JUNE 2026

Toward a Canadian Climate Risk Data Commons: Enabling Data Sharing for Resilience

Waterloo Climate Institute Policy Brief

Authors: Jason Thistlethwaite and Daniel Henstra

UNIVERSITY OF WATERLOO | WATERLOO Climate Institute

Abstract

Climate change is increasing the frequency and severity of hazards such as floods, wildfires and extreme rainfall across Canada, creating growing demand for reliable climate risk information. Governments, insurers and businesses depend on climate risk data to guide infrastructure investment, land-use planning, insurance pricing and disaster preparedness. However, these datasets remain fragmented across public agencies, private firms, utilities and research institutions, limiting their usefulness for decision-making. Fragmented data systems make it difficult to integrate information on hazards, infrastructure vulnerability and property exposure, weakening climate risk analysis. These gaps also reduce the effectiveness of economic signals that encourage resilience investments, such as insurance pricing or infrastructure planning. Institutional and governance barriers further restrict data sharing across sectors. This policy brief argues that Canada should establish a national climate risk data commons. A federated data-sharing system, supported by common geospatial standards and trusted governance frameworks, would improve access to climate risk information while allowing organizations to retain control over sensitive data. Strengthening Canada's climate risk data infrastructure would support better adaptation decisions, more effective insurance markets and more resilient communities.

Key Messages

- Climate-related disasters such as floods, wildfires and extreme rainfall are increasing in Canada, creating growing demand for reliable climate risk information.
- Climate risk data are currently fragmented across governments, insurers, utilities and private firms, making it difficult to integrate information on hazards, infrastructure vulnerability and property exposure.
- Fragmented data systems weaken climate risk analysis and reduce the ability of insurance markets and public policy to recognize and reward investments in risk reduction.
- Canada should establish a national climate risk data commons to enable secure, standardized data sharing across public and private sectors.
- A coordinated climate risk data infrastructure would strengthen climate adaptation policy, improve insurance market functioning and support more resilient infrastructure investment.

Introduction

Climate change is increasing the frequency and severity of extreme weather across Canada, exposing communities, infrastructure and economic sectors to growing risks. Governments, insurers and businesses rely on climate risk data to guide infrastructure investment, land-use planning, insurance pricing and disaster preparedness. The value of this information depends on integrating datasets describing hazards, infrastructure vulnerability and property exposure. When these datasets are fragmented or difficult to access, decision-makers struggle to translate risk information into effective adaptation strategies. Improving access to climate risk data, and the ability to combine data from different sources, is therefore a central challenge for climate resilience policy.

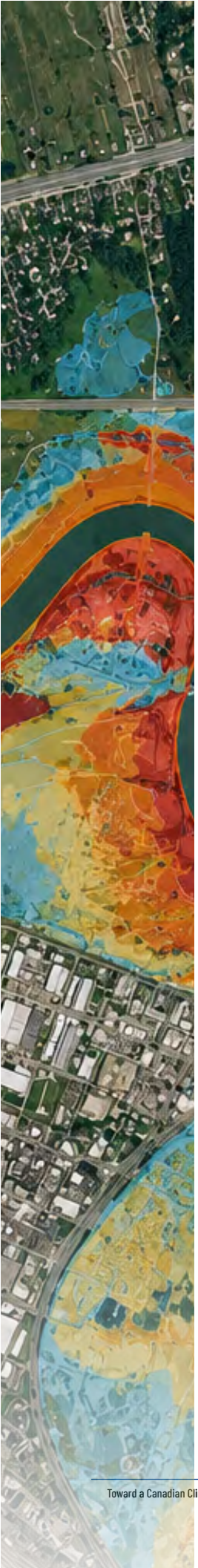
Reliable climate risk information is also critical to Canada's economic competitiveness. As governments invest in resilience and industries adapt to changing conditions, integrated climate risk data will influence where and how development occurs. Yet Canada's climate risk data landscape remains fragmented across public agencies, private analytics firms, utilities, insurers and research institutions. This fragmentation weakens risk assessment and reduces the effectiveness of financial signals, such as insurance pricing or investment decisions, that encourage resilience investments. This policy brief examines how fragmented climate risk data systems affect adaptation decisions and argues that establishing a Canadian climate risk data commons could improve climate risk governance through secure, coordinated data sharing.

Background

Climate-related hazards such as flooding, wildfires and extreme rainfall are increasing across Canada, generating growing demand for reliable climate risk information. Recent disasters have caused billions of dollars in damages and placed increasing pressure on disaster assistance programs, infrastructure systems and insurance markets. Climate impacts also affect household finances, with research suggesting climate-related damages significantly increase the average Canadian household's cost of living (Ness 2023). Governments, insurers and private firms increasingly rely on climate risk data to guide planning and investment decisions. For instance, municipal governments manage most public infrastructure, making climate-risk-informed asset management essential for maintaining reliable services (Carey 2023). Financial regulators and investors are also demanding improved climate risk disclosure because physical climate risks remain poorly measured in existing datasets (Calabrese 2023). As climate impacts intensify and losses potentially reach $25 billion annually within the coming decade, demand for integrated climate risk data will continue to grow (Canada 2023).

Climate policy is also increasingly framed as a source of economic competitiveness. Canada's natural resources, clean energy potential and critical minerals could support long-term prosperity in a climate-constrained global economy (Bakos and Stewart 2025). However, achieving these benefits requires resilient infrastructure systems, including transportation corridors, utilities and northern access routes, that support development and trade. Climate disruptions such as wildfire, drought and infrastructure damage therefore pose systemic risks to economic security if adaptation systems do not keep pace (Axworthy 2025).

Limited access to integrated climate risk data can reduce investment in climate resilience. Climate risk assessments combine datasets describing hazards, exposure and vulnerability, yet these datasets are often dispersed across platforms and institutions, making comprehensive analysis difficult (Reimann et al. 2026). When risk information is incomplete, mitigation investments, such as property retrofits or infrastructure upgrades, may not translate into lower insurance costs or clearer market incentives. For example, insurers in wildfire-prone regions report difficulty distinguishing between well-mitigated and high-risk properties due to the absence of standardized mitigation datasets (Watkins and Lim 2024). Improved data integration could therefore generate significant economic value by improving risk analytics and enabling more competitive insurance markets (Lucas 2026).



Analysis

This section examines how fragmented climate risk data systems affect the ability of governments, insurers and communities to assess risk and support effective adaptation decisions. It highlights three key issues: limited analytical capacity, weakened economic incentives for mitigation and governance barriers that restrict cross-sector data sharing.

1. Fragmented data systems limit climate risk analysis

Climate risk assessments typically follow the Intergovernmental Panel on Climate Change (IPCC) framework, where risk results from the interaction of hazards, exposure and vulnerability. Conducting these assessments requires integrating geospatial datasets describing hazards, infrastructure vulnerability and property exposure. In practice, these datasets are produced by different institutions using incompatible formats and governance rules, creating barriers to comprehensive analysis (Reimann et al. 2026).

For example, municipalities evaluating mitigation options must combine proprietary hazard models, government property records and parcel-level information held by property owners (Morin et al. 2025). Similar challenges occur in wildfire modelling, where insurers rely on a patchwork of hazard scores, aerial imagery and inspection data because standardized parcel-level datasets remain unavailable (Watkins and Lim 2024). Analysts therefore spend considerable time reconciling formats, permissions and legal constraints before conducting assessments, reducing the practical value of climate risk data (Bryant 2019).

Fragmented datasets also make it harder to model how climate risks evolve over time. Many risk assessments rely on static assumptions that fail to capture changing development patterns, infrastructure upgrades and cumulative climate impacts. Dynamic risk models show that redevelopment and infrastructure changes can significantly alter exposure to hazards. However, existing data systems rarely include standardized datasets describing mitigation actions or adaptation investments, making it difficult to evaluate how resilience measures affect future risk. Integrating datasets across sectors would improve dynamic risk modelling and support more effective long-term infrastructure planning.

2. Incomplete risk data weaken incentives for mitigation

Incomplete data integration also weakens economic incentives for households and communities to reduce climate risk. Insurance markets rely on detailed risk information to set premiums and signal the financial benefits of mitigation. When insurers lack access to reliable mitigation data, such as building upgrades or community-level protection measures, premiums may not reflect reductions in risk (Howard and Sherren 2023). This disconnect weakens incentives for property owners to invest in resilience improvements.

Research shows that mitigation can substantially reduce disaster losses. For example, defensible space and vegetation management can reduce wildfire-related property losses by more than 30 per cent in high-risk areas (Czajkowski et al. 2020). Catastrophe modelling studies also find that combining defensible space with fire-resistant construction can reduce expected losses and insurance premiums depending on the level of mitigation (Brinkmann et al. 2022). Similarly, micro-scale flood risk models show that household protection measures such as flood barriers and backwater valves can reduce simulated annual flood damages by more than 80 per cent when widely adopted (Rehan et al. 2024). However, the economic value of these measures is difficult to capture because datasets linking mitigation actions to avoided damages remain incomplete. As a result, governments may underestimate the long-term benefits of resilience investments and underinvest in measures that could reduce disaster losses (Doeffinger and Rubinyi 2023).

3. Governance barriers restrict climate risk data sharing

Climate risk data remains fragmented largely because institutional and governance barriers restrict how information is shared. Many high-value datasets are produced by private firms, such as catastrophe modelers, engineering companies and geospatial analytics providers, that rely on proprietary information as part of their business models. Governments cannot eliminate these incentives, but they can improve market efficiency by producing foundational datasets such as hazard maps, infrastructure inventories and land-use records that reduce information gaps.

Recent federal investments in flood mapping have expanded the use of LiDAR and advanced modelling to improve flood risk information (Farshad 2025). Despite these advances, some public agencies remain reluctant to release datasets because of concerns about privacy, legal liability or reputational risks associated with disclosing infrastructure vulnerabilities. At the same time, the rapid growth of commercial climate analytics services raises concerns about transparency, as

proprietary models often rely on undisclosed data and methods (Smyth 2025).

Evidence from Canadian case law suggests that concerns about liability may overstate the risks of releasing hazard information. Courts generally treat hazard disclosure as a public policy function undertaken in the public interest, limiting negligence claims based solely on the release of risk information (Howard and Sherren 2023). However, current open-data policies remain poorly suited to managing sensitive but decision-relevant climate risk datasets. These challenges indicate that restricting access to climate risk data can impose significant economic costs even when legal risks remain limited.

A federated data commons offers an alternative approach that allows organizations to retain control over their data while enabling secure, standardized access for authorized users. Through shared governance arrangements, governments, insurers, utilities and researchers could exchange climate risk information while balancing accessibility, privacy protection and institutional accountability.

Policy Recommendations

The following recommendations outline a coordinated policy approach to improve climate risk data sharing in Canada, focusing on establishing a national data commons, adopting common data standards and creating governance frameworks that enable trusted cross sector collaboration.

1. Establish a Canadian climate risk data commons.

A federated data commons would improve access to climate risk information and make it easier to combine datasets across institutions while allowing organizations to retain control over their data. Linking hazard, infrastructure and exposure datasets would strengthen climate risk assessment and improve governments' ability to evaluate the economic benefits of adaptation investments. Improved data sharing would also allow insurance and property markets to better recognize resilience measures, aligning economic incentives with climate risk reduction. Federal leadership should coordinate development in partnership with provinces, insurers and private data providers.

2. Adopt national standards for climate risk and geospatial data.

Climate risk datasets are currently produced using incompatible formats and reporting methods, creating significant transaction costs for analysts attempting to integrate data. National standards would enable hazard, infrastructure and exposure datasets to be combined more easily while improving the transparency and reliability of climate risk assessments. These standards should align with existing Canadian geospatial data initiatives and build on current federal and provincial data governance frameworks.

3. Establish governance frameworks for trusted data sharing.

Many climate risk datasets involve privacy, commercial confidentiality or liability concerns that limit their release through conventional open-data models. Clear governance frameworks, supported by licensing agreements, trusted research environments and formal data-sharing agreements, can build trust among data custodians while enabling broader use of climate risk data for research, infrastructure planning and insurance risk assessment.

Conclusion

Canada faces growing climate risks that require stronger information systems to support adaptation decisions. Yet climate risk data remain fragmented across governments, insurers, utilities and research institutions, limiting the ability to integrate hazard, exposure and vulnerability information. As climate impacts intensify and economic losses increase, improving how climate risk data are shared and integrated has become an urgent policy priority.

Establishing a Canadian climate risk data commons would provide a practical pathway to address these challenges. Shared standards, trusted governance frameworks and secure mechanisms for cross-sector collaboration would enable more effective climate risk assessment and better-informed decisions about infrastructure investment, insurance markets and disaster risk reduction. Strengthening Canada's climate risk data infrastructure will help reduce future losses while supporting more resilient communities and a more competitive economy.

References

Axworthy, Thomas. 2025. "Fire, Water, and National Security: Why Canada Cannot Backslide." Policy Special. Policy Magazine, December 1. https://www.policymagazine.ca/fire-water-and-national-security-why-canada-cannot-backslide/.

Bakos, Kathryn, and James K. Stewart. 2025. "Canada's Economic Success Is at Risk from Weak Climate Adaptation." Policy Options, October 23. https://policyoptions.irpp.org/2025/10/economy-adaptation/.

Brinkmann, Peggy, Nancy Watkins, Cody Webb, et al. 2022. Catastrophe Models for Wildfire Mitigation: Quantifying Credits and Benefits to Homeowners and Communities. Casualty Actuarial Society. https://www.casact.org/sites/default/files/2022-10/RP_Cat_Models_for_Wildfire_Mitigation.pdf.

Bryant, Seth. 2019. "Accumulating Flood Risk: A Model Study to Quantify Flood Damage Mitigation Measures under Dynamic Vulnerability." Master of Science, University of Alberta. https://doi.org/10.7939/r3-h2xs-8404.

Calabrese, Darren. 2023. "Expert Panel Tells Ottawa to Move Faster on Corporate Disclosure of Climate Risks." The Globe and Mail, August 25. https://www.theglobeandmail.com/business/article-expert-panel-tells-ottawa-to-move-faster-on-corporate-disclosure-of/.

Canada. 2023. Canada's National Adaptation Strategy: Building Resilient Communities and a Strong Economy. Government of Canada. https://publications.gc.ca/collections/collection_2023/eccc/en4/En4-544-2023-eng.pdf.

Carey, Dustin. 2023. "Building a Climate-Resilient Asset Management Culture." Municipal World. https://www.proquest.com/docview/2923269162/B8B5BB5D9E3346ACPQ/5?accountid=14906&sourcetype=Trade%20Journals.

Czajkowski, Jeffrey, Michael Young, Ian Giammanco, et al. 2020. Application of Wildfire Mitigation to Insured Property Exposure. Center for Insurance Policy and Research. https://content.naic.org/sites/default/files/cipr_report_wildfire_mitigation.pdf.

Doeffinger, Tess, and Steven Rubinyi. 2023. "Secondary Benefits of Urban Flood Protection." Journal of Environmental Management 326 (Part A). https://doi.org/10.1016/j.jenvman.2022.116617.

Farshad, Farzaneh. 2025. “From Smart Maps to Safer Communities: Canada’s New Era of Flood Resilience.” GoGeomatics, July 28. https://gogeomatics.ca/from-smart-maps-to-safer-communities-canadas-new-era-of-flood-resilience/.

Howard, Samantha C., and Kate Sherren. 2023. “Flood Risk Mapping in Southwestern Nova Scotia: Perceptions and Concerns.” Canadian Geographies / Géographies Canadiennes 67 (4): 499–512. https://doi.org/10.1111/cag.12836.

Lucas, Paul. 2026. “Competition Bureau Says Home Insurance Data Could Unlock $3.83 Billion.” Insurance Business, January 15. https://www.insurancebusinessmag.com/ca/news/propertyinsurance/competitionbureau-says-home-insurance-data-could-unlock-3-83-billion-562094.aspx.

Morin, Gabriel, Mathieu Boudreault, Jason Thistlethwaite, et al. 2025. “Economic Exposure of Canadian Residential Properties to Flooding.” Journal of Flood Risk Management 18 (1): e70012. https://doi.org/10.1111/jfr3.70012.

Ness, Ryan. 2023. “Climate Damages Are Inflating the Costs of Living for Every Canadian.” Canadian Climate Institute, June 5. https://climateinstitute.ca/climate-damages-inflating-costs-of-living-for-every-canadian/.

Rehan, Balqis M., Jim W. Hall, Edmund C. Penning-Rowsell, and Vance Zong Hao Tan. 2024. “A Comparison of the Cost Effectiveness of Property-level Adaptation and Community-scale Flood Defences in Reducing Flood Risk.” Journal of Flood Risk Management 17 (1): e12956. https://doi.org/10.1111/jfr3.12956.

Reimann, Lena, Dirk Eilander, Timothy Tiggeloven, et al. 2026. “Climate Risk STAC: A Living Metadata Catalog of Geospatial Data for Climate Risk Assessments.” Environmental Modelling & Software 198 (March): 106906. https://doi.org/10.1016/j.envsoft.2026.106906.

Smyth, Jane. 2025. “Buyer Beware: Navigating Private Sector Climate Analytics.” Substack newsletter. Let’s Get Geophysical, August 7. https://letsgetgeophysical.substack.com/p/buyer-beware-navigating-private-sector?utm_medium=web.

Watkins, Nancy, and Siew Gee Lim. 2024. WUI Data Commons Phase 1: Stakeholder Interview Summary. Milliman. https://www.milliman.com/-/media/milliman/pdfs/2024-articles/7-24-24_ibhs-phase-1-report.ashx.