Adapting the Built Environment in a Changing Northern Climate

Climate change poses unique and considerable risks to the built infrastructure of Canada's more northerly regions, including northern Ontario. Several studies describe these areas as among the most vulnerable regions globally, stemming from accelerated changes in temperature, sensitivity of the built environment, and constrained adaptive capacity.

Adaptation planning for the built environment involves both short and long-term planning to reduce vulnerability and understand the needs of a community, such as new building codes, locations for buildings, or even new types of infrastructure. There are two tools that inform the adaptation process for the built environment:

- → **Vulnerability assessments** seek to characterize susceptibility to harm in a system in response to a stimulus or stimuli and account for how climatic and non-climatic factors at different scales interact to affect how climatic risks and change are experienced and responded to in specific places. An individual, a household, a community or a set of infrastructure can be vulnerable to one or multiple climate and non-climate stresses at a time; therefore, vulnerability assessments range in scale and application.
- → **Hazard mapping** is the visual display of the spatial distribution of a natural hazard. Maps may show the distribution of past hazard events, such as floods, wildfires, or permafrost degradation, the potential for future events, and/or factors that are relevant to the development or occurrence of a hazard, such as underlying features or conditions that contribute to the potential for a hazard event. Hazard maps therefore show differential spatial exposure and consolidate knowledge of the hazards to which a specific location has been or may be exposed to facilitate spatial planning, inform infrastructure design, and support emergency preparedness and response. In the Canadian North hazard mapping is a relatively recent research activity.

A 2013 report titled **Adapting the Built Environment in a Changing Northern Climate** showcases the results of a systematic review of climate hazard-related mapping and vulnerability assessments of the built environment in northern areas of Canada. The authors evaluated the methodologies used in different projects and the outputs they generated, with a particular focus on examining their comparability and consistency.

In the report, the authors identify **4 key information gaps** in relation to both *vulnerability assessments* and *hazard mapping*:

1. Lack of publicly available data on climate and broader environmental change, permafrost, coastal erosion and regionally downscaled climate data.
2. Gap in implementation of building standards and codes that take into account current northern conditions and climate change projections.
3. Lack of information for community planning to identify areas safe for land-use development.
4. Lack of information sharing between regions in the north, between north and south and from practitioners to end-users in order to increase data availability.

The report concludes with **9 recommendations** for improving the process and outcomes of vulnerability assessments and hazard mapping for climate adaptation planning in Canada's north, with direct transferable lessons for northern Ontario. Here are a three of those recommendations:

1. **Prioritize stakeholder inclusion and engagement from project design to results publication by:**
    a. Targeting funding for research prioritizing stakeholder engagement, and/or prioritization of stakeholder driven projects;
    b. Involving northern professional associations or research institutes in research planning and development;
    c. Applying cultural and social guidelines to respectfully and ethically engage with stakeholders in northern regions; and
    d. Recognizing the importance of local and/or regional spatial scale for local community interpretation and policy implementation.
2. **Use vulnerability assessments and hazard mapping results to support the development of northern building standards and codes by:**
    a. Developing and updating climate design values for northern communities and industrial infrastructure to reduce population and infrastructure exposure to a given danger.
3. **Monitor and evaluate adaptation actions and outcomes by:**
    a. Developing plans and tools to monitor and evaluate adaptation interventions;
    b. Sustaining the collaboration between practitioners, end-users and stakeholders on the long-term basis; and
    c. Re-visiting communities later on to evaluate adaptation actions and monitoring implementations by meeting with the local organizations responsible for them.

To learn more about this research and to view the remaining 6 recommendations, please visit: www.jamesford.ca/archives/2266

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"The built environment is a key area of concern for both vulnerability assessments and hazard mapping because of the consequences of climate change."