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# Designing Resilient Communities:

Protecting people through  
climate-informed standards

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**C**anadian communities are on the frontline of climate change. Without action, future costs from flooding events in Canada alone could reach \$13.6 billion (CAD)<sup>1</sup> annually by the end of the century. And the costs are not only financial. Natural hazards such as wildfires and floods result in substantial economic burdens and lead to heightened anxiety and stress, causing mental health effects long after the event has passed. These economic and social impacts often disproportionately affect the most vulnerable demographics, including the elderly and those living below the poverty line.

**Urgent action is needed.** Using standards, decision-makers and professionals can find the tools and support they need to plan, design, and maintain climate-resilient, nature-positive, and sustainable communities across the country.

Through the Standards to Support Resilience in Infrastructure Program (SSRIP), SCC is collaborating with Canadians and the standardization system to bolster **Canadian leadership in climate adaptation. The program aims to foster resilient and sustainable communities through standards that build upon the current building codes.**

See below for some of the key areas we are working in!

## Fighting Flooding

Water-related damages are now the fastest-rising source of disaster-related costs in Canada. In addition to physical damage, flooding causes community displacement, disruptions to critical services and infrastructure, and impacts physical and mental health. Under SSRIP, we are advancing new National Standards and related tools to help Canadians better understand how the amount of rain and snow we receive is changing, how to reduce the risk of flooding, and how to protect our communities.

## Understanding future rain intensity and standardizing flood mapping

To be able to correctly design our stormwater systems and plan for the future, infrastructure professionals need to understand how heavy

rainfalls will evolve with the changing climate. Graphical tools known as Intensity-Duration-Frequency (IDF) curves offer insight into the probability of extreme rainfall events and can significantly contribute to designing drainage infrastructure resilient to future conditions. We are supporting CSA Group to develop a new National Standard of Canada that will identify the best methods to formulate and interpret IDF curves in a changing climate context.

Additionally, up-to-date flood maps play a pivotal role in preparing communities for climate change impacts, especially in identifying flood-prone areas. However, many flood maps in Canada are outdated or produced using techniques that vary by region, making it difficult for land-use planners to make sound decisions or for emergency response officers to anticipate how floods will affect communities. The Federal Flood Mapping Guidelines Series,

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<sup>1</sup> Canadian Institute for Climate Choices. 2021. Under Water: The costs of climate change for Canada's infrastructure. Available at: <https://climateinstitute.ca/reports/under-water/>



developed by Natural Resources Canada, provides technical guidance and best practices to improve and harmonize flood mapping procedures.

Now, two of those guidelines are being transitioned to National Standards of Canada (NSC). The Federal Airborne LiDAR Data Acquisition Guideline 3.0 specifies how data should be collected via airborne Light Detection and Ranging, a method that involves flying an airplane over an area of land and shooting pulsed lasers at the ground to measure variations in the terrain. The second guideline, the Federal Geomatics Guidelines for Flood Mapping, details different types of flood maps and outlines technical specifications to consider when acquiring, managing, and disseminating these maps and sharing associated geospatial data. These new standards signify a concerted national effort to establish consistent flood maps that are cohesive across all regional of the county.

## Tackling preventable sewer backups and basement flooding

Preparing for extreme rainfall and flooding involves more than just understanding IDF-curves and flood map information. Though out of sight and out of mind for most Canadians, sanitary sewer systems play a crucial role and demand proper design, construction, and maintenance to avoid costly, damaging, and stressful consequences. Each year, billions of litres of clean rain and groundwater leak or flow into sanitary sewers and onto sewage treatment plants. This entry of excess water into

sewers – referred to as Inflow/Infiltration (I/I) – shortens the lifespan of pipes, takes up capacity in the sewage network, and drives up costs for governments and taxpayers. Combined with extreme rainfall, I/I also increases the risks of urban and basement flooding, causing mental and financial stress, increased insurance claims, and disruptions to productivity.

Fortunately, some of this I/I is preventable. SCC is funding le Bureau de normalisation du Québec (BNQ) to develop the *CAN/BNQ 3682-420 Existing Sanitary Sewer Systems — Inflow and Infiltration Mitigation Program — Guidelines*. When published, this standard will provide step-by-step guidance on tracking I/I in existing sewer systems, allowing municipalities to prioritize fixes and reduce costs in the long run. The NSC will complement *CAN/BNQ 3682-320 Mitigation of the Risks of Inflow and Infiltration in New Sanitary Sewer Systems*, which was published in spring 2023.

## Boosting the efficiency of municipal emergency flood response

Efficient municipal emergency flood response requires adaptable solutions, particularly for existing infrastructure prone to frequent flooding where, permanent flood barriers might not be feasible. In collaboration with the National Research Council of Canada, SCC is supporting the



development of a municipal guidance document focusing on the selection and deployment of temporary emergency flood barriers. This will provide Canadian flood emergency responders with a comprehensive approach to selecting, deploying, and maintaining the appropriate type of emergency flood barrier, ultimately reducing flood-related damages to Canadian households and businesses.

## Shielding Shorelines

Despite having the longest coastline in the world, Canada faces a significant gap in coastal standards. Practitioners often rely on US and UK standards, which may not always be suitable to the Canadian context. Coastal communities are especially vulnerable to the impacts of climate change, experiencing compounded hazards such as sea level rise, coastal flooding, erosion, as well as high winds and fire. SCC is working to ensure Canadian-specific guidance is available for these challenges.

Shoreline management planning refers to the process of deciding what to do with a shoreline, broken down into segments, to address the risk of flooding or erosion while taking natural processes into consideration. Failing to adopt this approach, taking action to reduce flooding or erosion at one site can lead to instability along the shoreline, resulting in damage to infrastructure and ecosystems on which communities depend. SCC is funding the Intact Centre on Climate Adaptation

to develop comprehensive guidance for the Canadian context. This guidance will encompass defining boundaries for the “coastal cells” and shoreline segments, establishing best practices for governance, and outlining steps for creating an effective shorelines management plan.

## Understanding Urban Heat

Across Canada, extreme heat is occurring at a greater frequency and severity, with the health impacts from higher temperatures resulting in hundreds of deaths throughout the nation (619<sup>2</sup> and 66<sup>3</sup> deaths in British Columbia and Alberta, respectively, in the summer of 2021).

Temperature and heat-health vulnerability maps are crucial to understand the drivers of heat-related risks, measure their impacts, and help prioritize the adaptation measures. However, the variances in map design by different developers poses a challenge. In response, SCC is partnering with Health Canada to strengthen the tools available to Canadians for adapting

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<sup>2</sup> British Columbia Coroner's Service, “Extreme Heat and Human Mortality: A Review of Heat-Related Deaths in B.C. in Summer 2021.” Available: [https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/death-review-panel/extreme\\_heat\\_death\\_review\\_panel\\_report.pdf](https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/death-review-panel/extreme_heat_death_review_panel_report.pdf)

<sup>3</sup> Edmonton Journal, “Alberta saw spike in reported deaths during heatwave, causes still under investigation.” Published July 7, 2021. Available: <https://edmontonjournal.com/news/local-news/alberta-saw-spike-in-reported-deaths-during-heatwave-causes-still-under-investigation>



to increasingly hotter urban environments. This initiative involves the development of new guidance for heat-health vulnerability maps and air/surface temperature maps.

Heat-health vulnerability maps visualize an area's vulnerability and resilience to extreme heat, which can inform decision-makers where to implement land-use planning actions and public health interventions. These maps assist in identifying populations most at risk during heatwaves, highlighting adaptation measures and services, and functioning as indicators to assess likelihood of heat-related illness or death during heat waves, among others.

In contrast, surface temperature maps and air temperature maps serve as vital tools across various sectors such as physical infrastructure, public health, building construction, urban design and urban park planning.

SCC is also advancing the development of a novel framework designed to evaluate cities in Canada based on their readiness to tackle extreme heat risks. This framework quantifies the level of preparedness for extreme heat, providing local health regions with pertinent risk data, and informing climate resilient urban planning. Using this tool, communities will be better equipped to minimize the adverse effects of current and future extreme heat risk on residents.

## Recognizing Climate Risks

As extreme weather events such as flooding, high winds, wildfires, and heat waves become more intense and frequent, asset owners across Canada need an integrated approach to effectively identify, assess and mitigate climate-related risks.

To provide Canadian communities with a comprehensive framework for climate adaptation, SCC is supporting the Canadian adoption of internationally recognized standards such as *ISO 14090 - Adaptation to climate change — Principles, requirements and guidelines* and *ISO 14091 - Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment*. These adopted standards will outline principles

for climate adaptation through organizational preparedness, risk assessment, adaptation planning, implementation, and monitoring. Tailored to suit the Canadian context, these standards will provide guidance for reporting and communicating adaptation plans to key stakeholders, including infrastructure decision-makers.

Furthermore, additional guidance, geared toward asset management and the transportation sector, will be developed. This guidance aims to assist Canadian municipalities in optimizing the performance of their infrastructure assets portfolios by effectively managing costs, leveraging opportunities, and mitigating risks.

## Navigating Northern Climate Realities

Communities in Canada's North are facing unique challenges, notably the evolving conditions of permafrost. New standards will support the planning and design of more resilient infrastructure in permafrost regions.

This work begins with equipping planners with essential knowledge for adapting to climate change through a new guide on a *risk-based approach to asset management*. This guide will cover principles, asset classification, climate impact assessments, and risk analysis. Additionally, it will address the development of risk asset management options, including and associated costs, while evaluating the effectiveness of strategies to mitigate risk.

SCC is actively supporting an update to *CAN/BNQ 2501-500 Geotechnical Site Investigations for Building Foundations in Permafrost Zones*. This revised edition will incorporate the latest climate change adaptation practices and utilize more accurate and up-to-date climate data. The enhancements will ensure that the guidelines for designing and renovating building foundations in Northern regions align with the latest practices and insights in climate adaptation.

Lastly, to extend the usability of existing structures, we are supporting new material and design guidance to prevent mould, which can have health impacts particularly for vulnerable populations.



## Protecting People

Climate change is not affecting all communities equally. Its impacts will be shaped by various factors, such as geographical location and individual and community identities. Standards must acknowledge these differences in experiences and ensure inclusivity for all. As a program, ensuring equity is integral. Measures have been initiatives to mandate gender-responsive considerations in new standards development, while equity is also factored into topic selection.

### Climate-resilient Canadian health care facilities

CSA Z8000 *Canadian health care facilities* is a standard focused on the planning, design, and construction of vital healthcare infrastructure. As this standard undergoes updates, SSRIP is funding the inclusion of climate change and Northern considerations. The aim is to ensure that healthcare facilities in Canada are designed and operated in a climate resilient and equitable way.

### Guide to apply an equity lens to infrastructure portfolio management and project design

Addressing the need for guidance, SCC recognizes that asset owners or infrastructure practitioners may seek to incorporate equity in their work but lack the necessary know-how. This guide aims to assist in designing and operating infrastructure to meet the diverse needs of users and prioritize projects that minimize harms and maximize benefits for groups disproportionately impacted by climate change. Once completed, this guide will outline at least one framework for achieving this objective.

## List of SS RIP-supported Projects

Title	Expected publishing year	Guidance type
Developing and interpreting intensity-duration-frequency (IDF) information under a changing climate	2025	National Standard of Canada
Flood mapping: Light detection and ranging (LiDAR) data acquisition	2025	National Standard of Canada
Flood mapping: Geomatics	2025	National Standard of Canada
CAN/BNQ 3682-420 Existing sanitary sewer systems — inflow and infiltration mitigation program — guidelines	2025	National Standard of Canada
Selection, deployment and maintenance of emergency flood barriers	2025	Technical Specification
Shoreline management planning guideline	2024	National Workshop Agreement
Urban heat island mapping – surface and air temperature	2025	Guide
Urban heat island mapping – heat-health vulnerability	2025	Guide
Scoring framework for extreme heat resilience for communities	2024	Guide
Canadian adoption of ISO 14090 - Adaptation to climate change — principles, requirements and guidelines	2025	National Standard of Canada
Canadian adoption of ISO 14090 - adaptation to climate change — guidelines on vulnerability, impacts and risk assessment	2025	National Standard of Canada
Technical guidance on application of ISO 14090 and ISO 14091 to the transportation sector	2026	Technical Specification
Technical guidance on application of ISO 14090 and ISO 14091 in asset management	2026	Technical Specification

Title	Expected publishing year	Guidance type
Update of CAN/BNQ 2501-500 Geotechnical site investigations for building foundations in permafrost zones	2025	National Standard of Canada
Guidelines for managing mould in new and existing residential buildings in Canada's North	2025	Technical Specification
A risk-based approach to asset management in Northern regions	2025	Technical Specification
Update to CSA Z8000 - Canadian health care facilities	2025	National Standard of Canada
Equity lens to infrastructure project design and portfolio management	2025	Publicly Available Specification
Update to CAN/CGSB-12.1 Safety glazing	2026	National Standard of Canada
Update to CAN/CGSB-12.8 Insulating glass units	2026	National Standard of Canada
Update to CAN/CGSB-12.20 Structural design of glass in buildings	2026	National Standard of Canada





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