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# NATURAL RESOURCES CANADA GENERAL INFORMATION PRODUCT 155e

## **Recommendations compiled from the 2022 Resilience Pathways Report**

S. Safaie and S. Johnstone

Geological Survey of Canada

2024

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Canada



# RECOMMENDATIONS

*Compiled from the 2022 Resilience Pathways Report*

[DRRPathways.ca](https://www.drrpathways.ca)

This article consolidates all recommendations from *Resilience Pathways Report: Co-creating New Knowledge for Understanding Risk and Resilience in BC* (2022). The Report has the following objectives: a) to share knowledge about existing practices and recent advances in understanding and managing disaster and climate risk in BC, including some information on relevant federal programs, and b) to provide insights on gaps and recommendations that will help build pathways to resilience in BC.

To read all articles in the Resilience Pathways Report, see [DRRPathways.ca](http://DRRPathways.ca).

The Resilience Pathways Report is a project of Natural Resources Canada.

## RECOMMENDATIONS

### COMPILED BY:

Sahar Safaie, Sage On Earth Consulting

Shana Johnstone, Uncover Editorial + Design

### THE PATH FORWARD

This document brings together the 119 recommendations from the 2022 Resilience Pathways Report. The recommendations are specific to each topic covered in the Report, and it is best to refer to the relevant article for context. The commonalities and trends among these recommendations are captured in the Report's Strategic Summary for Policy Makers. All articles can be accessed on the Report's website at [DRRPathways.ca](http://DRRPathways.ca).

Articles 1.1 and 2.1 do not offer recommendations, instead providing an overview of natural hazard threat in BC (1.1) and sharing insight on the existing mechanisms and efforts

in coordinating risk mitigation in critical infrastructure, the status of the national strategy for critical infrastructure, and the upcoming strategy update (2.1).

This first edition of the Resilience Pathways Report convened and connected more than 120 experts from a range of institutions and disciplines to share knowledge, insights, recommendations, and challenges in addressing a path forward for disaster and climate risk reduction in BC. The insights, analysis, and recommendations presented in the Report are not necessarily unique to BC and are relevant—and invaluable—for disaster and climate risk management practitioners across Canada and the globe.

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## (1.2) SNOW AVALANCHES

Recommendation	Description of Impact	Priority Level	Capabilities Needed
1. Improve disaster planning for critical infrastructure.	Emergency preparedness for extreme avalanche events.	Critical	Contingency planning and interagency coordination.
2. Establish long-term funding to safeguard existing avalanche safety systems.	Reliability of critical avalanche information.	Critical	Reliable financial support for Avalanche Canada and Canadian Avalanche Association's InfoEx.
3. Create a mechanism for land-use planners to determine when it is necessary to consult an avalanche hazard mapper.	Avalanche hazards are not overlooked in future developments.	Necessary	Updated Canadian Avalanche Association's Land Managers Guide; planners informed about avalanche hazards.
4. Identify existing developments that are exposed to avalanche hazard.	Avalanche hazards are not overlooked in existing developments.	Necessary	Desktop and field-based province-wide study to retroactively identify existing occupied structures exposed to avalanche hazard.
5. Expand public avalanche bulletin regions to areas not currently covered.	Critical avalanche safety information provides for more areas used by recreationists.	Necessary	Increased financial support for Avalanche Canada.
6. Decrease the size of the regions for the public bulletins.	Reduces uncertainty in avalanche forecasts due to inherent spatial variability.	Necessary	Increased financial support for Avalanche Canada.
7. Design a robust strategy for evaluating and improving the effectiveness of public avalanche safety products.	More effective public avalanche safety products and services.	Necessary	Increased financial support for Avalanche Canada and research programs.
8. Improve the understanding of the needs and perspectives of the increasingly diverse community of backcountry users.	Critical for the design of effective public avalanche safety products that serve all users.	Necessary	Increased financial support for transdisciplinary avalanche safety research.
9. Create systems and tools that increase forecast accuracy based on available snowpack and weather information.	More effective public avalanche safety products and services.	Necessary	Better and more data to support the forecast so that products can be targeted more effectively.
10. Further develop computerized snowpack modelling and terrain mapping.	A warning system that integrates weather models, terrain maps, and snowpack modelling to predict significant avalanche events farther in advance.	Necessary	Better terrain datasets coupled with more support for computerized terrain mapping and snowpack modelling.
11. Investigate capital projects (e.g., Remote Avalanche Control Systems and avalanche detection networks) to help protect transportation corridors and other critical infrastructure.	Highway and infrastructure closure times are shortened, which reduces economic risks.	Necessary	Further investment in avalanche protection for transportation corridors and other critical infrastructure.

## (1.3) LANDSLIDES

Recommendation	Description of Impact	Capabilities Needed
1. Assign responsibility to a single entity, task force, or working group to provide provincial leadership on landslide management issues in BC, and coordinate activities to address gaps.	Gaps identified in this article, as well as other potential issues not listed here, are much more likely to be addressed.	Funding; interagency coordination; leadership.
2. Establish a single responsible entity to maintain a landslide event database for BC that records quantitative information about landslide location, type, size, movement rate, economic loss, damages, injury, and life loss.	Provides a basis for better understanding and assessing landslide risks in BC and how they compare to other risks.	Funding; interagency and research coordination; leadership.
3. Investigate opportunities to improve education of professionals related to landslide risk and risk management practice.	Improves quality and consistency of professional practice.	Funding and leadership.
4. Investigate opportunities to develop a landslide hazard and risk awareness program for the public that educates about where and when landslides occur and how to respond.	Reduces vulnerability and increases resilience to landslides.	Funding and leadership.
5. Complete province-wide landslide susceptibility mapping, with a priority on developed areas. (The State of Washington Landslide Inventory Mapping Protocol is a good example.)	Provides a basis for: identifying landslide-prone areas across the province; province-wide landslide risk reduction planning; and understanding landslide risk across BC.	Funding; provincial lidar coverage; interagency and research coordination.
6. Develop provincial guidance for landslide safety evaluation. As a first step, different policy options should be developed and their benefits/drawbacks assessed.	Improves consistency in the level of landslide risk to manage across the province; reduces inconsistency in how qualified professionals define "safe."	Funding; collaboration between all levels of government, EGBC, qualified professionals, owners, and researchers; leadership.
7. Investigate the feasibility of: 1) establishing landslide insurance for homeowners in BC; 2) improving data sharing between public and private entities; and 3) improving coordination of risk management activities in BC.	Provides a basis for potentially overcoming these complex gaps in current practice, which would likely require governance reorganization or new legislation.	Funding, interagency coordination; leadership.

## (1.4) VOLCANOES

Recommendation	Description of Impact	Priority Level	Capabilities Needed
1. Undertake hazard and risk assessment at “high” and “very high” threat volcanoes.	Makes possible land-use planning and emergency planning based on volcanic hazard and risk; informs monitoring.	Critical	Financial
2. Establish dedicated volcano monitoring at “high” and “very high” threat volcanoes, starting with at least one seismic station, and continuous deformation monitoring with InSAR.	Increases the likelihood of early unrest detection. Informs our understanding of long-term volcano behaviour. Is a first step in building monitoring infrastructure that may eventually be sufficient to forecast short-term behaviour.	Critical	Financial
3. Develop a real-time detection and alerting system for volcanic landslides in the Lillooet valley; develop the necessary concomitant communications systems, emergency plans, and public education.	Makes evacuation possible prior to arrival of a dangerous volcanic debris flow (which is most likely to occur in the absence of any volcanic unrest), thus reducing loss of life.	Critical	Financial and legislative (because such a system would require significant interagency cooperation and roles and responsibilities for this are unclear).
4. Develop a volcano risk governance framework.	Enables efficient and effective data-driven decision making before, during, and after a volcanic crisis.	Critical	Financial and legislative (because such a system would require significant interagency cooperation and roles and responsibilities for this are unclear).

## (1.5) WILDFIRES

Recommendation	Description of Impact	Priority Level	Capabilities Needed
1. Sustain funding and support for wildfire resilience planning and capacity building in vulnerable communities, including pre-suppression and evacuation planning.	Vulnerable communities have effective community wildfire resilience plans and enhanced risk reduction capacity.	Critical	Policy, financial
2. Integrate risk reduction planning and coordination across wildfire prevention, preparedness, response and recovery organizations, and levels of government, including an integrated spatial database of hazard and risk information and common operational picture of active incidents.	Improved “whole system” resilience.	Critical	Practice
3. Develop a better understanding of what makes for a fire-resilient community and policies or standards to foster adoption of FireSmart measures for development and construction in fire-prone areas; develop best practices for presuppression and evacuation planning.	More fire-resilient developments and structures.	Critical	Policy, technical
4. Enhance Indigenous and community forest stewardship and include local expertise in identifying assets at risk and in risk reduction plans.	Indigenous and rural communities have greater influence on fire hazard reduction and decision making.	Critical	Policy
5. Increase prescribed burning capacity, reduce liability for prescribed burning for risk reduction, and increase opportunities for Indigenous-led burning.	Increased use of prescribed and cultural fire; more resilient landscapes.	Critical	Technical, policy
6. Integrate forest management, landscape fire management, and community level plans, including forest industry participation; integrate with multi-hazard planning.	Enhanced landscape and forest resilience to fire across multiple scales (within and beyond the WUI) and interacting hazards, such as floods and debris flows.	Necessary	Policy, technical
7. Increase capacity in risk assessment, risk management, and recovery planning; renew regional fire committees to share best practices and research; communicate case studies of successful community-level risk reduction; outreach and education for elected officials and general public.	Continuous improvement in risk reduction and resilience planning; a broader common vision of what success looks like.	Necessary	Technical

## (1.5) WILDFIRES, CONTINUED

8.	Renew the BC <i>Climate Change and Fire Management Research Strategy</i> , including research into fuel treatment efficacy and to identify barriers and opportunities for uptake of proactive fire management.	Enhanced scientific and social basis for proactive wildfire management.	Necessary	Technical
9.	Research physical and mental health effects of wildfire and mitigation solutions on emergency response personnel, evacuees, and the general public.	Practices to maintain personnel wellness and understanding of determinants of wellness.	Necessary	Technical
10.	Encourage leadership from civic leaders and influencers, sustained messaging and outreach about living with fire, promotion of prescribed fire, fuel treatments, and property-level mitigation.	Greater cultural acceptance of fire; more engaged public.	Recommended	Policy, technical
11.	Enhance ability to predict wildfire surges and surge capacity.	Increased preparedness for surges in fire activity.	Recommended	Technical



## (1.6) COASTAL FLOODS

Recommendation	Description of Impact	Priority Level	Capabilities Needed
<b>Understanding Disaster Risk</b>			
1. Develop strategic shoreline management plans for all coastal reaches in BC.	Provides a strategic framework for managing risk (to guide more specific, local actions) and defines system boundaries within which whole-of-society needs, risks and opportunities are identified. Raises public awareness of risk. Takes a long-term view.	Necessary	Federal and/or provincial government leadership; multi-disciplinary expertise and whole-of-society participation.
2. Develop a more comprehensive understanding of flood hazard event types and scenarios impacting coastal communities.	Increases awareness and understanding that multiple event types can impact communities. Moves towards an “all hazards” understanding of risk.	Necessary	Federal and/or provincial government leadership; multi-disciplinary expertise and whole-of-society participation.
3. Conduct comprehensive post-event analyses that consider stakeholder and community values.	Establishes a cycle of continuous improvement where learnings from flood events inform planning and preparedness in ways that reflect stakeholder and community values and perspectives.	Necessary	Federal and/or provincial government leadership; multidisciplinary expertise and whole-of-society participation.
4. Establish an integrated, province-wide coastal monitoring network and program.	Provides the baseline data needed to support flood risk assessment, forecasting and early warning, adaptation planning, and preparedness.	Recommended	Sustainable, long-term funding; federal and provincial government commitment and accountability; partnership with private sector and academic/non-profit technical specialists.
5. Enshrine risk-based approaches and a broader portfolio of adaptation strategies in updated provincial guidance on coastal flooding.	Modernizes provincial coastal flood risk management practice and expands portfolio of risk management strategies.	Recommended	Adequate funding for updates to guidance; peer review of guidance prior to publication.
<b>Strengthening Disaster Risk Governance</b>			
6. Implement UNDRIP best practice guidelines in flood management and increased First Nations participation in all aspects of risk reduction.	Meaningfully engages First Nations and includes Traditional Knowledge in decision making.	Critical	Competencies needed, technical guidance and training to enable practitioners to implement UNDRIP; financial capacity to First Nations to meaningfully participate.

## (1.6) COASTAL FLOODS, CONTINUED

7. Harmonize and modernize regulations and guidelines.	Reduces conflicting regulations/guidelines that prohibit implementation of risk reduction measures and innovative solutions.	Necessary	Public awareness to build political support.
8. Establish risk reduction mandates.	Enables information sharing to understand risk and increased collaboration to implement risk reduction measures.	Recommended	Public awareness to build political support.
<b>Investing in Disaster Risk Reduction</b>			
9. Set up sustainable funding and planning.	Allow for long-term planning and implementation of solutions outside of the status quo.	Critical	Long-term, sustained cost sharing programs to implement strategic work.
10. Streamline, consolidate and modernize funding programs and application processes.	Enables flood risk managers to quickly and easily access funding streams for a broader range of risk management activities and works (e.g., for green infrastructure). Align DFAA funding with “build back better” principles.	Necessary	Engagement at multiple levels of government; communications expertise; financial resources needed.
<b>Enhancing Disaster Preparedness for Effective Response and to “Build Back Better”</b>			
11. Increase capacity and reduce barriers to implementing natural and nature-based solutions.	Sets out a path forward for solutions outside of the status quo. Avoids decisions of regret. Provides more sustainable options for managing flood risk. Harnesses ecosystem services to deliver multiple co-benefits.	Necessary	Competencies needed, invest in training programs for professionals; financial capacity to support pilot projects; harmonization of regulations; long-term research and monitoring programs centred around pilot projects.
12. Develop and maintain a province-wide coastal flood forecasting system.	Provides early warning to communities and emergency managers to enhance preparedness.	Necessary	Initial investment to bring existing systems up to “state-of-the art” and sustained, ongoing financial investment to maintain and operate.
13. Raise performance standards for buildings and infrastructure to provide enhanced resistance and resilience.	Reduces residual risk, emergency response resource demands, and post-flood recovery times in the event of flood exposure.	Necessary	Investment in rapid advancement of building codes, and/or alternative mechanisms (e.g., standards); training of construction professionals; insurance industry involvement.

## (1.7) EARTHQUAKES

Recommendation	Description of Impact	Priority Level	Capabilities Needed
<b>Enable strategic and coordinated earthquake risk management</b>			
1. Develop a provincial strategy and plan for a coordinated and holistic approach to reduce seismic risk in BC in alignment with the Sendai Framework.	Aligns components of earthquake risk management with different levels of governments; brings clarity on roles and responsibilities and long-term plans for reducing seismic risk in BC.	Critical	Legislation, technical, financial
2. Gather best practices and guidelines for key components of earthquake risk management at the local level.	Supports risk reduction and preparedness.	Necessary	Technical
<b>Advance understanding of earthquake risk, its drivers, and information sharing</b>			
3. Gain a better understanding of interdependencies and cascading impacts of earthquakes on critical infrastructure through scenario planning.	Scenario planning brings different CI owners and providers together to discuss and understand interdependencies, cascading impacts, and capabilities for risk reduction.	Critical	Technical, financial
<b>Effectively share data and information with users</b>			
4. Access publicly funded risk assessment data and information from a central location.	Assists all levels of government in prioritizing hotspots and areas where mitigation will be most effective. Supports further research and analysis for advanced decisions and plans.	Critical	Technical, financial
5. Develop policy and mechanisms to share information about building hazard, risk levels, and risk reduction history at time of sale.	Better informs homeowners on how vulnerable their building may be in an earthquake.	Critical	Legislation
<b>Use innovative communication methods and materials</b>			
6. Bring awareness about earthquake risks and generate preparedness action by using innovative public education methodologies, including experiential methods.	Makes individuals more aware and better prepared for earthquakes.	Critical	Technical (including science of communication and human behaviour)
7. Use risk communication strategies that address known behavioural biases for earthquake risks.	Gives individuals an increased understanding of the risks associated with earthquakes and can evaluate costs and benefits of investing in risk reduction measures.	Necessary	Technical

## (1.7) EARTHQUAKES, CONTINUED

8.	Better communicate and educate stakeholders on structural vulnerability using non-technical formats.	Raises awareness and understanding for decision makers about vulnerable structures to prioritize mitigation.	Necessary	Technical
9.	Provide communication briefs on earthquake hazards, including economic and public safety benefits of DRR, for politicians.	Make elected officials aware of earthquake risk and proactive measures to make communities more resilient.	Critical	Technical
<b>Manage earthquake risk in new developments with research, policies, and programs</b>				
10.	Evolve building codes to provide design requirements to expand beyond life safety.	Increases societal resilience for faster recovery from a damaging earthquake.	Critical	Technical, legislation
11.	Address zoning and permitting in the Local Government Act to limit density of people and assets in areas exposed to damaging earthquake, flood, and landslide risks.	Limits density of people and assets in regions that are exposed to potentially damaging earthquakes, floods, and landslides.	Critical	Legislation
12.	Expand the City of Vancouver's approach to engineered single-family buildings in areas exposed to potentially damaging earthquakes and increase the code for multi-family buildings.	Improves public safety and recovery rates in new buildings.	Critical	Legislation
<b>Retrofit existing buildings with research, policies, and programs</b>				
13.	Conduct research to understand equity issues related to risk information and implementation of retrofitting programs.	Avoids accidental gentrification or inadvertent increase of risks for marginalized groups by driving up prices for safe homes.	Critical	Technical
14.	Research and define design synergies between seismic retrofit, climate adaptation, and climate mitigation.	Helps buildings to withstand a changing climate and earthquakes.	Critical	Technical
15.	Investigate means to apply standards to existing buildings and ensure compliance with building codes.	Helps buildings be more resilient to withstand and recover from damaging earthquakes.	Necessary	Legislation, technical, financial
16.	Provide homeowners with seismic retrofit guidelines.	Informs homeowners on how to make their homes safe.	Necessary	Financial
17.	Identify the locations and types of buildings most susceptible to structural damage.	Provides local authorities with information to inform structural mitigation strategies.	Critical	Technical
18.	Expand existing Energy Step Code Program in BC to include seismic upgrades.	Empowers local authorities to implement and incentivize policies for energy efficiency and seismic resilience.	Recommended	Legislation

## (1.7) EARTHQUAKES, CONTINUED

19. With financial institutions and provincial regulators, develop an incentive-based lending program based on proactive investments in mitigation and/or adaptation measures.	Provides incentives for individual property owners to invest in risk reduction measures and reduces financial liability of lending institutions.	Recommended	Financial
<b>Manage financial impacts</b>			
20. With government oversight, incentivize earthquake property insurance that is risk-based and transparent (similar to the California and New Zealand insurance models).	Increase insurance uptake rates to support economic and financial recovery following an event.	Critical	Financial
21. Provide non-technical information for homeowners on the limitations of the Disaster Financial Assistance (DFA) Program for post-earthquake repairs.	Makes asset owners aware that DFA does not cover earthquake damages and they will need to purchase insurance for coverage.	Critical	Technical
<b>Enhance post-disaster recovery planning and practices</b>			
22. Establish neighbourhood resilience hubs across the province.	Creates social connection and a societal approach to all-hazard preparedness, mitigation, response, and recovery.	Recommended	Financial
23. Revise protocols for seismic upgrades and post-disaster refuge to allow occupants to shelter in place where the structural integrity of a building has been confirmed.	Minimizes socioeconomic disruption to individuals and businesses and accelerates post-disaster recovery.	Recommended	Financial
24. Streamline permitting and approval functions to replace and/or repair buildings damaged in an earthquake and prioritize structures critical to the recovery process.	Reduces the time to recover following a disaster event.	Necessary	Financial

## (1.8) RIVERINE FLOODS

Recommendation	Description of Impact	Priority Level	Capabilities Needed
<b>Understanding Risk</b>			
1. Complete publicly available flood maps for all flood-prone communities in BC for current and future conditions.	Areas of high flood risk are identified using a consistent approach, and inaccuracies are minimized.	Critical	Technical
2. A province-wide flood risk assessment that includes a range of mitigation scenarios and captures information on historical events.	Mitigation and adaptation reduce impacts effectively, and communities are more equitably resilient to flood risks.  Post-event data and forensic data informs an understanding of future impacts and risk reduction measures.	Necessary	Technical
3. Provincial guidelines are expanded to include an integrated approach and move beyond structural mitigation, including natural approaches, land-use planning tools, and visualization tools.	Communities and practitioners have increased awareness and guidance to address a range of mitigation approaches that take into account the health of the ecosystem.	Critical	Technical
4. Mortgage lenders, appraisers, and the public are aware of flood risks, including at the time of sale, lease, or rental of a property.	Individuals and the real estate industry are aware and can adapt to and prepare for flood risks.	Critical	Technical
<b>Risk Governance and Building Back Better</b>			
5. Coordinate governance structures to manage, share, and update regional maps in areas prone to flood hazards; make high-level decisions about flood risk mitigation; and monitor progress and changes within the catchment area.	Supports the creation of an integrated flood management strategy. The BC DRR Hub concept note provides details on the benefits of a collaboration hub.	Critical	Technical, Financial
6. Regional growth strategies, official community plans, development permit areas, zoning bylaws, floodplain regulations, subdivision bylaws, servicing bylaws, and building codes take into account natural hazard risks and consider natural infrastructure and open spaces as flood resilience tools.	Land uses and building codes consider flooding and climate change impacts.	Critical	Legislation, Technical
7. Expand strategic and comprehensive funding to allow for an integrated approach to flood risk management.	Allows funding to expand support for a variety of options, including managed retreat and nature-based solutions.	Critical	Technical, Financial

## (1.8) RIVERINE FLOODS, CONTINUED

8. Update dike management to include a provincial repository of dike information and assign owners to orphaned dikes.	Support dike maintenance, upgrades, and audits; streamline emergency response and recovery planning and actions; increase the public's risk awareness.	Critical	Technical, Financial
<b>Preparedness, Response and Recovery</b>			
9. Improve and expand flood forecasting and early warning systems.	Communities and emergency responders are better prepared to respond to and cope with floods.	Critical	Technical, Financial
10. All flood-prone communities have capacities for emergency response and have flood response plans.	Communities are better prepared to manage and respond effectively to floods.	Critical	Financial

## (2.2) SOCIAL INFRASTRUCTURE AND COMMUNITY RESILIENCE

### Recommendation

#### Funding for Stability, Long-Range Planning, and Adaptation

Government agencies can improve resilience outcomes for communities by funding and supporting comprehensive packages for SI that recognize the importance of the operational costs, staff, facilities, and physical assets that make services, programs, and social connections possible.

1. **Core funding and operational grants:** Many organizations have called for changes to existing philanthropic models that largely offer project-based or innovation funding. Organizations require longer-term operational grants to maintain their core programs and services and conduct long-term planning. Many SIOs are continually creating new programs to qualify for grants, while struggling to fund their existing and impactful work. An ongoing lack of operational funding prevents organizations from planning for long-term administrative costs and creates instability in programming, staffing, and even facility maintenance.
2. **Contingency funds and flexible funding during emergencies:** A dominant misrepresentation of overhead costs as excessive and unnecessary for social purpose organizations contributes to the problem of insufficient operational funding and a lack of contingency funds for these organizations. Availability of operational funding and contingency funds would allow organizations to adequately pay staff, resource ongoing programming appropriately, and proactively plan and respond to emergencies. During the pandemic, many government and philanthropic funders notified SIOs quickly that their funding would be flexible. This allowed organizations to keep their staff and adapt their programs and service delivery methods during the pandemic emergency. This lesson should inform standard approaches for flexible funding through emergencies in the future.
3. **Capital funds and real estate tenure:** In cities in BC and across Canada, sharply increasing real estate prices, property tax values, and redevelopment pressures are creating insecurity and displacement pressures for organizations owning or renting properties for social purposes. The pandemic compounded these pressures. The SPRE Collaborative's 2021 survey of the BC social purpose sector found that lack of affordable space, suitable space, and declining tenure and long-term security in terms of ownership and leasing of space are the biggest challenges the sector faces, and these challenges directly affect the quality or extent of programs and services offered. Mechanisms are needed to help these organizations stay close to the people they serve.
4. **Capital funds for resilience and adaptation:** At a practical level, SI spaces are a collective investment in resilient and protective facilities and services for communities. A significant number of residential buildings in BC are not designed beyond life-safety code for earthquakes, are built in flood plains, have limited air filtration for pollutants and wildfire smoke, and are not designed for thermal safety in heat waves. As climate change increases the frequency and severity of extreme weather (like the heat dome of 2021) and BC faces persistent and significant earthquake risk, investments in SIOs offers a temporary stop-gap. SIOs need capital funding to upgrade and replace aging facilities and construct flexible-use spaces that can accommodate emergency response activities like shelters or mass feeding.



## (2.2) SOCIAL INFRASTRUCTURE AND COMMUNITY RESILIENCE, CONTINUED

### SI as Key Partner in Disaster Risk Reduction

Support for the SI sector should receive serious consideration in the modernization of BC's EPA legislation and should be considered in the renewal of Canada's National Strategy for Critical Infrastructure (2021–2023). There should be more connections among the disaster risk and emergency management fields, the social sector, and communities. Communities and municipalities rely heavily on SIOs during disasters, and local authorities should be encouraged to seek out partnerships with SIOs in advance of disasters. There should also be clear pathways of government funding and compensation for SIOs that take on response and recovery roles.

5. **Liability considerations for the role of SI during emergencies:** Current documents on the BC EPA modernization process include consideration of civil liability protection for registered and convergent volunteers during emergencies. This could include protection from undue liability for service providers using their facilities for emergency response activities, even those that do not have a mission to engage in emergency response but that step in to fill a need in their neighborhood.
6. **Insurance and financial backstops:** SI owners and operators need accessible and reasonably affordable insurance products and services, and regulations to ensure that they do not encounter excessive cost increases, exclusions, or complete denial of insurance coverage or renewal during emergencies and disasters, as many have during the pandemic.
7. **Incorporating SI into hazard, risk, and vulnerability assessment (HRVA) processes and comprehensive recovery plans:** SIOs must be included as partners in shaping HRVAs. They are essential for developing comprehensive and relevant hazard, risk, vulnerability, and capability assessments and in supporting participatory processes that involve civil society and diverse communities. This requires a fundamental shift in what type of knowledge we elevate, and a willingness to see non-traditional and non-technical knowledge as valuable expertise. It also requires appropriate resources for SIOs to have the capacity to participate in these processes.
8. **Communication, coordination, and collaboration in emergencies:** Emergency situations involve rapidly changing conditions, logistics, required provisions, and available supports, so SIOs need to receive information and resources in a timely manner as they decide how to adapt their services and support residents. Emergencies also necessitate quick and flexible collaboration, and, often, staff of local government and philanthropic grant-making institutions will play an informal coordinating role to help SIOs and community leaders connect with each other, share resources, or identify gaps in services that need to be filled. For a lasting and supportive relationship between local authorities and SIOs, it is necessary for local authorities to ensure clear and effective support for SI across all municipal departments during emergencies. For example, though social policy departments tend to have the most direct engagement and relationships with community partners, SIOs and smaller community groups may need permits for new or temporary facilities or activities, or may need to use municipal-owned property. For this, they must deal with building permit departments that may have a different understanding of how or whether the local government should support community groups.

Governance and decision-making mechanisms for local SI networks are also important. A general lack of coordination, formal roles, and decision-making frameworks to allocate resources and aid in disasters abounds, but should be established to ensure that key emergency response services such as food provision are provided without interruption, and that appropriate facilities are kept available for use, whether by their normal operators or other operators that can step in during emergency contexts.

## (2.3) RISK AND RESILIENCE APPROACHES IN ELECTRICAL INFRASTRUCTURE

Recommendation
1. Continue to develop wildfire management and methods to reduce the risk of BC Hydro infrastructure causing wildfires.
2. Improve the radial line policy to include changes based on increased electrification and the integration of non-wired alternatives and new technology integration.
3. Share information within the utility both in planning and responding to emergencies. Learn best practices from other departments and gather input from each area of expertise.
4. Share climate change risks, impacts, adaptation, and mitigation strategies externally with other utilities. Learn from other utilities' best practices and lessons learned. The Emergency Management Team is already a part of a mutual assistance group that collaborates and shares learnings.
5. Centralize the risk reduction planning. Hazards and risks do not have municipal or even provincial boundaries.
6. Improve local weather and climate data. Continue to improve data collection.
7. Streamline changes to allow for increased fuel switching. Work with regulators to make changes easier and beneficial to the end user.

## (2.4) SEISMIC DESIGN OF BUILDINGS FOR FUNCTIONAL RECOVERY

Recommendation	Description of Impact	Priority Level	Capabilities Needed
1. Train all involved in the building industry on the use of these methodologies; educate and engage with the public to enhance their understanding of earthquake risk and recovery-based objectives.	Training enables the delivery of building projects in which the expected seismic performance of buildings expressed in terms of their functional recovery is explicitly verified. Outreach results in direct demand from end-users (building owners and occupants) for buildings with enhanced seismic performance.	Critical	Technical and financial
2. Raise the bar by enhancing earthquake design and performance requirements.	The ability of the City of Vancouver and UBC to set their own bylaws independent of the BC Building Code or the National Building Code of Canada, which serves as the model code for the provinces and territories, provides a unique opportunity to raise the bar by enhancing seismic design and performance requirements.	Critical	Leadership
3. Shift from objective-based to performance-based design.	Shifting from the current implicit verification of a building's seismic performance (i.e., building meets code) to an explicit verification of performance (e.g., the building will take five days to achieve functional recovery after a major earthquake) will enhance our understanding of earthquake risk and will engage end-users (building owners and occupants) in defining the desired seismic performance of buildings.	Recommended	Technical and legislative (reflect in code)

## (3.1) THE ROLE OF MEDIA IN DISASTER RISK REDUCTION

### Recommendation

1. **Highlighting communities that are resilient.** When disaster strikes, accountability to communities and individuals who have suffered is often the main priority, which means focusing on what hasn't or still needs to be done when it comes to resilience. Positive news stories are harder to find outside the realm of personal resilience. Reframing the narrative during and after high-risk events can help with this. For example, during major flood events where some communities are hit very hard, finding stories of communities that recently undertook retrofits, upgrades or entire projects (like dikes) to protect against this kind of event would help to show the tangible side to preparation. This is exactly the kind of story that could inspire change in other communities.

**Recommendation: Work with an expert who can help find these stories.** It may be hard to know whether an area would have experienced a more significant impact from an event like an earthquake, flood or heat wave without an expert with "forensic expertise." Pairing such experts with newsrooms would really help to be able to tell stories of success and resilience.

2. **Planning for telecommunication resilience and redundancy.** The majority of media organizations rely on large technological infrastructure (telecommunications) to remain in place. Most news organizations have contingency plans to outsource outside of the province but this should be regularly reviewed and updated. For example, during a major seismic event in Vancouver, broadcasting will revert to Toronto, with collaboration with ham radio operators. Most of the time, such plans only get reviewed following a disaster.

In an emergency, major news organizations know where they are in the priority sequence of getting infrastructure back online. All news organizations, especially those that have come to provide regular updates and that a portion of the public might rely on during a disaster, need to have a contingency plan and must coordinate with emergency officials.

**Recommendation: Set up cross-media collaboration.** Perhaps during urgent times, social media accounts, landing pages, radio spots and other platforms could be temporarily taken over by other organizations. Currently, collaboration (pooling resources) does sometimes happen between competing agencies during times of need. For example, CBC and Global share video during some breaking events.

3. **Staying focused on public safety.** Press briefings with a Q&A period with reporters during an unfolding crisis are critical in helping to distill information to the public. Sometimes reporters may appear aggressive and adversarial, while experts and politicians can seem hesitant to share the full picture (perhaps for fear of being misquoted) and unwilling to stray from key messages. A note that this scenario is the minority; the majority show a very positive working relationship between the two sides.

**Recommendation: Train briefing staff from other agencies.** Knowing that both sides are trying to get information, perhaps there is a chance to expand on basic media training with an understanding of what makes a briefing effective for newsrooms. Formal media training does exist, but there is an opportunity at the beginning of each "season" for all parties to meet and be reminded of the risks for the season ahead and what each party wants to get out of future briefings.

When presenters have pre-produced "simple" slides and graphics of the information they are trying to convey, either during media briefings or press releases, the story immediately has higher engagement and is easier to share across platforms. Especially when journalists are working to a deadline. Visuals have to be simple, so that organizations do not have to reproduce them in-house. These should be easy for the media to share and point people to. Reproducing slides from the COVID-19 briefings, for example, has been very time consuming. Simple is best for mass public consumption.

Researchers can assist media by providing stills and video of actual people doing the work they are wanting to share. Again, offering additional visual or audio elements makes a story so much easier and more engaging to produce across platforms.

## (3.1) THE ROLE OF MEDIA IN DISASTER RISK REDUCTION, CONTINUED

**4. Having more journalists with expertise.** While the topic of risk and resilience stretch across a broad range of content units (politics, community, business), reporters have historically not been assigned to this topic as a beat. Having insider contacts and relationships in the way that Capitol Hill reporters do, for example, would help drive the story with the same level of importance as other beats.

**Recommendation: More beat reports and/or regular experts.** The pandemic is a great example of a situation where several high-profile epidemiologists were a regular part of programming. This built trust between the experts and the audience. As well, these experts have become an invaluable resource behind the scenes for verification, thoughts, and guidance on the science and policy. The same system could work well for resilience experts and scientists.

Newsrooms could hold public town halls to help connect agencies and information and answer questions or engage with the public. Newsroom website landing pages could help direct the public to the direct sources of information they are looking for (i.e., a place on a media platform where the Resilience Pathways report can live).

## (3.2) THE ROLE OF PROFESSIONAL ASSOCIATIONS IN DISASTER RISK REDUCTION

Recommendation	Description of Impact	Priority Level	Capabilities Needed
1. Develop a collaborative community of practice amongst professional associations, and between professional associations and Indigenous Peoples.	Creates a venue for interdisciplinary collaboration, knowledge sharing, and a repository for shared resources and case studies (exemplars).	Critical	Non-volunteer to facilitate discussion, training, etc.; knowledgeable participants; Indigenous participation may need separate funding.
2. Develop guidelines for the relevant professionals on nature-based solutions for climate change adaptation, disaster risk management, and resilience.	Empowers action at various scales, costs, and levels of effort; opportunity for immediate action and outreach.	Critical	Funding and technical expertise for research and development.
3. Make the connection between climate adaptation and disaster risk reduction with GHG emissions reduction more explicit in guidelines and strategic frameworks of professional associations.	Enables strategic planning around “build-back-better” and maximizes co-benefits that reduce disaster risks and emissions.	Critical	Funding for outreach; leadership.
4. Create policies or guidelines to ensure disaster and climate risk management is incorporated into rezoning and development-related applications.	Helps protect the public and brings DRR expertise to rezoning and development approval processes.	Critical	A coordinated public-private sector effort; change to development approval policies (possibly legislation).
5. Provide open-source access to all disaster and climate risk management projects, research, and strategic planning that are paid for from public funds.	Reduces cost and speeds up risk data and DRR knowledge sharing by building on work already completed.	Recommended	A managed repository and jurisdictional willingness (this could be at the provincial level, extend across several provinces, or be national).

## (3.3) NATIONAL DISASTER MITIGATION PROGRAM OUTCOMES IN BC

Recommendation	Description of Impact
1. Simplify project administration: <ul style="list-style-type: none"> <li>▪ Lessen the burden of proof for applicants (i.e., providing evidence that climate change will impact the West Coast)</li> <li>▪ Adjust templates to ensure they better reflect the complexity and cost of projects</li> <li>▪ Standardize guidance and terminology</li> </ul>	Reduces the amount of time and number of resources/capacity recipients need to dedicate to the application process.
2. Adapt timelines to ensure they can be met by recipients.	Increases the maximum number of eligible recipients applying to NDMP.
3. Broaden NDMP eligibility to reflect an all-hazards approach.	Enables recipients to apply for mitigation funding to address other hazards, such as wildfires.
4. Increase disaster and climate risk mitigation funding.	Reduces the impacts of climate change being felt by communities.

## (3.4) OPEN DISASTER RISK REDUCTION DATA PLATFORM

### Recommendation

- 1. Additional natural hazard types:** Time will be needed to further build relationships with other federal partners who hold expertise in each of the other hazards. With this in mind, the decision was made to focus on earthquake risk and bring in additional hazards (e.g., landslides, wildfires, flooding, tsunami) when the platform is more mature.

There are several ways in which additional hazards can be added. They can be integrated fully or partially depending on the nature of the data and the capacity of the responsible party. For example, at the most basic level, a repository could be set up for each hazard type and the datasets, stored as release assets, could be easily propagated to the dissemination infrastructure by way of existing processes. A more advanced approach would be to generate the datasets from within the platform as it currently done for earthquakes; this would require a fair amount of scripting (e.g., Python, Shell) to achieve, but would not be impossible.

- 2. Engagement:** To engage the public more effectively and efficiently respond to queries about the science, the project will leverage the Discussions module in GitHub. The Discussions module can support FAQs, general discussions, feedback collection, or any other type of engagement. Outside of GitHub, the primary researcher would typically have to respond to queries on an ad hoc basis—a time-consuming but necessary task. The Discussions module could reduce the level of effort to support science hosted in repositories.

Other opportunities to engage with the user community will be explored as time and resources permit.



## (4.1) RISK DYNAMICS MODELLING IN METRO VANCOUVER

### Recommendation

1. Cities are continually changing. Similar natural hazard events can cause different degrees and patterns of loss if they strike at different moments in a community's history. A community's hazard risk landscape—whether from earthquakes, floods, wildfires, or any other natural hazard—changes over time as the community changes and grows. Building this understanding into community development planning can help identify and better characterize the effectiveness of different risk reduction strategies and help select development strategies that take changing risk into account.
2. The approach we have described is just one of many and we have identified several areas for improvement to our approach, which can be found in our technical report on the DRR Pathways website.

## (4.2) NEIGHBOURHOOD SOCIAL VULNERABILITY IN VANCOUVER

### Recommendation

1. Completing a neighbourhood-level social vulnerability assessment is important to understand how social impacts of disasters may be distributed throughout a community. Small changes made to community preparedness, emergency response, and disaster recovery plans and policies can significantly reduce potential impacts on vulnerable populations immediately following a disaster and help them recover from such events more quickly.
2. Knowing which communities are most vulnerable allows policy makers and emergency managers to prepare better to assist these populations should a disaster occur. Materials, equipment, and human resources can be pre-positioned to locations where the need is likely to be greatest. When combined with physical risk modelling, social vulnerability assessments allow decision makers to dispatch resources to the locations most likely to be in need following a disaster.
3. There is significant interest around measuring social vulnerability in BC, both as part of the DRR Pathways project and by the BC disaster risk reduction community at large. The approach we've described is just one of many, and we have also identified several potential future enhancements to our approach, which can be found in our technical report on the DRR Pathways website.