines: <ul style="list-style-type: none"> Topographic and Bathymetric survey data and data management guidelines. Support on Guidelines <ul style="list-style-type: none"> Inclusion of Climate Change in Hydrology, Hydraulics and Mapping. Flood Mapping Guidelines (River): Make more prescriptive. Flood Mapping Guidelines (Coast): Develop. <p>Note: 5 of these roles already existing within the RFC and Flood Safety Section</p>
1	Manager (Mapping and assessments)	<ul style="list-style-type: none"> Overall responsibility for mapping and assessment team mandate and operations.
8 (4,4)	Hazard and risk assessment professionals	<ul style="list-style-type: none"> Develop guidelines: <ul style="list-style-type: none"> Inclusion of Climate Change in Hydrology, Hydraulics and Mapping. Flood Mapping Guidelines (River): Make more prescriptive. Flood Mapping Guidelines (Coast): Develop Support Funding Program (esp. Foundational Tools Fund):

Number	Role	Responsibility
		<ul style="list-style-type: none"> ○ Set reasonable expectations for scope and budgets. ○ Support on criteria for selection. ○ Provide technical support to applicants (through regional hubs). ○ Review and quality control all submissions to Foundational Tools Fund (e.g., quality control of newly developed flood maps). ● Liaise with parallel roles in regional offices.
1	Manager (Policy)	<ul style="list-style-type: none"> ● Overall responsibility for policy team mandate and operations.
4 (2,2)	Policy Analysts	<ul style="list-style-type: none"> ● Support ADM and team to advocate for legislative changes required to enable best practice for flood risk reduction. ● Develop/Augment Guidelines: <ul style="list-style-type: none"> ○ Flood Planning Guide, with example decision frameworks and processes and consideration of climate uncertainty (see Issue B-4: Flood Planning and B-3: Flood Risk Assessment for base information). ● Support Funding Program (esp. Planning and Resilience Fund): <ul style="list-style-type: none"> ○ Set reasonable expectations for scope and budgets. ○ Support on criteria for selection. ○ Provide technical support to applicants (through regional hubs). ○ Review and quality control all submissions to Planning and Resilience Fund. ● Liaise with parallel roles in regional offices. ● Support on development and implementation of pilot programs for novel ideas (e.g., property level flood resilience).
1	Manager (Structural Activities)	<ul style="list-style-type: none"> ● Overall responsibility for structural activity team mandate and operations <p>Note: This role currently exists in the form of the IOD</p>
2	Structural Specialists	<ul style="list-style-type: none"> ● Carry out responsibilities as currently laid out in the DMA. ● Develop/Maintain Guidelines: <ul style="list-style-type: none"> ○ Dike Design Guidelines (Currently in existence)

Number	Role	Responsibility
(1,1)		<ul style="list-style-type: none"> ○ Seismic Dike Design (Currently in existence) ○ Green flood protection guideline (NEW) ● Support Funding Program (esp. Structural): <ul style="list-style-type: none"> ○ Set reasonable expectations for scope and budgets. ○ Support on criteria for selection. ○ Provide technical support to applicants (through regional hubs). ● Review and quality control all submissions to Implementation Fun. ● Liaise with parallel roles in regional offices. ● Support on development and implementation of pilot programs for novel ideas (e.g., living dikes, kelp forests for coastal protection)
42.5		

8.4.2.4 Cost

High-level costs for the development of a new a central hub have been developed and are presented in Table 8-4. These costs, along with others developed for other Issues will be refined in Issue D-1 (AECOM Canada Ltd. 2021).

Table 8-4: Costs related to proposed central hub.

Element	Assumptions	Estimate
Provincial Staffing (All Roles)	1 FTE ADM and Administrative Support @300k 5 FTE Manager Positions@ \$175k 15 FTE Specialist Professional Positions @ \$150k 20.5 FTE Professional Positions @ \$100k (see above)	\$5.475 M Annually
Additional Project Costs (Contracts)	Foundational Tools (Risk Assessment, assumed low end from B-3 report @ \$2M, Development of Refined Funding Program @\$200k*) Guidelines (7 guidelines at an average of \$200k each, which assumes that some peer review and outreach is included) Pilot Projects (assume annual budget of \$500k to support varied initiatives)	\$3.6M One-time Costs \$500k Annual Cost
Total		\$3.6M One-time costs \$5.975 M Annually

*Estimated based on experience in developing DMAF program merit criteria and guidebooks. This is not the fund itself but the systems, guidance, criteria, etc.

8.4.2.5 Constraints and Issues

This proposal ideally requires that the Direction be complete or underway. Many of the guideline and research initiatives must be aligned with the objectives and targets set out in the Direction.

Further, this proposal does not specifically consider the details or costs associated with restructuring provincial staff roles and systems, which would require additional expertise from within the Province.

8.4.3 Regional Support Hubs

8.4.3.1 Summary

Regional support hubs will support collaboration on a regional and watershed basis, and will provide expertise and support to all, but especially underserved communities. The regional support teams operated by the Province will report directly to the central hub.

These regionally-based provincial government representatives will be key to supporting local initiatives with region-specific flood knowledge and experience. This will enable local and First Nation governments to meet their current responsibilities, and will also support regional collaborations and have a mandate to develop regional projects, which for regional/watershed based issues is an obvious efficiency.

8.4.3.2 Rationale

The regional support hubs are intended to improve governance across a number of best practice principles and to address many of the challenges that were highlighted in earlier sections of the report. Specifically, regional support hubs will support improved performance, transparency, and accountability for local flood projects by providing support, expertise, and a measure of screening to local government and First Nation government projects.

Second, a key rationale for the regional support hubs is to manage the current inequities in the system, by providing high-quality advice and support to all governments, especially to those who do not have internal capacity or expertise. A further rationale for a regional hub model, is for this group is to both encourage and force collaboration at a suitable watershed or reach scale. There are many practical reasons to work at watershed scale that are on top of financial incentives of conducting work efficiently. A regional hub can also support on alignment and synergies with other regional initiatives and bodies, as there will be clear point person/group to enable collaboration across disciplines.

Finally, there is a strong rationale to have locally-based experts when it comes to emergency response. Each river or coastal system is unique, and locals understand it best. This is especially true during emergency response, when locals, with long experience, are most able to make quick and informed decisions. The lack of local hydraulic experts in the EOCs/PREOCs during recent flood events was highlighted as a gap that created concerns for public safety.

8.4.3.3 Roles and Responsibilities

The following activities and responsibilities are imagined for these regional hubs:

1. Take direction and report directly to the central hub (ground-truthing interviews highlighted the need to have regional hubs report directly to the central hub as opposed to other managers within regional government offices).
2. Support science, collect data, collaborate with other scientists in the region related to flood management.
3. Support First Nation and local governments to scope flood projects (technical, policy and planning) and to submit grant applications, and then to support these same communities to manage the projects to ensure a high standard of work (i.e., to act as owner’s engineer for communities who do not have resources).
4. Co-ordinate funding applications from different governments as appropriate so that efficiencies can be gained. And, in some instances prioritise projects at the regional level prior to submission to central hub.
5. Create opportunities for regional scale projects by co-ordinating (and potentially mandating) local governments to work together on projects when it makes practical or common sense to work as a group.
6. Liaise with other related regional groups (e.g., regional planners committees, NGOs, watershed groups, etc.)
7. Enforce all legislation and regulation related to flood control (i.e., responsibilities under the DMA).
8. Play an active role during response and recovery by providing local expertise to EOCs.

Table 8-5: New and expanded roles and responsibilities within regional hubs.

Number	Role	Responsibility
1	Manager (Regional Flood Hub)	<ul style="list-style-type: none"> • Overall management of operations at regional office. • Liaise with management team at central hub.
2 (0,2)	Reconciliation Officers	<ul style="list-style-type: none"> • Ensure that principles of UNDRIP and FPIC are upheld across all operations. • Support regional collaboration, especially projects lead by First Nations. • Support Local Governments to meet FPIC requirements on all flood projects, and especially those conducted through funding programs. • Support First Nations Governments to access funding and participate in processes led by other Local Governments.
2 (1,1)	Data, science, forecast professionals	<ul style="list-style-type: none"> ○ Liaise with data, science, and forecast team at Central Hub. ○ Provide local knowledge and intelligence to support province-wide and local forecasting systems. ○ Play an active role in any response activities to increase

Number	Role	Responsibility
		<p>scientific and technical knowledge that is also local.</p> <ul style="list-style-type: none"> ○ Support Local and First Nation governments to access funding, and develop and disseminate data collection and management systems.
1 (0,1)	Funding Co-ordinator	<ul style="list-style-type: none"> ○ Liaise with funding team at Central Hub. ○ Support to local governments and First Nations to apply for funding programs. ○ They will also co-ordinate applications as appropriate thereby increasing efficiency, reducing overlap, and working towards goal of watershed co-ordination. ○ Work with local technical and policy teams to scope and budget projects appropriately.
2 (1,1)	Hazard and risk assessment professionals	<ul style="list-style-type: none"> ● Liaise with hazard and risk team at Central Hub. ● Provide local knowledge and intelligence to support province-wide efforts. ● Provide a front-counter service to First Nation and local governments to help them understand communications and navigate systems. ● Play an active role in any response activities. ● Support First Nation and local governments in the development of grant applications to ensure that they are well scoped and appropriately budgeted. ● Support First Nation and local governments in the execution and implementation of any grant funding or other flood projects. ● Support First Nation and local governments to work together at a regional/watershed scale on projects where this is a technical necessity, or a cost-efficiency.
2 (1,1)	Policy Analysts and Planners	<ul style="list-style-type: none"> ● Liaise with policy team at Central Hub. ● Provide local knowledge and intelligence to support province-wide efforts. ● Play an active role in any response activities. ● Support FNs and LGs in the development of grant applications to ensure that they are well scoped and appropriately budgeted. ● Support FNs and LGs in the execution and implementation of any grant funding or other flood projects. ● Support FNs and LGs to work together at a regional/watershed scale on projects where this is a

Number	Role	Responsibility
		technical necessity, or a cost-efficiency.
2 (1,1)	Structural Specialists	<ul style="list-style-type: none"> • Carry out responsibilities as currently laid out in the DMA. • Liaise with structural team at Central Hub. • Provide local knowledge and intelligence to support province-wide efforts. • Play an active role in any response activities. • Support First Nation and local governments in the development of grant applications to ensure that they are well scoped and appropriately budgeted. • Support First Nation and local governments in the execution and implementation of any grant funding or other flood projects. <p>Note that these roles are currently covered under the 10 DIOD positions, although this role is expanded.</p>
12	Total/Per Hub	

8.4.3.4 Cost

High-level costs for the development of a regional hubs have been developed and are presented in Table 8-6. These costs, along with others developed for other Issues will be refined in Issue D-1 (AECOM Canada Ltd. 2021).

Table 8-6: Costs related to proposed regional hubs.

Element	Assumptions	Estimate (Annual) (Per Hub)
Provincial Staffing	1 FTE Manager Position @ \$175k 4 FTE Specialist Professional Positions @ \$150k 7 FTE Professional Positions @ \$100k (see above)	\$1.475 M
Contracting	Miscellaneous local contracts to support local projects and capacity building	\$500k
Enabling	Additional funds to allow for participation of First Nations and smaller communities	\$500k
Total per Hub		\$2.475 M
Total for 6 Hubs	Based on Province of BC Regions (may change to watershed basis, some variation in each hub is expected, see recommendations in next section)	\$14.85 M

8.4.4 Funding for Locally Driven Flood Management Projects

8.4.4.1 Summary

Finally, it is envisioned that the existing model of funding programs granted to First Nations and local governments to conduct locally-relevant projects will continue, but that the resourcing will be significantly increased. However, the effectiveness and efficiency of these projects is expected to be much improved under this model, which will be more holistic and transparent.

8.4.4.2 Rationale

There is a clear need to conduct flood projects, whether they involve building foundational knowledge, or include making plans for mitigation, or implementing these plans. The need for this type of work is clearly highlighted through many of the other Issue reports. The main challenges associated with the current funding systems (beyond the inadequacy of the available funds) are varied. They include the funding process itself (it being opaque and inequitable), the types of projects currently funded being constrained by a western-science/engineering worldview, and the quality of projects being completed. There is a strong rationale to improve the funding system so that dollars are well spent on projects that reflect local needs, but also meet a base standard of quality.

8.4.4.3 Components

Three broad funding programs, all run from the same office at the central hub, are envisioned. These are:

1. Foundational Tools Fund. This fund would support projects that develop base knowledge related to flood. This would include Traditional Knowledge, hydrometric, climate, bathymetric and topographic data collection as well as the preparation of assessments, analyses, and maps.
2. Planning and Resilience Fund. This fund would support planning activities related to risk reduction tools and resilience. For example, local or regional flood plans, but also emergency response plans. Planning and emergency response planning is intentionally brought together to support better full emergency response planning cycles, and to support responders working directly with planners and engineers and others involved in flood mitigation planning.
3. Implementation Fund. Where plans (prepared under fund #2) identify the need for significant expenditures related to flood mitigation (e.g., structural mitigation works), this fund would provide capital to support these significant investments. It is also hoped that this fund could be used to implement non-structural elements of flood plans (e.g., buyouts).

The approach for all three funds is envisioned to be significantly shifted from the current model to:

- Be risk-based (e.g., prioritisation based on current risk or risk reduction opportunity), but also be mindful of issues of equity (i.e., acknowledging that areas of highest risk may be in this situation because of historic decisions that have created increased exposure, especially in economic value).
- Have clear and transparent merit-based scoring systems available to applicants prior to completing applications. These should include consideration of risk-reduction potential, as well as ensure that projects meet all regulations and guidelines, and have consideration of social, environmental, and economic impacts and benefits of the project.

- Be managed by a team of funding specialists working with technical experts who have the capacity to understand the project's technical merit and reasonableness given funding ask.
- Be vetted and reviewed by technical experts at the close of the project to ensure that the fund is being well spent.
- Have strong monitoring systems to understand the success of individual projects, but also the overall programs.
- And finally, be aligned with Federal funding programs such that monies can be combined to conduct large projects that would otherwise not be possible.

No costs for each of these funds is provided here as estimates are provided (for slightly modified versions of this funding model) in other Issue reports. Further, cost-sharing models between the Federal and Provincial governments are not explored at this time, as relations between these governments are evolving and the Federal government funding programs are also shifting.

8.4.5 Other Elements

8.4.5.1 Professional Associations

As the *Professional Governance Act* [2018] comes into full force, and new guidelines are developed it will be important to work collaboratively with professional associations and their membership understand the broad governance changes, as well as regulatory changes. It was noted on several occasions during the engagement that there are challenges associated with current professional reliance model, and it is hoped that this will evolve with the roll out of the new Act. This will likely be managed by the professional associations themselves but will require support and oversight of the Province.

Professional Associations, with the support of the Province, and potentially post-secondary institutions, will need to develop resources to support their members to adapt to changes expected within the field. For example:

1. Understanding the new *Professional Governance Act*, and in the interim the liability associated with signing hazard related documents as a qualified professional.
2. Supporting professionals to understand the science and the uncertainty of climate change.
3. Supporting professionals to understand a fuller suite of tools that can be used to support flood risk reduction and resilience.
4. Supporting professionals to work in collaborative multi-disciplinary environments.

8.4.5.2 Post-Secondary Institutions

The reimagined flood risk governance system for BC requires a significant body of highly-qualified and up-to-date professionals and technicians. It will be imperative that BC can source these professionals locally. Therefore, it is recommended that the Province work with post-secondary institutions to ensure that the existing undergraduate programs reflect the needs of the future workforce.

Further, it is proposed that the Province explore with post-secondary institutions the potential for a multi-disciplinary graduate program focussed on flood risk. This program could be modelled on other programs elsewhere in the world as outlined in Section 4.2.3.

8.5 Challenges for Action on Change

As noted at the outset of this report, the current system exists because of historic decisions and actions, and now sits within a relatively entrenched pathway. There is a certain amount of inertia that will have to be shifted in order to change how flood risk is governed in BC. This is true for the Provincial government who will need to take responsibility and control of some elements of flood risk governance back, and for local governments who will have to cede some autonomy and control in exchange for improved consistency, enhanced capacity, and support for implementation of best practices. The actions to mitigate damages are also different under this model, with a stronger focus on more holistic activities, and less on structural controls. Further, professionals will need to change who they work with (more multi-disciplinarity) and their comfort with uncertainty and the lack of engineering standards and criteria to govern decisions. All this change will be challenging and will need to be carefully managed and monitored. The intent of the early visioning and engagement activities are intended to support this change.

Further, this new concept will be challenged because the price tag is initially large, and significantly higher than what is currently being spent on flood in the province. However, there is a clear long-term argument to be made, that investments in community resilience are economically sound and will limit response and damage costs down the road. And, that investments in capacity at the province and elsewhere will support better decisions, that are financially responsible in both the short and long-term.

8.5.1 Limitations

This new concept was developed based on an understanding of the existing challenges and opportunities highlighted in this report. It was ground-truthed with representatives from the Province, local and First Nation governments. It is however intended to be a first draft concept that will enable next step conversations and analyses regarding potential changes. It is not intended as a detailed plan. Much more additional work, with stronger input from within the Province, who have the best understanding of existing roles and responsibilities, as well as the appetite for change and re-organisation, is recommended and expected in future.

8.6 Other Recommendations

In addition to the recommendations embedded within the new concept for flood risk governance, there are some ideas that should be considered more generally. These are outlined below.

High-level estimates of priority and cost (primarily dollar cost, but also in some instances human resources and skills) are provided in this table as **High (red, 10s of \$M)**, **Medium (yellow, \$Ms)** and **Low (green, \$1000s)**. The authors have also noted who the recommendation is targeted at in the Recommendation/Option Column.

Table 8-7: Recommendation related framework for flood risk governance within Governments.

No.	Recommendation/Option	Description and Rationale	Priority	Cost (Annual)
1.	Refine and maintain list and visual summary of governance activities. (Province, MFLNRORD)	The above information was collated and researched from dozens of different sources. There is now a base framework to organize and understand governance activities. As new information or refinements are developed, this framework should be updated, amendments should be made when further changes to governance (e.g., the promulgation of a modernised Emergency Program Act) occur.	M	L
2.	Conduct a full legislative review to establish required changes and/or updates. (Province)	This report identified some legislative barriers and obstacles from the perspective of a flood policy specialist. These have not been considered in detail, nor have they been reviewed by a legal expert. There is a need to conduct a more thorough review of legislation to establish required changes to enable the new concept model for flood risk governance.	H	M
3.	Conduct a study to define appropriate regional boundaries for regional hubs. (Province)	This report temporarily identifies 6 regional hubs centred within the current MFLNRORD regions. This may not be an ideal geographic organisation as it does not follow watershed boundaries, and does not reflect the risk distribution (i.e., there is not equal risk within each of these regions). Further, it was identified that it would be important to ensure that regional hubs report directly to central hub rather than to senior management within a regional ministerial office; this may be easier to achieve if the flood risk governance system is outside the normal chain of command. A study to confirm the best geographic boundaries and arrangement of regional offices is proposed.	H	L
4.	Consider getting guidance on change management. (Province)	A new concept for flood risk governance in BC will require a paradigm shift in thinking at all levels and within broader society. Change is hard. In order to support this shift, it is recommended that the province seek expertise on who to enable change.	L	L

9 Closing

The current model for flood risk governance in BC is broken. The province continues to face damages, losses and misery associated with flood events, and the system clearly breaks down on best practice principles for good governance. There are however some components of the existing system that are strong and should be leveraged.

There is, at this moment, a policy window because of external factors in combination with knowledge of new paradigms for flood risk governance. This is an amazing opportunity to improve flood risk governance in BC, which will create safer more resilient communities today and in future.

This report outlines best practice for flood risk governance, the current baseline for flood risk governance in BC, and the gaps between the two. These gaps, as well as an exploration of the strengths within the existing system, and the strengths and weaknesses of alternate governance systems culminates in a proposal for a new concept for flood risk governance.

This new concept, which includes a stronger well-resourced group of professionals within provincial government, will ensure efficiency and will overtime not only create safer communities, but will reduce pressures on the public purse.

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11 Glossary

Term	Definition
Adaptation	The practice of adjusting or taking actions to limit or reduce vulnerability to changing hazard risk. In the context of climate change impacts on coastal flood hazard risk, specific adaptation actions might include improved coastal zone management, changes to planning, permitting, codes and standards, structural design, and social preparedness.
All Hazards	Referring to the entire spectrum of hazards, whether they are natural or human-induced. For example, hazards can stem from natural (e.g., geological or meteorological) events, industrial accidents, national security events, or cyber events.
All-Hazards Approach	An emergency management approach that recognizes that the actions required to mitigate the effects of emergencies are essentially the same, irrespective of the nature of the incident, thereby permitting an optimization of planning, response and support resources.
Annual Exceedance Probability	The probability, expressed in percentage, of a flood of a given size being equalled or exceeded in any year. Accordingly, a flood that is estimated to recur once in 100 years (on average) has an AEP of 1/100 or .01 (1% AEP meaning a 1% chance of occurring in any year). A flood estimated to recur once in 500 years on average has an AEP of 1/500 or 0.002 (.2% AEP).
Assets-At-Risk	Refers to those things that may be harmed by hazard (e.g., people, houses, buildings, cultural assets, or the environment).
Coastal Flood Hazard	A potentially damaging flood event (or multiple events) in coastal regions, which may cause damage to buildings and infrastructure, and/or the loss of life, injury, property damage, social and economic disruption, or environmental degradation.
Coastal Flood Risk	The combination of the probability of a coastal flood hazard event (or multiple events) and the associated negative consequences.
Contents Damages	The damages to the contents within a building, such as appliances, furniture, electronics, etc.
Critical Infrastructure	Processes, systems, facilities, technologies, networks, assets, and services essential to the health, safety, security, or economic well-being of Canadians and the effective functioning of government.
Damages	The financial and non-financial impacts/consequences of a hazard event. For buildings and infrastructure, this may include structural damage or loss of performance, or damages due to loss of serviceability/operability.
Dike	An embankment designed and constructed to prevent the flooding of land. A dike is supported by related works, such as floodboxes, gates and pumps that serve to hold back floodwaters while continuing to discharge water from behind the dike.

Term	Definition
Direct Damages	The financial costs to repair or replace an asset to its pre-flood condition. Direct damages include structure and contents damages.
Disaster	A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts.
Disaster Risk Management	The application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses.
Disaster Risk Reduction	The concept and practice of reducing disaster risks through systematic efforts to analyze and reduce the causal factors of disasters. Disaster risk reduction includes disciplines like disaster mitigation and preparedness.
Exposure	The presence of people, infrastructure, housing, or other assets-at-risk (or parts thereof) in places that could be adversely affected by hazards.
Flood and Flooding	The presence of water on land that is normally dry. Often used to describe a watercourse or body of water that overtops its natural or artificial confines.
Flood Construction Level	The minimum height required for a development to protect habitable living space from flood damage.
Flood Maps (Mapping)	Maps (Mapping) that display information related to a flood, such as the estimated extent of flooding, water depths, water velocities, flood duration or other information.
Flood Risk Assessment	Evaluation of a flood hazard (including the expected flood extent, depth and direction of flow) together with information about assets and people that are vulnerable to flooding to identify potential economic, social, cultural and environmental losses from flooding.
Floodplain	A floodplain is flat or nearly flat land that is susceptible to flooding from a watercourse, lake or other body of water.
Floodplain Management	Floodplain management includes policies and regulations intended to reduce flood risks associated with land use and development in floodplains and flood hazard areas.
Floodproofing	In reference to development, actions taken at the site or property level that reduce the vulnerability of buildings and their contents to flood damage.
Governance	Governance describes the process by which society, or groups within it, organizes itself to make decisions.
Hazard	A potentially damaging physical event, phenomenon, or human activity that may cause the loss of life, injury, property damage, social and economic disruption, or environmental degradation.

Term	Definition
Flood Hazard	A potentially damaging flood event that may cause the loss of life, injury, property damage, social and economic disruption, or environmental degradation.
Flood Mitigation	Steps to reduce flood damage by structural measures (such as dikes), non-structural measures (such as keeping populations and assets away from flood-prone areas or requiring floodproofing), or a combination of these measures.
Hazard Assessment	Acquiring knowledge of the nature, extent, intensity, likelihood, and probability of a hazard occurring.
Hazard Inventory or Database	An inventory of the location, nature, and extent of influence of any potential hazards in an area of concern. Generally compiled as a GIS database.
Indirect Damages	The financial costs incurred as a result of a flood event. Indirect damages include flood fighting/mitigation, evacuation, temporary housing, employment and productivity losses, post-flood cleanup, etc. Areas outside the flood hazard may also experience indirect damages, such as business disruption.
Intangible Damages	The non-financial or otherwise non-quantifiable impacts due to a flood event including social, health, and environmental impacts. Areas outside the flood hazard may also experience intangible damages, such as due to the spill and transport of a deleterious material.
Likelihood	A general concept relating to the chance of an event occurring. Likelihood is generally expressed as a probability or a frequency of a hazard of a given magnitude or severity occurring or being exceeded in any given year. It is based on the average frequency estimated, measured, or extrapolated from records over a large number of years, and is usually expressed as the chance of a particular hazard magnitude being exceeded in any one year (i.e., the Annual Exceedance Probability, AEP).
Losses	Equivalent to damages that occur as a result of a flood event, both tangible and intangible.
Natural Hazard	Natural process or phenomenon that may cause loss of life, injury, other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.
Residual Risk	The risk that remains even when effective risk reduction measures are in place.
Resilience	The ability of a system (such as individual or multiple buildings or infrastructure assets), community, or society exposed to hazards to resist, absorb, accommodate, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Term	Definition
Risk	The combination of the probability of a hazard event and its negative consequences.
Risk Assessment	<p>A method to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed buildings, infrastructure, people, property, services, livelihoods, and the environment on which they depend.</p> <p>Risk assessments (and associated risk mapping) include: a review of the technical characteristics of hazards, such as their location, intensity, frequency, and probability; the analysis of exposure and vulnerability, including the physical, social, health, economic, cultural, and environmental dimensions; and the evaluation of the effectiveness of prevailing and alternative coping capacities, with respect to likely risk scenarios. This series of activities is sometimes known as a risk analysis process.</p>
Risk Management	The systematic approach and practice of managing uncertainty to minimize potential harm and loss.
Susceptibility	An asset that could be adversely impacted by exposure to a hazard is susceptible to the hazard. For example, a typical residential building is susceptible to damage from floodwaters. A properly constructed concrete landscaping wall that has some floodwaters around it may not be adversely impacted and is therefore not susceptible to a flood hazard.
Structural Damages	Damages to the structural systems of a building or infrastructure, such as walls, floors, heating and cooling systems, etc.
Tangible Damages	Measurable financial impacts due to a flood event.
Vulnerability	The characteristics and circumstances of a community, system, or asset that make it susceptible to the damaging effects of a hazard. For buildings and infrastructure assets, vulnerability is a product of both exposure and susceptibility to damage.

Appendix A – List of Investigations

Investigations in Support of Flood Strategy Development in BC

List of All Investigations

Theme A. Governance

Issue	Investigation
A-1 Flood Risk Governance	1. Identify the flood management services provided by each order of government in BC.
	2. Investigate the roles of non-government entities in flood management in BC.
	3. Identify challenges, gaps and limitations with current service delivery.
	4. Identify opportunities for improving collaboration and coordination within and across authorities and adjusting non-government entities' roles that would address challenges and improve efficiency and effectiveness.
	5. Recommend changes to support improved collaboration and coordination in flood management, including an analysis of benefits and costs/limitations for each recommendation.
	6. Investigate alternative options for distributing and integrating flood management responsibilities among authorities, including an analysis of benefits and costs/limitations for each option.

Theme B. Flood Hazard and Risk Management

Issue	Investigation
B-1 Impacts of Climate Change	1. Investigate the state of climate change science in relation to BC flood hazards and identify gaps and limitations in provincial legislation, plans, guidelines and guidebooks related to flood hazard management in a changing climate.
	2. Identify current sources of information and models used by experts in the province to predict future climate impacts and investigate opportunities for improved predictive modeling.
	3. Investigate the capacity of responsible authorities and other professionals and practitioners in the province to integrate climate change impacts and scenarios to inform flood planning and management.
	4. Investigate the legislative, policy, and regulatory tools available to responsible authorities in all levels of government for integrating climate change impacts in flood planning and management.

Issue	Investigation
B-2 Flood Hazard Information	1. Investigate the current state of flood mapping in the province, including gaps and limitations. Recommend an approach to improve the spatial coverage, quality, utility and accessibility of flood hazard maps and other flood hazard information.
	2. Investigate the approximate level of effort to prepare flood hazard mapping to address current gaps for existing communities and future areas of development (including floodplain maps and channel migration assessments).
	3. Investigate the current state of knowledge related to dike deficiencies and recommend an approach to improve the quality, consistency, review, utility and accessibility of this information.
	4. Investigate the status of LiDAR standards for flood mapping and develop recommendations to improve standards if applicable.
B-3 Flood Risk Assessment	1. Evaluate and compare the benefits and costs/limitations of taking a risk-based approach to flood management versus a standards-based approach.
	2. Investigate the effort required to develop and maintain a province-wide asset inventory and/or exposure dataset covering flood prone areas.
	3. Investigate approaches to completing a province-wide flood risk assessment, addressing effort required, level of detail, types of flood risk, current and future scenarios, scale, and any information required and data gaps.
	4. Investigate the level of effort to develop a coarse local-scale flood risk map based on available flood hazard map(s).
	5. Determine the effort required to undertake a local-scale comprehensive flood risk assessment for multiple types of flood hazards (e.g. riverine, coastal).and for varying degrees of available data on flood hazard, exposure, vulnerability and risk.
	6. Investigate methods for valuing the benefits and costs/limitations of flood risk reduction actions in a holistic and consistent manner and develop a framework for project prioritization that could be applied or adapted across the province to reduce flood risk.
B-4 Flood Planning	1. Investigate the ability of responsible authorities in the province to develop adaptation plans and strategies for flood management.
	2. Investigate opportunities to improve the knowledge and capacity of local authorities with regard to climate change adaptation and the benefits of proactive flood risk reduction.
	3. Investigate the potential content of a provincial guideline to support the development of local Integrated Flood Management Plans.
	4. Investigate the level of effort for a local authority to complete an Integrated Flood Management Plan and the possible role of the province in reviewing and/or approving these plans.

Issue	Investigation
B-5 Structural Flood Management Approaches	1. Investigate opportunities to incentivize or require diking authorities to maintain flood protection infrastructure and plan for future conditions such as changing flood hazards.
	2. Investigate opportunities to improve the knowledge and capacity of local diking authorities with regard to dike maintenance.
	3. Investigate opportunities to improve coordination amongst diking authorities under non-emergency conditions.
	4. Investigate impediments to and opportunities for implementing innovative structural flood risk reduction measures, including the role of incentives and regulation.
B-6 Non-Structural Flood Management Approaches	1. Investigate past and current approaches to land use and development decisions in floodplains by local and provincial authorities.
	2. Investigate alternatives to the current approach to managing development in floodplains, including returning regulatory authority for development approvals in municipal floodplains to the Province, and provide an analysis of the benefits and costs/limitations of both local and provincial authority.
	3. Investigate impediments to and opportunities for implementing available non-structural flood risk reduction actions, including the role of incentives and regulation.
	4. Investigate the nature of an educational campaign for regional, local and First Nations governments to raise awareness of flood risk and possible risk reduction options.

Theme C. Flood Forecasting, Emergency Response and Recovery

Issue	Investigation
C-1 Flood Forecasting Services	1. Investigate current capacity, coverage, value, and gaps in flood forecasting services.
	2. Visualize where flood forecasting gaps exist and estimate costs for improvement to end users.
C-2 Emergency Response	1. Investigate the future direction of the Federal government related to a National Flood Risk Strategy and the future of Disaster Financial Assistance Arrangements
	2. Investigate the Province's expanding role in providing flood response to First Nations.
	3. Investigate the status of local authority flood response plans and recommend an approach to manage, update and improve this information.

Issue	Investigation
	4. Investigate flood response capabilities considering different flood hazards and different regions of the province.
	5. Investigate opportunities for improved organizational planning for emergency response in all levels of government.
C-3 Flood Recovery	1. Investigate the current status of coverage of existing overland flood insurance available to home-owners.
	2. Investigate the concept of "build back better" and impediments to implementation.

Theme D. Resources and Funding

Issue	Investigation
D-1 Resources and Funding	1. Investigate resource and funding needs associated with implementing recommendations to strengthen flood management in BC.
	2. Investigate evidence in support of investment in proactive flood planning and mitigation activities.

Appendix B – Summary of Core Competencies: Links to other investigations and gaps

	Core Competency	Related Issue
Data	Traditional Knowledge	Not studied
	Hydrometric and Climate Data	B-1
	Topographic and Bathymetric Surveys	B-2
	Topographic and Bathymetric Data Dissemination	Not Studied in detail
	Flood Protection Infrastructure Surveys	B-5 (Not studied in detail)
	Exposure and Vulnerability Data Development	B-3
	Exposure and Vulnerability Data Dissemination	B-3
Science and Forecasts	Flood Event Mapping	Not studied
	Climate and Climate Change	B-1
	Weather	B-2, C-1
	River (Flows and/or Levels)	B-2, C-1
Mapping and Assessments	Coastal Conditions	Not studied
	Hazard - Creation	B-2
	Risk - Creation	B-3
	Compilation/Storage	Not studied
	Publication and Sharing	Not studied
Education	Post-Secondary Programs	Not studied
	Professional Programs	Not studied
	Public Education	B-6

	Core Competency	
Planning	Flood plans	B-4
Hazard Conservation	Maintain natural assets	Not studied
	Restore natural assets	Not studied
Hazard Control	Dams - Build	Not studied
	Dams – Operate and Maintain	Not studied

	Dikes - Build	B-5
	Dikes – Operate and Maintain	B-5
	Channel Maintenance	B-5 (not in detail)
Exposure (Land Use)	Acknowledge/Disclose	Not studied
	Avoid	B-4, B-6
	Retreat	B-6 (not in detail)
	Redistribute	Not Studied
Vulnerability	People	Not Studied
	Culture	Not Studied
	Environment	Not Studied
	Critical Infrastructure	Not Studied
	Structures	B-6 (not in detail)

	Core Competency	
Residual Risk	Insurance (Private)	C-3
	Insurance (Publicly Funded)	C-2
Resilience	Engineering Resilience	Not Studied
	Socio-Ecological Resilience (Adaptive Resilience)	Not Studied
Response	Flood Response Plan Development	C-2
	Flood Response Plan Maintenance	C-2
	Monitoring and Warning	C-2
	Flood Response Training	C-2
	Flood Response Resources	C-2
Recovery	Financial Recovery	C-3
	Engineering/Structural Recovery	C-3
	Social/Cultural Recovery	C-3
	Environmental Restoration	C-3
	Post-disaster planning	Not studied

Appendix C – Engagement Summary

Flood Risk Governance in BC: Engagement Report

April 30, 2021

Submitted to: Ebbwater

Submitted by: Pinna Sustainability

1. Introduction

1.1 Background

In November 2020, the Fraser Basin Council contracted Ebbwater Consulting Inc. (Ebbwater) and Pinna Sustainability Inc. (Pinna) to lead research as part of the Investigations in Support of Flood Strategies in British Columbia. The focus of this research is Theme A: Flood Risk Governance, one of four interconnected project themes. Funding for this project is from BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD).

The overall objective of this project is to understand the baseline for the governance of flood management activities in BC, and to then explore opportunities and obstacles to improve governance. Pinna lead engagement with stakeholders and Indigenous communities, gathering input and feedback on how to improve flood governance. This report is a summary of methods and findings from this engagement process.

1.2 Approach

This project employed a flexible and iterative approach designed to make the most of opportunities for engagement planned for the early months of 2021. Over the course of the project our team completed the following engagement deliverables:

1. Attended four Indigenous engagement events BC Flood Strategy a sperate and distinct process.
2. Hosted interviews and conversations with 13 representatives from Indigenous communities and stakeholders, specifically from local governments and regional districts. These interviews were conducted to further understand insights and themes that emerged from the Ebbwater desktop research and the BC Flood Strategy engagement sessions.

Throughout each phase of the project, our team aimed to be respectful and sensitive to the needs of interview participants. In the interview process, we recognized our role in the project as knowledge translators, and acknowledged the participants as experts.

1.3 Report Structure

This report begins with a summary of key insights from the BC Flood Strategy sessions, followed with a summary of findings from the interview process. The last section of this report offers final considerations from all stages of the project.

2. Key Insights from the BC Flood Strategy Sessions

Alderhill Planning Inc. (Alderhill) led an Indigenous engagement process for BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD) to support the development of a BC Flood Strategy. The BC Flood Strategy is a provincial planning process to support provincial efforts to reduce the impacts of flooding on people, communities and infrastructure in the province. Lessons from this process relate well to the distinct and separate research on Flood Governance research being led by FBC. Through collaborative conversations with MFLNRORD and Alderhill it was identified that Pinna’s attendance at the BC Flood Indigenous Engagement Sessions would be beneficial and complement both processes.

The sessions were titled BC Flood Indigenous Engagement Sessions. There were two virtual sessions held in January 2021 and two sessions held in February 2020.

2.1 Overview of Key Messages

Below is a summary of key messages from the Alderhill report titled Bridging our Knowledge Towards Indigenous Flood Resilience in BC: 2021 Indigenous Engagement Summary Draft Report. This report has many valuable insights from 23 Indigenous participants across BC and should be read in its entirety to fully understand the important messages that emerged. Key message 4 is dedicated to flood governance, while all points provide valuable context and insight to future flood governance.

Key Message	Details
1 First Nations communities in B.C often face disproportionate effects of flooding	Flooding can mean the loss of economic opportunities, the destruction of fish habitats, traditional plants, medicines, cultural sites, traditional burial grounds, and other sacred places.
2 Indigenous self-determination is required.	Having the ability to participate, plan, and make decisions for yourself, your family, your community, your nation and your land, based on inherent rights, knowledge and natural law, and without the interference of colonial policies and practices. The BC Flood Strategy should set the conditions to enable Indigenous peoples to express agency and self-determination in unique, creative ways that are relevant to their needs.
3 Priority focus on improving relationships and partnering with First Nations and Indigenous communities for a holistic approach to	Creating true partnerships with First Nations; improving information flow; clarifying jurisdictional issues; investing in infrastructure and creating tools for capacity building; as well as consistent funding streams, underlie the core findings and recommendations of the Abbott-Chapman 2018 Report for flood response.

<p>emergency management, specifically for fire and flood events.</p>	
<p>4 Effective flood governance requires prioritizing and strengthening relationships across the entire watershed.</p>	<p>Challenges related to jurisdiction over waterways lead to increased flood risk. While experiences vary across the Province, participants noted that relationships with other First Nations, municipalities, and regional districts, in addition to higher-level Bilateral and Tripartite relationships and coordination across Ministries is crucial for effective flood management in their communities.</p>
<p>5 Need for respectful and reciprocal sharing of information and data, with better appreciation for and inclusion of Indigenous knowledge in flood management.</p>	<p>Participants expressed a need for balance between Western Science and Indigenous Knowledge, with each community having the agency to determine for themselves how and when each is used. Many Indigenous communities in B.C. are trying to plan for flood risks using inaccurate and out-of-date data. There is a need for richer and deeper data including community-specific work on hydrology, hydrogeology, geomorphology, bathymetry, scour assessments and river system dynamic analysis. Without this information it is challenging to know what types of flood risks to prepare for, and it is impossible to become resilient without understanding the risks communities face. <i>“A weather station 200km away being the closest, is not good enough.”</i></p>
<p>6 Communities require sufficient capacity to work towards flood resilience.</p>	<p>This includes both financial capacity and human resource capacity. There is a need for funding that is multi-year and no-strings-attached. In addition, communities would benefit from better coordination of funding opportunities between funding bodies. There is also a great need to support capacity-building initiatives in communities to strengthen flood management and in working towards flood resilience.</p>
<p>7 Flood risk management must be led by each community.</p>	<p>First Nations and Indigenous communities must be supported to determine what flood resilience means to them, and what their needs and goals are within their specific contexts. From this position, communities can determine the best approaches and methods to achieve flood resilience Supporting Nations to be leaders in their own flood risk management means supporting Indigenous self-determination. <i>“We’ve created an industry that’s about fighting against the river, and building infrastructure instead of resiliency”</i></p>

3. Flood Governance Interview Summary

To build upon insights gathered through attendance at the BC Flood Indigenous Engagement Sessions and the desk top research by Ebbwater, a series of one-on-one telephone interviews were conducted with representatives from Indigenous communities and with stakeholders representing local governments and regional districts.

3.1 Interview Methods

3.1.1 Approach

Interviews were conducted using a qualitative approach to inquiry. The following steps were taken to ensure that the interviews were meaningful to those that were participating and to the project purpose. Preparation of materials, contacts and tracking mechanisms were developed in collaboration with Fraser Basin Council and Ebbwater. The following tasks were completed prior to conducting the interviews:

- A contact list was developed with contacts provided by the Pinna team and Ebbwater. Expertise of the individuals, existing relationships, and representation from across British Columbia were considered when developing the list.
- Participants of the BC Flood Strategy were invited to participate in this investigation. Pinna worked with Alderhill to coordinate our involvement at the BC Flood Strategy events.
- A semi-structured interview script was developed to guide the conversations with participants. Questions were developed to support a line of inquiry that would respond to the following objectives:
 - Understand community stories of strength and success regarding flood management.
 - Identify challenges and gaps with current service delivery.
 - Identify opportunities for improved collaboration and coordination within and across authorities to address current challenges and gaps while improving efficiency and effectiveness.
- An email invitation, interview script and a 1-page context brief were created to support the interview process.
- The intention was to create safe space to share in a conversational and storytelling style 1-hour interview. The Interviewer recognize the participants as experts in all interviews.
- Comments and recommendations surfaced during the interviews are summarized by theme. The report will not identify the interviewee unless the participant has given permission to share a quote or story.

3.1.2 Description of Participants

In total, 24 interviewees were invited to participate in an interview, and 13 interviews were completed throughout the engagement period. Participants included 7 individuals who work for Indigenous communities as Emergency Management Coordinators, Climate Action Coordinators, Lands and Resources Coordinator, as well as a Hereditary Leader. There were 6 interviewees from local government

and regional districts, participant roles included Planners, Sustainability Specialists, and Senior Administrators. A complete list of participants by role is provided in Appendix 5.2.

It is important to note that interviews and conversations were conducted between March 1 and April 6, 2021, in the midst of the COVID-19 global pandemic. This likely influenced to some degree the level of participation as many who are involved in emergency planning and coordination may not have had time to commit to a conversation due to competing priorities. One participant could not attend as they were setting up a vaccine clinic and another had to keep the interview short due to vaccine clinic coordination.

3.1.3 Data Analysis

Notes and information gathered from all the one-on-one interviews were compiled, and grouped, allowing for themes to emerge. All team members contributed to defining the key insights from the interview phase. Key insights are provided in the next section.

3.2 Interview Findings

The findings from interviews are outlined in the following section. Findings are organized in sections based on three objectives and grouped by theme. Findings are also separated by feedback from Indigenous participants and stakeholder participants.

The following objectives guided the interviews.

Objective 1: Understanding community stories of strength and success regarding flood management.

Objective 2: Understanding challenges and gaps with regards to flood management.

Objective 3: Identifying opportunities for improved collaboration and coordination within and across authorities to address current challenges and gaps while improving efficiency and effectiveness.

3.2.1 Indigenous Interview Findings

General comments:

Indigenous communities are experiencing the impacts of flooding. These experiences are diverse and vary across the province. Indigenous communities prior to colonization had agency to move their communities as they needed based on their Indigenous Knowledge Systems that have been developed over millennia and passed on from generation to generation. Indigenous communities were forced to settle on small pieces of land often in areas not valued by settlers. Many Indigenous communities face repeat flood events and are restricted by reserve boundaries.

One community shared a recent story when flood and extreme weather resulted in a slide that pulled trees into a local river near an important bridge, pulling a lot of debris into a salmon bearing river. Another community shared how a local river was diverted for industry benefit that resulted in repeat flooding of their community and they have since been displaced from this area. Although, the industry is no longer in operation the river was not restored to its previous state. In some coastal Indigenous communities, there has been awareness and action to address flood risk for years. In other coastal communities flooding is not a current issue, however future risk of sea-level rise and what that means for homes and infrastructure located in vulnerable locations near ocean front is becoming more urgent.

Theme	Details
Objective 1: Understanding Indigenous community stories of strength and success regarding flood management.	
Indigenous communities are preparing for flood risk using risk assessments and vulnerability studies	<p>Most Indigenous community representatives shared stories of success in understanding their flood risk through the development of risk assessments and vulnerability studies.</p> <ul style="list-style-type: none"> ○ Many of these communities are looking at options to address risks outlined in their assessments. These risk assessments have recommendations for consideration and communities are in the process of deciding on the best path forward. ○ One community is looking at flood within the umbrella of a resilience strategy.
Risk assessments are informing land use plans and decisions	<p>Some communities shared that the flood assessments are informing land use decisions on reserve.</p> <ul style="list-style-type: none"> ○ One community is heeding the warning of their study and built a new fire hall well above the minimum flood level. This fire hall also serves as the emergency center meaning that this center will be in a 'safe zone'. ○ Another community shared that flood considerations are built into their land use plan. The areas that are most subject to flood has influenced the suggested land uses for those areas.
Natural methods are important to explore in flood risk mitigation	<p>In consideration of what methods are taken to mitigate flood risk, Indigenous communities are interested in exploring natural methods.</p> <ul style="list-style-type: none"> ○ One community is interested in exploring the use of kelp as a wave inhibitor to protect homes and shoreline. This is an example that is aligned with the community's culture and knowledge system.
Emergency preparedness is a central focus	<p>Many community representatives are taking actions toward emergency preparedness.</p> <ul style="list-style-type: none"> ○ One community accessed funding to put up signs to let public know where to go to get to safe zone. Another community installed a Tsunami siren. ○ Additionally, communities are seeking out emergency response training for teams such as their local fire department.
Successful relationship building with external partners	<p>Indigenous communities are taking initiative to build relationships with external partners such as governments, organizations and funders.</p> <ul style="list-style-type: none"> ○ One community discussed the importance of bringing together a team to address flood risk and in the event of an emergency they would have a great core of people to rely on. It is important to work with funders and EMBC especially in the case of an emergency.
Community resilience is tied closely with community knowledge.	<p>Some communities have engaged their Elders and Knowledge Holders to understand impacts and stories of flooding over the years "the information they provided is vivid and valuable".</p> <ul style="list-style-type: none"> ○ Community knowledge about how creeks historically flooded and how much snow there was that lead to flooding gave a "good heads up." ○ "No matter what kind of struggle, climate has been changing for a long time, since the ice age, identify issues and overcome them as they come at you, historically look back – famine, war, recognize world is changing and make community more resilient to whatever is happening."

Theme	Details
Objective 2: Understanding Indigenous community challenges and gaps with regards to flood management.	
Flooding is an overwhelming issue and it can be challenging to engage community members.	<p>Community engagement is very important. Community members need to be informed regularly about details of flood risk management efforts.</p> <ul style="list-style-type: none"> ○ One community is considering replacing riprap. Need to let community know exactly what is happening to put people’s minds at ease. ○ Challenge talking about future impacts especially when there are no current impacts, it can overwhelm community members. However, need to plan for the future and think about future generations.
Lack of recognition and valuing of Indigenous Knowledge	<p>Indigenous communities have extensive local knowledge of flood risk and the history of flood in their territories however this knowledge is not adequately respected and recognized.</p> <ul style="list-style-type: none"> ○ Communities don’t have an engineer’s stamp- that is what holds weight with in assessments.
Infrastructure location, resilience and up-keep	<p>Indigenous communities understand that there is no easy fix for this issue.</p> <ul style="list-style-type: none"> ○ What can we do to make homes more resilient to flood? ○ Current infrastructure is failing - Riprap needs to be replaced ○ Communities cannot easily move away from the rising flood water
Funding is inaccessible in multiple ways.	<p>Indigenous communities experience gaps in funding for flood risk management.</p> <ul style="list-style-type: none"> ○ Funding is segmented and it is challenging to address all community needs and meet predetermined criteria. There are different eligibility requirements, adding complications. ○ The people in charge of funding always seems to be changing, a new person means there is a need to re-tell story. This is a lack of continuity; same thing is true for other projects.
Often Indigenous communities do not have adequate capacity to deal with flood risk.	<p>Indigenous communities are addressing flood risk with differing levels of capacity.</p> <ul style="list-style-type: none"> ○ One community expressed the need to have own first responders, especially when the community is remote. There is a feeling of always chasing money to pay someone to do the job for you. ○ Another community expressed that they don’t have someone that is dedicated to this work. They are doing this work ‘off the side of their desk’. They have multiple roles and flood is one of many. Need a support person to help access external resources, it falls back on capacity problem.
Flood monitoring and mapping is inaccessible	<p>Some communities have flood monitoring capacity and many do not have adequate access.</p> <ul style="list-style-type: none"> ○ One community expressed that smaller remote communities have access to less provincial flood monitoring data compared to larger communities. They need to write grants to get money to invest in monitoring systems, and systems are expensive. ○ There is a need for good mapping to be shared. Industry and government have high quality mapping, and it is expensive for Indigenous communities to have access to hydrology data without holding grant.
Access to some Indigenous communities is limited	<p>Some communities only have one road into community and out of community. This is an important issue to address as in the case of evacuate.</p> <ul style="list-style-type: none"> ○ One community is looking at upgrading a second road for evacuating community (<i>Egress</i>)

Theme	Details
Objective 3: Identifying opportunities for improved collaboration and coordination within and across authorities to address current challenges and gaps while improving efficiency and effectiveness.	
Elements of good flood governance	<p>Knowledge holders and experts are valued, utilized and respected.</p> <ul style="list-style-type: none"> ○ One community has conducted a lot of interviews with community elders, they asked the right people to inform the research. The study was successful because they went to Knowledge Holders at the beginning, went right to the source. ○ It is important to include Knowledge Holders and stories from Elders. “Go out to fishing camps, go with aunts and uncles, talk about changes witnessed over time, fish and hunt and gather. What better knowledge to gather than from those people, camping out, today-traveling by boat.” <p>Learn from Indigenous community examples like the Guardian Watchman program.</p> <ul style="list-style-type: none"> ○ A program like the Guardian Watchman, where nations have people to watch the land. ○ One community explained “There are river people, they always polled up the river and down the river, waterways were the fastest ways to get around, you didn’t want anything to happen to the ‘highways’, dealt with log jams immediately. Eyes on the waterways marking it down, keep record, have people there.” <p>Understand the unique perspectives an Indigenous community has regarding stewardship.</p> <ul style="list-style-type: none"> ○ What does stewardship mean for your own community? This question needs to be answered for each community as every community is unique. <p>Develop good awareness of localized flood risk.</p> <ul style="list-style-type: none"> ○ Indigenous communities need to be prepared for flood risk. Awareness of flood risk can result in a longer response time. This includes having adequate access to data. Need to have an adequate number of stations monitoring hydrometrics. <p>Consider the entire watershed and work with neighbors in a watershed.</p> <ul style="list-style-type: none"> ○ One community expressed that being at the confluence of two major rivers, there are a lot of players up stream, building relationships with these communities is crucial. <p>Indigenous communities require the authority to govern their territories and to mitigate impacts to watershed.</p> <ul style="list-style-type: none"> ○ One community shared that they consider water quantity when looking at timber referrals, as loss of tree cover will lead to run off. There is frustration that communities are not able to comment on issues that may influence flood (e.g.: industry), and see integration as a way of achieving real results. ○ Many communities are working to understand the cumulative effects of industry, land use, and development on local flooding. ○ Indigenous governments need to lead land stewardship. Industries such as logging needs to happen in line with Indigenous stewardship protocols. For example, if an Indigenous community asserts that building can only occur 20 meters from a stream rather than the common 2 meters, this should be respected.

Theme	Details
Objective 3: Identifying opportunities for improved collaboration and coordination within and across authorities to address current challenges and gaps while improving efficiency and effectiveness.	
Funding to address Indigenous territories holistically	<p>Funding needs to move beyond reserve perspective to include Indigenous territories and include a watershed perspective.</p> <ul style="list-style-type: none"> ○ First Nations Adapt only applies to reserve. Since it is a federal program it can't extend beyond the boundaries of the reserve, nor look at other locations that are important to a community. Including community areas outside of reserve areas can improve governance. Flood events don't respect boundaries of any kind.
Meaningful reconciliation is fundamental	<p>Flood governance needs to respect the rights and needs of Indigenous people. Anything external in terms of collaboration boils down to the need for reconciliation.</p> <ul style="list-style-type: none"> ○ One community shared that Indigenous communities were dealt a terrible hand, did not choose where their community is located. This is an example of mistreatment. Real challenges will require working government to government and with major natural resource sector. ○ One community suggested that there is a need for recognition of historic problems. This interviewee shared that it took them 1 hour to write a 2-paragraph email that would explain this in such a way that could lead to change.
Building strong relationships	<p>Non-Indigenous governments need to take initiative to build relationships with your neighbours, build relationships one-on-one can result in important successes, especially in emergency situations.</p> <ul style="list-style-type: none"> ○ One community participant shared that when you meet face to face you get results and can work on making things better. "This is governance - your office speaking with my Nation." This participant shared that there should be a provincial mandate to telling governments and organizations to reach out and work in relationship with Indigenous communities. The minister of FLNRO should direct regional managers from every office "to do better." However, it is important that Indigenous communities do not wait for regional managers and governments to take the initiative as it will take time for attitudes to change.
Increase capacity of non-Indigenous governments to work with Indigenous communities	<p>Non-Indigenous governments need to develop their capacity to work in partnership with Indigenous communities.</p> <ul style="list-style-type: none"> ○ One community participant shared that if local governments had more capacity to work with Indigenous communities, if they could find the right representative that could come work with you it would make a big difference. ○ Non-Indigenous governments and organizations need to learn about the history of the Indigenous territories in BC and specifically those they are on.
Utilize Indigenous organizations such as First Nations Leadership Council	<p>Indigenous communities can use political organizations such as the First Nations Leadership Council to advocate for important issues around flood governance.</p>
Consider the spiritual nature of water	<p>Many Indigenous communities consider a holistic perspective which values the spiritual nature of water. This cultural relationship with water is important to consider in any governance model that will be inclusive of Indigenous world views and it is important to have this</p>

	<p>awareness when working together. Similar to wildfire, there are some communities that do not see water as inherently bad, in fact there can be some restorative benefits to wildfire and flood.</p>
EMBC has a good flood toolkit	<p>Ensuring that tools and resources that exist are made accessible to Indigenous communities.</p> <ul style="list-style-type: none"> ○ One community shared that the EMBC toolkit will guide a community on the ministries that need to be contact and the type of resources you will need in your community such as heavy machinery.
Revenue sharing	<p>There is interest in seeing revenue from tax shared with Indigenous communities to support flood management.</p> <ul style="list-style-type: none"> ○ One community representative suggested that the carbon tax and stumpage fees should have a portion that is shared with Indigenous communities.
New land negotiations	<p>In some cases, Indigenous communities will need new lands for their communities to retreat to and this is especially the case for coastal communities. This issue needs to be addressed with appropriate levels of government.</p> <ul style="list-style-type: none"> ○ One community recommended that retreat advocacy can be done through political organizations like First Nations Leadership Council. ○ Issues such as sea level rise, climate change and flooding need to be viewed as a rights issue under DRIPA, and consider reconciliation at the forefront of any land negotiations.
Respect the land and water	<p>There is a strong need for everyone to respect the land and water.</p> <ul style="list-style-type: none"> ○ One interviewee shared: "To me, more political then technical, people need to start respecting lands more than they do. Logging is ruining rivers, probably a lot - because we are so small, we don't live in homelands, in old villages, might know what is going on – Need respect for lands, we meaning the entire world Including Indigenous communities. One of the main things." This participant shared the word for respect in their language.
Differentiate between flooding from rivers and rise in sea levels.	<p>There should be a distinction between river flooding and sea level rise.</p> <ul style="list-style-type: none"> ○ One community shared the importance of linking mitigation to flooding, and the need to understand and prepare for sea level rise, tsunamis, and river flooding. There is a need for special attention for each of these types of flooding.

3.2.2 Findings from Stakeholder Interview Phase

The findings from interviews with stakeholders are outlined in the following section. Interviews were conducted with 6 local governments and regional districts.

Stakeholders Interview Findings

General comments:

Overall communities have many successes and are developing flood resilience even though they face limitations such as varying levels of knowledge and capacity in flood management, and incongruent access to data to support flood management decision making.

Many local governments rely on risk assessments and planning to increase resiliency in vulnerable areas. One participant shared “planning with the flood impacted areas ahead of time has shown to increase resilience in these areas and has prevented them from requiring evacuations during minor to moderate flood events. Community alerting and education about what to do in the event of a flood has shown to empower residents to take proactive measures when it comes to protecting their property and safety.”

Innovative thinking in flood management is spurred on by increasing flood events in recent years, and interest in understanding and adapting to climate change such as sea level rise. There is a sense of urgency that is leading to an openness to new thinking.

Throughout the interviews conducted, stakeholder participants expressed a sincere interest in providing information that would support the work that FBC has set out to do. Participants were positive in their tone, and cautiously optimistic of the process to come, including eagerness to contribute to improvements in flood governance in BC.

Additionally, many non-Indigenous communities feel they do not have the knowledge, funding or capacity to meaningfully implement the Declaration on the Rights of Indigenous Peoples (DRIPA). However, some local governments have taken initial steps to engage and work in partnership with local Indigenous communities, in some cases with the support of Indigenous engagement specialists.

Theme	Details
Objective 1: Understanding local government and regional district stories of strength and success regarding flood management.	
Floodplain management bylaw	Communities are utilizing the governance tools that they have available to them such as the bylaws for floodplain management. <ul style="list-style-type: none"> ○ One community shared that the bylaw is probably one of our strongest regulatory tools. It requires properties maintain a minimum setback on the water body, as well as achieve minimum flood construction levels with elevation above projected flood levels, and other kinds of regulations.
Combined approach includes a riparian perspective	Including consideration of riparian areas means looking for conditions where wildlife can be sustained.

	<ul style="list-style-type: none"> ○ One community shared that their biologists look at conditions of the creek and that urbanized or straightened waterways can lose the of ability to sustain fish. “You can’t narrow a flood plain and expect fish to survive- there is an impact of erosion.”
Choosing to live with the water	One community shared that they are in a unique place, have a blank space, and have learned from others experience. You can choose to live with the water and choose a landscape design that will reduce risk but still create opportunities for water and people.
Watershed perspective, working with neighboring communities	<p>It is important to consider a watershed perspective where possible, to work with your neighbors and consider how your decisions might impact those downstream.</p> <ul style="list-style-type: none"> ○ One community held a referendum to create a Watershed Planner position at the regional district level to support the important work of planning for a healthy watershed. ○ One community shared that creeks have been straightened resulting in higher flood risk and remodifications of these creeks are being considered to protect smaller communities downstream. They are trying to repair through flood protection, including riparian restoration.
Existing resources for homeowner’s	One community shared that they have homeowner resources and promote opportunities for neighborhood planning. Their approach is to provide as much information, education to homeowners so they can make the most appropriate decisions for themselves regarding flood risk management.
Emergency preparedness	<p>Communities have invested in emergency preparedness.</p> <ul style="list-style-type: none"> ○ One community has an alert system that residents can sign up, and it is well subscribed to, and is being very useful. They have evacuation plans, emergency plans, and our root system in place, as well as operational guidelines.
Public engagement is ongoing	<p>Most of the participants talked about community engagement as an aspect of their flood risk management process. Most noted that community engagement requires thought and care especially when it comes to the language you use.</p> <ul style="list-style-type: none"> ○ A community participant shared “It is important to be frank and honest about what is not known about flood with the public that using clear and concise language around sea-level rise is important. You do not need to have all the answers to begin preparing, it is about the pathways to take you there, use visuals, establish transparency and trust, the conversations are not always comfortable. The sky will not fall if you put up a flood map, and ask <i>Is this of value?</i>” ○ It was noted that the term preparedness seems to be more accessible than climate change. It is important to use different language to talk to different people. Make technical language more accessible.
Indigenous histories present a larger/longer view of water	Approximately half of the participants talked about the importance of Indigenous engagement.

Theme	Details
Objective 2: Understanding local government and regional district challenges and gaps with regards to flood management.	
Need support in knowing how to respect Indigenous rights	<p>Stakeholder communities are unsure how to operationalize DRIPA.</p> <ul style="list-style-type: none"> ○ Local government staff need training and learning on how to work with local Indigenous communities, especially as they work in important areas that have historical and archeological meaning.
Lack of adequate and stable funding sources	<p>Communities have a need for stable funding in order to support important decision making and prioritization of flood risk management strategies.</p> <ul style="list-style-type: none"> ○ One participant felt unsure about the principles needed to guide funding decisions and whether they should rely on central funding or taxes, or provincial or federal governments ○ One regional district shared that funding sources such as the Community Emergency Preparedness Fund do not provide enough financial support to adequately address the needs of a large regional district. This has led to the exclusion of Indigenous Knowledge in the risk assessment process.
Lack of regional coordinating bodies	<p>Some mentioned reference to existing regional coordinating bodies and others stated a need for a coordinating body.</p> <ul style="list-style-type: none"> ○ One community believed that a coordinating body is needed to manage and guide flood management.
Lack of capacity	<p>Local governments generally don't have access to the professionals needed for flood risk management such as engineers. Sometimes there is a disconnect between planners and engineers as they "speak different languages."</p>
Mental health impact	<p>One regional district shared that the impacts of repeated flood events have resulted in community members that are hyper concerned and stressed about future potential floods. The financial impacts of flooding also add to mental health strain on communities.</p>
Ridged governance systems don't allow for new ways of thinking	<p>Some respondents shared that the current governance system does not allow for creativity, new ways of thinking or reflect diverse values.</p> <ul style="list-style-type: none"> ○ One community noted that the system is based on logic long ago and that there is a need to "expand the toolbox" ○ One stakeholder noted that the Community Charter outlines flood governance and focuses on life and safety, and that other broader diverse values are not reflected.
Homes and Infrastructure in flood plains	<p>One community noted that an important challenge is "having people who live in known flood plains and nowhere else to go."</p>

Theme	Details
Objective 3: Identifying opportunities for improved collaboration and coordination within and across authorities to address current challenges and gaps while improving efficiency and effectiveness.	
Elements of good governance	<p>Clarity of power and authority</p> <ul style="list-style-type: none"> ○ There is a need for clarity regarding who has authority, who has the power to do what. The role and mandate of any governing body should be clear and transparent. ○ One respondent shared: “It is like a constellation- how I engage with those who make decisions should be very clear. Clear vision, mission, rules, values, and principles to guide process.” <p>Stable funding and commitment</p> <ul style="list-style-type: none"> ○ There needs to be commitment to provide funding that will be there for 20 years. <p>Available up to date high-quality data</p> <ul style="list-style-type: none"> ○ Need to understand and address data gaps such as updated sea level rise data, river systems, climate change impacts on flooding, data for remote communities, ○ Good quality data is expensive and needs to be shared and made available. ○ Awareness of historic flood events. ○ Develop a data acquisition framework and database. <p>Emergency preparedness</p> <ul style="list-style-type: none"> ○ Early warning systems established, search and rescue aware when alerts are issued, support with evacuation if necessary. ○ Aim to be proactive rather than reactive as much as possible ○ One community noted “When rainfall events meet or exceed the trigger points, we inform the flood impacted zones to prepare ahead of time. This allows the residents to activate their own household emergency plans and to alert their neighbours to the possibility of flooding. A proactive approach has worked best for the flood prone areas.” <p>Capacity</p> <ul style="list-style-type: none"> ○ High level of awareness of how to develop an OCP and meaningful community engagement process <p>Watershed perspective</p> <ul style="list-style-type: none"> ○ Communities working together in a collective way is an important aspect of flood governance. ○ One participant noted a need to “look at the watershed as a whole – why is it important- show importance, upstream will affect (neighboring communities), and the healthier everything will be.”

Theme	Details
Objective 3: Identifying opportunities for improved collaboration and coordination within and across authorities to address current challenges and gaps while improving efficiency and effectiveness.	
Emergency services need to be streamlined	One community shared that reimbursement to evacuees need to be made more efficient and reliable- "If the guidelines are followed, then it should be a simple response."
Political jurisdiction needs to be planned around natural ecosystems	One community noted that political jurisdiction needs to reflect natural ecosystems.
Provincial leadership around jurisdictional issues regarding watershed authority	Governance in the watersheds can be contentious. <ul style="list-style-type: none"> ○ One community noted that "none of the municipalities or regional districts water services have any ownership of the watersheds that supply drinking water to their residents, they are almost entirely private property. Couple that with the responsibility for storm drainage that is shared by the municipalities and MOTI, and it becomes very difficult to know who is actually in charge of what when it comes to the flow of water from the mountains to the ocean in our region. It would be good if the province provided more leadership on this front."
Need investments in community capacity	There is a need to invest in staff to do flood risk management. <ul style="list-style-type: none"> ○ It is staff's job to collaborate and coordinate across jurisdictions therefore there should be staff dedicated to collaboration and coordination at every level of government. There should be a requirement to report out on flood governance to ensure accountability.
Increase protected areas	Protected areas play an important role in buffering the impacts of floods on communities. <ul style="list-style-type: none"> ○ One idea was shared that BC Natures Trust could buy more land as an important part of the water system as land holds the water and provide flood protection method. ○ Another community shared that riparian areas could be protected through the province or through local governments using setback of 20 meters. (A 20-meter setback was also noted as important by an Indigenous interviewee).
Learn from international jurisdictions	Communities suggested looking to other jurisdictions as examples of flood governance best practices. <ul style="list-style-type: none"> ○ In the UK they have legislation that provides the authority for regulating water management at the environmental agency level and local level. ○ In the US they have models for 60% of river systems. In BC we have large gaps in data. This information is made public on FEMA website.
Develop a design process	A design process which supports a shared values-based method is desirable. <ul style="list-style-type: none"> ○ One community wanted to see a process developed that gets away from check boxes. ○ Criteria framework would be developed with relevant partners that determine own standards based on values of community allowing for more alignment of governance processes. For example, certain things would be deemed not acceptable, like fish passage, targeted water quality that is good, holistic perspective that recognizes that "everything is tied to water, we all rely on water."

Governance model

Communities shared many ideas for the way that governance needs to be structured. Many of these ideas overlap and interconnect.

- A model that includes a mechanism for staff to share recommendations with senior administrators and decision makers that can shift ministry level work plans.
- A place for concerns to be raised regarding funding or programs.
- Embedding another layer into the governance process, responsible for cumulative effects, land use analysis, regional and watershed planning and collaboration.
- Sharing responsibility- Communities and province need to work together to enable OCP and zoning to avoid some areas, and allow wetlands treated more as an asset – through buying out old title to create protected areas, some relaxation of the RAR to clean out channels at a time that will not harm fish.
- Downloading provincial authority to municipalities who have limited authority to manage water systems, watershed protection.
- One participant shared “there should be more flexibility as the community knows the situation better than anyone, and if they require the resources for a response, it should be quick and easy and supported by other levels of government.”

4. Final Considerations

The final considerations are a culmination of the themes from input and feedback we heard throughout the project (i.e.: BC Flood Strategy engagement, Indigenous and stakeholder interviews). These considerations are intended to inform the development of the FBC Investigations in Support of Flood Strategy Development in BC- Issue A: Governance report.

It is critical to note that the project team has gathered information through listening to participants through interviews, and is sharing insights from participants in good faith to inform approaches to improve coordination and collaboration of flood governance in BC. The work completed throughout this project was limited in scope and aimed to identify preliminary ideas and next steps to inform the development of flood governance strategies.

Through this initial phase of work, the project team recommends that future work on flood governance in BC requires an expanded engagement approach and must be guided by all who are impacted by any changes to the current system including all levels of government. In terms of Indigenous engagement, our team recognizes that the limited engagement does not fully meet the requirements of the Declaration on the Right Indigenous Peoples Act, we recommend further more broad engagement and partnerships as an important next step.

Overall, it was clear that there are many ideas for improving the current flood governance model and a depth of knowledge from the participants shown in their feedback. It is important to review all of the Interview findings presented in this report and to consult the Bridging our Knowledge Towards Indigenous Flood Resilience in BC: 2021 Indigenous Engagement Summary Report. That said, overarching themes are offered below as a summary for this report are common between Indigenous and stakeholder participants unless noted as specifically pertaining to Indigenous communities. The bold points are overlapping with the BC Flood Strategy engagement report (from section 2), in order to show the interconnections.

Key Theme 1: Capacity issues need to be addressed for successful flood governance.

- **Support capacity-building initiatives in communities to strengthen flood management and in working towards flood resilience.**
- Need for positions that are dedicated to flood risk management such as first responders and someone to help access external resources.
- Need for training programs that are dedicated to flood risk management.
- Increase access to trained professionals such as engineers especially for rural and remote communities.
- Increased capacity and education of non-Indigenous governments to work in partnership with Indigenous communities and implement DRIPA.
- Increased awareness of important flood management skills such as knowledge of how to develop and OCP, engage and communicate with community members, and how to review and create good flood maps.

Key Theme 2: Access to consistent and stable flood governance funding

- **There is a need for funding that is multi-year and no-strings-attached. In addition, communities would benefit from better coordination of funding opportunities between funding bodies.**
- Funding is segmented and it is challenging to address all community needs and meet predetermined criteria. There are different, complicated eligibility requirements.

- In many cases, the point people for funding programs always seems to be changing, a new person in a key position like this trigger the need to retell one's story. This lack of continuity has a significant impact, particularly for Indigenous communities.
- Larger funding pots need to be available to larger governing bodies such as regional districts or Indigenous territories.

Key Theme 3: Regional and watershed collaboration and coordination

- **Challenges related to jurisdiction over waterways lead to increased flood risk. While experiences vary across the Province, participants noted that relationships with other First Nations, municipalities, and regional districts, in addition to higher-level Bilateral and Tripartite relationships and coordination across Ministries is crucial for effective flood management in their communities.**
- Consider the entire watershed and work with neighbors in this watershed. There are many neighbors in a given watershed and building relationship with these communities is crucial.
- It is important to consider a watershed perspective where possible, to work with your neighbors and consider how your decisions might impact those downstream.
- Communities should have access to Watershed level coordinator position to support the important work of planning for a healthy watershed. Look to communities and regional districts who have examples of these position in place already.
- Multiple communities talk about changes made to waterways to make them smaller and more direct for industry or development. These changes increase the vulnerability to communities downstream.

Key Theme 4: Additional coordination and collaboration support for flood governance

- **Development of a network of Indigenous-led watershed-level authorities (in terms of a mutually-supportive brotherhood/sisterhood) to monitor and collect data, maintain local knowledge bases, and ensure clear roles, communication, and consistency over time. A pilot project of one to three Authorities could test the merits of the concept. These Authorities could function as Indigenous led-centres of excellence in flood resilience with full time staff able to assist communities in all areas of flood and water management, including grant writing.**
- A comprehensive flood governance model needs to include a mechanism for staff to share recommendations with senior administrators and decision makers that can shift ministry level work plans and raise concerns regarding funding or programs.
- Flood governance is a shared responsibility- Communities and the province need to work together to enable OCP and zoning to avoid some areas, and allow wetlands to be treated more as an asset – through buying out old title to set aside as protected areas.
- Clarification and leadership from province on watershed authority and protection.

Key Theme 5: Access to high quality data and mapping

- **Need for respectful and reciprocal sharing of information and data, with better appreciation for and inclusion of Indigenous knowledge in flood management. Many Indigenous communities in B.C. are trying to plan for flood risks using inaccurate and out-of-date data. There is a need for richer and deeper data including community-specific work on hydrology, hydrogeology, geomorphology, bathymetry, scour assessments and river system dynamic analysis. Without this**

information it is challenging to know what types of flood risks to prepare for, and it is impossible to become resilient without understanding the risks communities face.

- Need to understand and address data gaps such as updated sea level rise data, river systems, climate change impacts on flooding, data for remote communities, awareness of historic flood events.
- Good quality data is expensive and needs to be shared and made available.
- Develop a data acquisition framework and database.

Key Theme 6: Indigenous self-determination is required

- **Having the ability to participate, plan, and make decisions for yourself, your family, your community, your nation and your land, based on inherent rights, knowledge and natural law, and without the interference of colonial policies and practices. The BC Flood Strategy should set the conditions to enable Indigenous peoples to express agency and self-determination in unique, creative ways that are relevant to their needs.**
- Authority of Indigenous communities to govern their territories and to mitigate impacts to watersheds and oceans.
- Ability to comment and influence issues that could influence flood in an Indigenous community or territory such as industry practices.
- Proper lands stewardship that is directed by Indigenous governments.
- Meaningful reconciliation is fundamental.
- Take initiative to build meaningful relationships between non-Indigenous and Indigenous communities.

Key Theme 7: Respect for Indigenous People and Knowledge Systems

- **First Nations and Indigenous communities must be supported to determine what flood resilience means to them, and what their needs and goals are within their specific contexts.**
- Indigenous community resilience is tied closely with Indigenous community knowledge. Some communities have engaged their Elders and Knowledge Holders to understand impacts and stories of flooding over the years “the information they provided is vivid and valuable.”
- Community knowledge about how creeks historically flooded and how much snow there was that lead to flooding gave a “good heads up.”
- Indigenous communities have extensive local knowledge of flood risk and the history of flood events in their territories. However, this knowledge is not adequately respected and recognized.
- Flood governance needs to begin with Knowledge Holders and community experts. Connect with those who are out on the land. This indicates the need for more engagement on flood governance.
- Learn from Indigenous community stewards like the Guardian Watchman program. A program like the Guardian Watchman, where nations have people to watch the land.
- Every community is unique and has diverse perspectives on stewardship and flood governance. Need to learn the history of the Indigenous peoples whose territory settler governments occupy.
- Consider the spiritual nature of water. Many Indigenous communities consider a holistic perspective which values the spiritual nature of water.

5. Appendix

5.1 Interview questions:

All of the questions are suggestions meant to guide the conversation. There is no need to cover all the questions, or go in order. The conversation was meant to cover what is important to the Indigenous community and local government representatives flood governance. The following questions were used in all 13 interviews.

When referring to governance, generally referring to roles and responsibilities in flood management, coordination and collaboration and allocation/or effective use of resources.

Community Flood Management:

1. What stories of strength does your community have in preparing for flood and building flood resilience?
2. What is your community currently doing to manage flood risk? What is your role when it comes to flood management?

For example:

- Does your community have a flood risk assessments or plan(s)?
 - Structural flood risk reduction measures:
 - i. Conventional dike along a river bank, sea dike, set-back dike, flood wall riprap, etc.
 - Land Use Strategies:
 - i. Prohibit building and development in certain areas etc.
 - Tools to manage building and development in floodplains?
 - i. Comprehensive Community Plan, Land Use Plan, Infrastructure Plan, Bylaws etc.
 - Does your community practice flood monitoring? (data collection)
3. In reference to the previous question, what is working well in your community approach?
 4. What resources or services is your community accessing to support flood management?
 - These services could be in support of planning, implementation, investments, monitoring.
 - Is your community involved or partnered with any external governments or flood plan(s)?

Understanding challenges:

5. What challenges is your community facing with flood management systems?
 - Are there any limitations or gaps in your community's flood management?
6. What resourcing gaps or challenges exist with accessing flood governance services and support?

- Challenges could include funding, expertise, relationship based, land use, resources that exist or are needed, guidance documents for flood mapping.

Suggestions and Opportunities:

7. What are elements and/or indicators of good flood or watershed governance?
 - Are there elements of Indigenous governance systems that can inform flood governance?
8. What could be changed or added in the current service delivery model that would make it more useful for Indigenous communities, or reflective of Indigenous knowledge systems?
 - How can the province and other governments improve flood governance in a way that promotes respect to Indigenous Peoples?
9. Do you have any suggestions for improved coordination and collaboration across authorities in order to meet the flood management needs of your community?
 - Collaboration examples:
 - i. MOUs, sitting at different government planning tables,
 - Coordination examples:
 - i. Resources in one place, could involve increased regulations

5.2 List of Participants

Indigenous Participant Roles
Fire Chief, Fire and Emergency Services
Climate Action Coordinator
Climate Action Coordinator
Climate Action Coordinator
Climate Action Coordinator
Hereditary Chief
Lands and Resources Coordinator

Stakeholder Participant Roles
Senior Sustainability Specialist
Senior Planner
Chief Administrative Officer
Watershed Planner
Manager of Community Sustainability
Manager of Utility Planning

Appendix D – Complete Visual Summary

