CANADIAN RED CROSS
CROIX-ROUGE CANADIENNE

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INCLUSIVE RESILIENCE

A SOCIO-ECONOMIC VULNERABILITY INDEX TO MAP FLOOD RISKS FOR TARGETED COMMUNICATIONS AND DISASTER RISK REDUCTION

EXECUTIVE SUMMARY

Before, during, and after disasters, the Canadian Red Cross works with individuals and communities across Canada to strengthen their resilience. In 2019, Red Cross and Public Safety Canada started a four-year project, the **Emergency Public Awareness Contribution Program**. This program develops and tests materials, methods, and tools to engage and empower communities in culturally relevant ways. It relies on continuous monitoring and evaluation to enhance emergency and disaster preparedness.

As part of this program, the *Inclusive Resilience* project aimed to promote inclusive approaches, tools, and actions that foster inclusive disaster risk reduction (DRR) and emergency preparedness across Canada. The Canadian Red Cross implemented the project in partnership with FireSmart Canada, Partners for Action (University of Waterloo), the BC Earthquake Alliance, the Native Women's Association of Canada, and community partners.

Partners for Action carried out two strands of research for the Inclusive Resilience project: one on public outreach and risk communications, and the other on how to understand where disproportionate socio-economic vulnerabilities exist to identify where to equitably and efficiently allocate resources for strengthening community resilience. This report presents findings from the latter.

A socio-economic vulnerability index (SoVI) is a decision-support tool that reveals the spatial distribution of disproportionate vulnerability based on a selection of variables. SoVI scores can be mapped through geographic information systems (GIS) applications, making it easy to visually identify areas of higher vulnerability relative to other areas within a community. Hazard exposure can also be mapped. Visualizing analyses of vulnerability and hazard exposure through GIS can guide emergency managers to focus efforts on areas where Canadians are at risk to different hazards. Once areas of disproportionate socio-economic vulnerability (referred to as social vulnerability) and/or risk to a specific hazard (such as floods) are identified, risk communications and strategies can be refined and delivered at the community-level more efficiently and effectively.

For more information about the research informing this report, visit the Inclusive Resilience research study website: uwaterloo.ca/inclusive-resilience.

REPORT AT A GLANCE

Social vulnerability refers to the socio-economic conditions that lessen a population's ability to prepare for, cope with, and recover from a shock or hazard event. This renders them more susceptible to the negative consequences of a disaster than others within a community who are not subject to the same systemic or structural constraints. Disaster events, such as floods, landslides, and earthquakes, can both exacerbate existing inequalities and create new socio-economic vulnerabilities within a community. Once areas that experience disproportionate social vulnerabilities are identified, risk communications can be refined and delivered at the community-level with a greater understanding of where and how to prioritize efforts. Therefore, identifying the spatial variations in social vulnerability is critical for the efficient and effective distribution of awareness-building and preparedness strategies.

Constructing a social vulnerability index (SoVI) is one method of assessing social vulnerabilities. This decision support tool can narrow the spatial distribution of awareness and preparedness products to Canadians disproportionately affected by all hazards. By combining socio-economic variables from a dataset, such as a national census, a SoVI allows for comparisons to be made between communities or neighbourhoods using visual mapping representations expressed through GIS. However, assessing social vulnerabilities on its own is not enough to identify priority locations for designating risk communications and preparedness programs. Given the increased frequency and severity of natural hazard events due to climate change, it is crucial to combine social vulnerability analyses with hazard exposure data to identify where people that are most likely to experience risks are located, and who within those areas might be the most systemically disadvantaged, thus requiring additional support to prepare for, cope with, and recover from disasters.

Partners for Action combined a SoVI, constructed from publicly available census data, with a flood exposure analysis using JBA Risk Management data, licensed to the University of Waterloo, to identify areas within communities facing high levels of both social vulnerability and flood exposure.

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This report begins by exploring the concept of social vulnerability and identifying the demographic groups most likely to be disproportionately impacted by flood events based on existing disaster risk reduction, emergency management, and climate change adaptation literatures within the North American context. The report continues with a discussion on how and for what purposes social vulnerability indices have been used to inform equity-informed decision-making. Methodologies are provided for how to construct a SoVI, carry out a flood exposure analysis, and overlay the two to visualize risk in web-based maps, with uses and limitations of each. Flood risk maps that overlay spatial analyses of flood exposure data and social vulnerability (via a SoVI) are provided for the following communities identified by Red Cross for this project:

(1) Richmond, British Columbia
(2) Thompson, Manitoba
(3) Ottawa- Renfrew, Ontario
(4) Ottawa-Gatineau, Ontario
(5) Moose Factory, Ontario and,
(6) Bay St. George, Newfoundland and Labrador

Finally, recommendations and areas of future research are provided for reproducing, validating, and advancing the SoVI and risk assessment methodologies outlined.

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ABOUT PARTNERS FOR ACTION (P4A)

P4A is a research initiative of the University of Waterloo's Faculty of Environment, which seeks to empower Canadians to become flood resilient by promoting awareness and preparedness actions that are inclusive and evidence-based. Partnership is central to our approach; strategic collaborations allow us to focus on changing the flood response landscape at the ground level and with policy makers. As a thought leader and steward of Flood Smart Canada, P4A moves conversation and multi-level action forward by localizing community-engaged flood risk awareness and preparedness, partnering for adaptation, and developing flood resilience planning and foresight. These priorities will enable communities to access practical resources and innovative research, and to embrace inclusive resilience.

Learn more about us at: www.uwaterloo.ca/partners-for-action.

ABOUT THE CANADIAN RED CROSS

In Canada and overseas, the Red Cross stands ready to help people before, during, and after a disaster. As a member of the International Red Cross and Red Crescent Movement – which is made up of the International Federation of Red Cross and Red Crescent Societies, the International Committee of the Red Cross, and 192 national Red Cross and Red Crescent societies – the Canadian Red Cross is dedicated to helping people and communities in Canada and around the world in times of need and supporting them in strengthening their resilience.

ACKNOWLEDGEMENTS

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