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# Mobilizing Flood Adaptation Solutions in Canada

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## Executive Summary

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This policy brief identifies the actions that the insurance sector can take to mobilize climate adaptation in Canada. Recognizing the broad scope of our challenge, we decided to focus on flooding events because they take lives, disproportionately affect vulnerable populations, disrupt economic activity, and are the costliest extreme weather event in Canada. For instance, in November, flooding in British Columbia (BC) displaced more than 15,000 people and the cost of rebuilding is estimated at over \$9 billion.<sup>1</sup> The British Columbia floods show how a proper policy response requires a multi-

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**Section I: Raise Awareness of Flood Risk.**

1. *The insurance sector should advocate to Eric Loubier, Director General of the Canada Centre for Mapping and Earth Observation at Natural Resources Canada (NRCan) to update flood maps, make them available in an online portal,*

## Background

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trend, as global heating increases the severity and frequency of extreme weather events throughout Canada and the world. Canada is warming two times faster than the rest of the world and Northern Canada is warming three times faster.<sup>2</sup> As a result, studies have shown Canada is facing rising sea levels, loss of snow and ice, and shifting precipitation patterns including increased extreme rainfalls.<sup>3</sup>

impeding action and possible drivers to address them. We designed the recommendations in this report based on those barriers and drivers, summarised in the following section.

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Following a literature review and stakeholder interview process with experts from the public sector, academia, think tanks, and non-governmental organisations (NGOs) across all levels of government, we developed our key insights to consider when recommending solutions for effective adaptation mobilization.

We asked our stakeholders to identify and prioritize the barriers that are impeding planning and implementing flood adaptation solutions. We found common threads in their responses and categorized the findings into seven themes. Although these themes were differentiated for analytical purposes, some of them overlap and interact. For example, low climate adaptation capacity among public servants relates to challenges in accessing federal funding for the development of climate actions. This overlap

o single solution. Nevertheless, it is useful to consider the themes separately to better understand them.

### Barriers to Implementing Climate Adaptation

Key Themes	Barriers
Capacity	<ul style="list-style-type: none"> <li>- Small municipalities and Indigenous communities often cannot develop their own flood risk maps or apply for external funding due to capacity constraints.</li> <li>- A significant capacity gap exists between governments in small and large communities.</li> <li>- As a result, large municipalities with better capacity have a disproportionately strong voice at policy discussion tables.</li> </ul>
Funding	<ul style="list-style-type: none"> <li>- Lack of access to funding has been mentioned as a key constraint in implementing adaptation solutions by all our municipal level stakeholders.</li> <li>- Municipalities must jump through multiple hoops to get provincial or federal funding. There is a lot of paperwork involved which often discourages small municipalities from applying for funds.</li> <li>- Current approval processes are perceived to be lengthy.</li> </ul>
Coordination	<ul style="list-style-type: none"> <li>- Municipal and provincial stakeholders perceive the federal government as the federal level to lead and provide top-down criteria for adaptation.</li> <li>- There is a lack of coordination between departments tasked with adaptation across the same jurisdiction.</li> </ul>
Political Will	<ul style="list-style-type: none"> <li>- A lack of public pressure on politicians about flooding allows them to</li> </ul>

## Key Themes



adaptation is not caused solely by a lack of funding. Rather a lack of allocative efficiency is

## Recommendations

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1. **The insurance sector should advocate to Eric Loubier, Director General of the Canada Centre for Mapping and Earth Observation at Natural Resources Canada to update**

Resources Canada. Various flood map types would be included, such as inundation maps, flood extent and emergency maps, flood hazard maps, flood risk maps, and flood awareness maps, as defined by the federal government.<sup>18</sup> The portal would provide real-time maps of floods and river ice break-ups with information on emergency response. This portal would allow residents of Canada to look up their risk and flood vulnerability by postal code. Homeowners, renters, businesses, developers, real estate agents, and others would have access to the same updated information and could make informed decisions related to flood risk.

**Case Study:** The UK has a historic flood map with multiple GIS layers to inform patterns and

and help equip individuals to further their understanding of current and future risks. The long-term goal is for homeowners, businesses, and developers to better prepare for or avoid living in high-risk areas.

### **Key Arguments**

**Update flood maps for homeowners:** The exposure of Canadians to flood risk has increased to two in 10 Canadian homes at risk of flooding.<sup>21</sup> To address this, the federal government is

a map of their neighbourhood.<sup>22</sup> The federal government can also work with the insurance industry and Indigenous nations, who many have already developed flood maps and are important collaborators. A recent government-funded mapping effort by Western University released Canada-wide maps using 150,000 reference documents.<sup>23</sup> The proposed platform would allow for potential users to search by postal code their neighborhoods to identify flood risk and predictions decades from now. Increased access to flood risk information would equip residents of Canada to understand their risk and act accordingly.

**Inform Canadians of their flood risk and the potential costs associated with flood events:**



or retrieve information for further course of action.

are outdated by 20 to 25 years, and

on flood mapping, both fluvial and risk maps should be updated to fully utilize this dashboard. For instance, provincial governments can better allocate their budgets and set priorities by evaluating the current status of flood adaptation initiatives and the risk scores of each municipality. Moreover, the dashboard will support municipalities in making evidence-based adaptation

initiative versus risks, provide autogenerated suggestions by analysing data of different initiatives in different municipalities. This will enable other public and private institutions to make informed decisions. For example, authorities can plan public infrastructure and community home constructions by retrieving interactive climate data from the dashboard.

**Initiate network governance:** Political decision-making went through significant changes in recent decades. Non-state actors, like FCM, can play a significant role in joint resource mobilization where the federal government still has the prime responsibility for steering policies.<sup>38</sup> Horizontal exchanges of knowledge and experience can help to overcome gaps between policy areas or sectors.<sup>39</sup> Therefore, a central dashboard can convince policy actors with a common narrative of needs and gaps in flood adaptation.

**Influence to take quick actions:** Climate scientists have repeatedly raised concerns about how delays in taking climate action may multiply future adversities. Therefore, small actors like municipalities need better tools to analyze capacity and feasibility to act quickly.<sup>40</sup> <sup>41</sup> Canadian municipalities are also lagging on adaptation actions, and such a dashboard can outline the concurrent reality in climate adaptation actions and act as a performance evaluation tool for



implementers of flood solutions can seek preceding peer support and engage in various in-kind or skill exchange partnerships to ameliorate adaptation practices. For instance, the dashboard can initiate partnerships among municipalities to jointly implement flood

and working on different projects to bridge the gap.<sup>50</sup> The insurance sector highlighted the need for awareness and education to expedite adaptation efforts. However, looking at modern technologies, establishing a data hub for developing awareness is essential.

Research suggests that Canadian youth are technically and contextually equipped to forward with technological solutions for various socio-behavioral problems.<sup>51</sup> The insurance sector can take the opportunity to engage young app developers from Canadian universities in VR app development competitions (Hackathons), where youth can use *Application Programming Interfaces (APIs)* of various open-source platforms and develop virtual reality (VR) based flood adaptation awareness apps. Once ideas are formed through these Hackathons; the insurance sector can incubate the best ideas integrated into a master app to provide an effective and contextually rich representation of flooding impacts that a broad set of stakeholders can understand.

**Case Study:** In Japan, VR technologies are used to make children aware of flooding events and their possible consequences.<sup>52</sup> Japan is also developing new tools to prevent and mitigate the effects of extreme weather events. For example, virtual reality disaster preparedness training is gaining popularity. Instead of lectures, schools are utilizing VR attention. Trainings are designed with animations and trainees' physical behaviour can be tracked while they experience disasters virtually. Another benefit of preparedness and mitigation VR training is that it can be completed anywhere and by anybody with a computer and a VR headset. The drills happen in the form

For instance, a recent report of Simon Fraser University also endorsed how 3D visualizations can effectively increase flood awareness and actions.<sup>54</sup> Therefore, more research is expected in this domain in the upcoming days. With developments in the VR industry, visualizations can also be adopted by the gaming industry to design serious games on flood adaptation.<sup>55</sup> This means research on the effects of virtual reality and gaming applications are already gaining momentum in Canada. Further initiatives from the insurance sector to develop VR simulations can encourage other private sector actors to focus on flood adaptation.

**Inclined with the federal government strategies:** Policies proposed by private sect (fe) 6 (d) h 6 (d) h 6 (d)-6 (c)

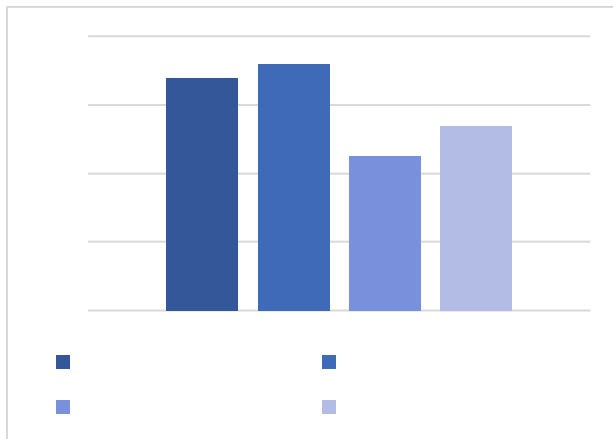
the future.<sup>65</sup> Currently, Natural Resources Canada relies on RADARSAT satellites that can now  
Alert-Ready System only provides notification  
but does not necessarily provide any approximate virtual information on how a flood may look at  
the given alert scale. Previously,  
accurately estimate water height from 8-12.5 meters, which made it difficult to project overland  
flooding quickly.<sup>66</sup> However, the latest development in 2022 suggests increased accuracy of the  
RADARSAT Constellation mission and may estimate up to 30 meters.<sup>67</sup>

Once the flood maps are updated following Recommendation 1, NRCan can plug in geospatial  
data of these powerful constellations for ameliorating flood predictions. This will facilitate the  
development of real-time flood detection and alert systems. NASA uses passive microwave  
measurements of river surface area to sense river discharge changes. Canada has the same  
technology but there are no digital visual tools for citizens to simulate real-time flood experiences.  
A VR app can plug-

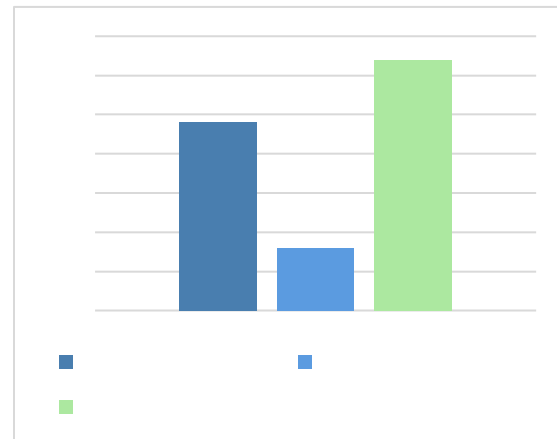
that affect adaptive capacity include social, political, human, financial, and environmental capital. When a country has enhanced adaptive capacity at all levels of government, it can design and implement effective adaptation strategies in the face of evolving hazards and stresses. The country can effectively reduce the likelihood of the occurrence and/or the magnitude of harmful outcomes resulting from climate-related hazards.<sup>70</sup>

Over the years, Canada has made some progress in mobilizing resources and building the capacity to adapt to climate change through various adaptation plans, consortiums, and collaborative efforts. Despite these efforts, Canada is still lagging in terms of building adaptation expertise among public servants across levels of government. The capacity gap is especially prominent in smaller municipalities, Indigenous governments, and northern governments. It has pervasive consequences such as the possibility of maladaptation, inaction, slow mobilization of climate adaptation solutions, lack of learning and improving climate adaptation solutions, and difficulties accessing funding.

According to a nationally representative survey of professional planners conducted by the Canadian Institute of Planners in 2019, 32 per cent of respondents working as adaptation specialists at different levels of government stated that they had no experience or skills around climate change (Graph 2). Similarly, when respondents were asked about the barriers, they face in incorporating climate change adaptation into their planning work, more than 50 per cent mentioned their lack of adaptation expertise (Graph 1) These findings indicate a perceived need from planners for further training on adaptation planning.



Source: 2019 survey of Canadian planners, CIP



Source: 2019 survey of Canadian planners, CIP

### **Description of the Recommendation**

#### **a. Capacity Needs Assessment**

To mobilize climate adaptation policy within different levels of Canadian government, public servants must have the capacity to do so. The first step in developing capacity is to conduct a capacity needs assessment. This would take stock of the existing skills and capabilities at both organisational and individual levels.



Once capacity gaps are identified and contents are developed through a needs assessment, the next step is to design training methods. Two proposed overarching and interlinked methods are highlighted below.

**Customized and Short-term Training:** This type of training is often more desirable since its impacts are more readily observable and immediately tangible. This training can be either supply-driven pre-existing contents that are regularly scheduled or demand-driven, developed following a particular event. Research shows that short-term adaptation-related training is most effective when customized to the participant's

**Intended Outcome**

Increase public implement, and evaluate climate adaptation solutions, including areas and communities disproportionately facing flood risk.

**Key Arguments**

**Stakeholder views on the capacity constraints:** On a similar note, many of the stakeholders interviewed also highlighted the lack of capacity of public



the program are established, it would entail only recurrent costs in terms of staff time both in providing and receiving training.

5. **The insurance sector should develop and propose a proof of concept for managing adaptation funding programs to Jonathan Wilkinson, Minister of Natural Resources Canada.**

### **Problem Statement**

**Climate adaptation funding programs are fragmented:** Due to insufficient internal funds, small municipal governments, Indigenous governments, and northern governments rely on federal and provincial funding programs for their adaptation-related projects. However, these funding programs are highly fragmented and come with different objectives. This fragmentation stems from the cross-cutting nature of climate adaptation and diffusion of responsibilities, especially flood-risk management, across several federal departments and ministries.<sup>74</sup> A quick scan of the

informational, offering details about compliance with the program requirements. There should be opportunities for interaction with the departments to help answer questions and support local governments to complete required procedures online. Information could be pooled from different agencies by a central institution.<sup>76</sup> When the platform is established, and all the relevant federal departments are on board, it would act as a coordination model. The platform would coordinate with the ministries and departments to manage the adaptation funding space and gradually incorporate provincial and private sector grants and contributions.

Some key considerations for developing the proposed OSS platform are highlighted below.

**Central planning institution:** A federal department with solid communication and feedback channels with other departments should take the lead in developing and managing the platform. On that note, Natural Resources Canada is better positioned to be that central planning institution considering its mandate of advancing the climate adaptation agenda in Canada.<sup>77</sup>

**Regulatory changes:** To ensure cooperation with other departments and

Figure 5: Simplification of the funding program management

**Intended Outcomes**

In addition to addressing the fragmentation and the inaccessibility of funding, the one-stop-shop platform is expected to enhance coordination across and within levels of government promoting a whole-of-government approach. The OSS platform would reduce administrative burdens and transaction costs for smaller municipalities and Indigenous communities through process simplification. In the long-term, the platform is expected to bring provincial and other private

**Key Arguments**

**Low usage of funds:** The current approach to climate adaptation funding is inefficient in reaching the local governments and supporting up-front measures that would help communities avoid or reduce potential climate-related damages. According to a report from the office of the auditor general of Canada in 2016, only a fraction of the available federal government mitigation funds was dispensed during the audit period (FY 2009- FY 2016).

Graph 3: Utilization of federal flood mitigation funds

Source:

It is high time to shift the pattern of how the public sector funds are being managed. In this regard,

### **Problem Statement**

Residents of Canada are not adequately covered by flood insurance and could face significant monetary and social costs due to flood damages. Twenty per cent of Canadian households face some vulnerability to floods, and 10 per cent are at high risk of flooding. Up to 10 per cent of homes in Canada are uninsurable due to flood risks, according to the Insurance Bureau of Canada (IBC). A lack of political will in coordinating more effective flood insurance has left the greatest burden on individual homeowners and renters during floods. Furthermore, the lack of coordination across jurisdictions has created a patchwork of flood insurance providers and has left people behind, unprepared, and uninsured.<sup>81</sup> While several countries coordinate flood insurance nationally, Canada is the only G7 country with no national flood insurance program.<sup>82</sup>

Real estate agents and lenders are not required to disclose flood risk information. In several cities across Canada, flooding has caused an eight per cent reduction in the sale price of a home and a 44 per cent reduction in the number of homes listed for sale.<sup>83</sup> A moral hazard exists when real estate agents and lenders

**2) Default opt-out insurance coverage:** Default opt-prompting individuals to participate in flood insurance coverage and allowing the freedom of choice to opt-out.<sup>84</sup> The automatic enrollment would be especially critical for those within flood-risk areas, but could prove critical for those in surrounding areas, as flooding events become increasingly frequent. Insurers should advocate to the federal government to use default opt-out insurance coverage, rather than the current opt-in participation. This would encourage broader enrolment in the coverage, as individuals are less motivated to opt-out.

**3) Regulation of the development of new housing in high-risk flood areas:** The federal government must prohibit and regulate the development of new housing in high-risk flood areas. t in floodplains and encourages land use controls. Land use regulations recognize that hazard areas will continue to be flooded.<sup>85</sup> Stronger regulation is required to work with municipalities to limit development in areas prone to flooding.

**4) Collaboratio**

a national flood insurance program if re-elected but has delayed its implementation.<sup>87</sup> In the last federal election, the Liberal and Conservative parties' campaign platforms included developing a low-cost insurance program for high-risk homes, which the Insurance Bureau of Canada largely designed. The federal government allocated \$6.3M from 2020 to 2021 to work on flood insurance and relocation and launched the Task Force on Flood Insurance and Relocation to recommend its next steps. It plans to release a report on a flood insurance program at some point in the future, but as of June 2022, there are still no details on such a program. Meanwhile, flood risk and damage increasingly affecting insurance coverage.

**Improve coordination across jurisdictions:** Based on our stakeholder interviews, the Climate Risk Research Group and the Partners for Action at the University of Waterloo are better positioned to inform the federal government about how to better coordinate and oversee an ooding insurance is a

### **Cost Considerations**

The insurance sector would advocate to the federal government to develop a framework with regulations for the National Flood Insurance Program. The regulations for mandatory flood risk disclosure, default opt-out insurance coverage, regulation of new development and collaborating with CMHC are efforts to encourage greater uptake of flood insurance in high-







Figure 6: Evaluation Process for Climate Adaptation, based on enhanced CDCs framework.<sup>99</sup>

**Intended Outcome**

Focusing more on measuring readiness and preparedness for climate adaptation and having an evaluation framework centred on learning will make it easier to see visible progress. The federal s frustrates public servants.

Adaptation is a moving target, non-reducible to a single variable, and effective adaptation prevents flooding events from happening, which makes adaptation actions hard to evaluate. A more flexible evaluation would mobilize public servants and jurisdictions by removing these barriers. In the long run, clearer and more useful evaluation frameworks can make the funding process more accessible.

public servants to adapt by removing existing barriers. These meaningful evaluation practices foster flood adaptation implementation.

**Focusing only on effectiveness hampers funding:** The federal government is reluctant to provide further funding based on the efficacy of previous adaptation actions. In the words of a public official, "The federal government is not interested in funding adaptation actions unless they are proven to be effective. This is a barrier to understanding effectiveness, and

the NAS. There are no negative co-impacts of this particular action, and in terms of feasibility, since there is a policy window for it, there is considerable ease for its implementation.

8. **The insurance sector should outline to Minister Dominic LeBlanc and Minister Steven Guilbeault how Infrastructure Canada and Environment and Climate Change Canada can best invest in natural infrastructure. The outline should describe implementation criteria and identify how these departments could partner with Indigenous communities.**

*Problem*

necessary decarbonization required with emissions reductions in Canada. Natural infrastructure can absorb excess precipitation and divert floodwaters from affecting critical infrastructure and homes. The co-benefits must also include equitable outcomes for surrounding communities.

The federal gov  
infrastructure, according to a politician in municipal government. To avoid maladaptation, the government of Canada can set criteria to ensure the implementation of natural infrastructure is place-based, context-dependent, and rooted in local and/or traditional knowledge. The criteria must consider the local, environmental, economic, and social contexts, including traditions and culture, which can provide more sustainable support for these initiatives.<sup>109</sup> The criteria must also provide safeguards that respect biodiversity science, uphold Indigenous rights to the land, ensure good governance, and promote gender equality in the implementation of natural infrastructure. With

stewardship and governance, ensure the integration of local and/or traditional knowledge, provide appropriate community-specific recommendations, and support reconciliation efforts by ensuring consent on unceded territory in Canada.

### **Key Arguments**

**Invest in nature as a first line of defence:** The government of Canada can increase its investments in nature for flood adaptation. The federal government has grown its attention to natural infrastructure and nature-based solutions. In 2018, the federal government dedicated \$2 billion over 10 years for a Disaster Mitigation and Adaptation Fund for large-scale built and natural infrastructure projects.<sup>113</sup> The government of Canada also committed to planting two billion trees for climate action. Greater alignment on natural infrastructure-related federal commitments and

between Indigenous knowledge holders and governments helps promote effective adaptation action.<sup>115</sup> Participatory mapping is used for flood monitoring and disaster risk reduction near James Bay. Another successful example is the partnership and integration of Coastal First Nations in the forest management of the Great Bear Rainforest.<sup>116</sup> There is a greater need to collaborate across



In the medium-to-long term, to improve public sector awareness

Advocate to the Canadian Center for Climate Services (CCCS) to design and conduct a capacity needs assessment survey of all relevant public servants across all levels of governments Provide technical assistance in	x		
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## Conclusion

This policy brief outlines eight recommendations that the insurance sector can undertake to mobilize flood adaptation solutions in Canada. We identify the critical policy opportunities based on a multi-level approach of adaptation governance. We focus on the federal government as it is best suited to lead the changes we recommend, and it is planning to publish a National Adaptation Strategy (NAS) by the end of 2022. There is an opportunity for the insurance sector to advocate for change within the NAS framework. To limit the scope of our research, we focused on flooding, the costliest weather event with impacts on the wellbeing of the residents of Canada.

The insurance sector should advocate for updated flood maps within the next two years to bring awareness to homeowners, renters, businesses, and developers of their flood risk. With a centralized flood map portal, the government will better coordinate flood prevention across jurisdictions and better regulate flood risk zones. Recognizing information is necessary, but can be insufficient to change behavior, we recommend partnering with the University of Waterloo to organize hackathons for the development of innovative visualization tools that provide an experience of flood to nudge civilians and decision-makers into action. With updated flood maps

In conclusion, the key points made in this report are as follows:

- Raising awareness is the first step to protecting residents from climate threats. In general, Canadians are unaware of their flood risk. Within the next five years, centralized mapping and visualization efforts can address that knowledge gap.
- Despite some efforts to increase capacity, smaller municipalities and Indigenous governments are not adequately equipped to act on climate adaptation. Increasing capacity through training programs and simpler funding processes can help avoid maladaptation and mobilize action.
- Within the next two years, designing an evaluation framework in tune with the evolving nature of climate adaptation can improve actions and motivate public servants to implement solutions.
- Canada is leaving its most vulnerable residents unprotected from flood risk. Setting regulations for a National Flood Insurance Program and investing more in natural infrastructure can enhance flood resilience.

We started writing this report in November 2021 when atmospheric rivers devastated British Columbia. The frequency of these events is increasing faster than the reaction to insurance sector can advocate to governments across Canada, particularly the











**Climate Adaptation Evaluation Challenges**

<b>Challenge</b>	<b>Definition</b>	<b>Proposed Solution</b>
Multiplicity of geographies, scales and sectors		<u>Key question:</u> What kind of future do we want and what actions do we need to get there?

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- **Maladaptation** is actions that may lead to increased risk of adverse climate-related outcomes, increased vulnerability to climate change, or diminished welfare, now or in the future.<sup>127</sup>
- **Non-State Actor:** An individual or organisation that has significant political influence but is not allied to any particular country or state.
- **Socioeconomic vulnerability** influence their capacity to prepare for, respond to, and recover from a flood hazard event.<sup>128</sup>

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**BRACE:** Building Regional Adaptation Capacity and Expertise Program

**CMHC:** Canadian Mortgage and Housing Corporation

**CCCS:** Canadian Center for Climate Services

**ECCC:** Environment and Climate Change Canada

**FCM:** Federation of Canadian Municipalities

**GIS:** Geographic Information System

**IBC:** Insurance Bureau of Canada

**ICLEI:** Local Governments for Sustainability

**INFC:** Infrastructure Canada

**NAS:** National Adaptation Strategy

**NRCan:** Natural Resources Canada

**OSS:** One-stop-shop

**VR:** Virtual Reality

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