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Moving Towards Emergency Management Resilience to Climate Change in Rural Municipalities: Best Practices

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The Research

This 'Best Practices Guide' is directed towards emergency management practitioners, particularly at the municipal level. The goal of this three year project, entitled '*Rural Ontario Municipal Emergency Management and Critical Infrastructure: Enhancing Planning and Preparedness Capacities for Climate Change Resilience*' was to assess the current emergency management planning and preparedness capacities of rural Ontario municipalities to climate change-related threats across key critical infrastructure sectors. Despite notable strengths, rural municipalities will require ongoing and targeted support from emergency management practitioners to be able to 1) address the distinct vulnerabilities and resiliencies in rural spaces, and 2) actively cope with climate change impacts, including the effects from extreme events on rural critical infrastructure. This Guide pulls together key insights drawn from a background review of the literature, interviews, an Ontario-wide survey and two case studies. Practitioners may be particularly interested in two of our final products: a Tabletop exercise focused on an extreme flooding scenario and information about how to obtain locally-relevant climate change projections.¹



Homes destroyed by the 2012 Wawa flood remain today. Photovoice participant 2 (2016)

Rural Resilience to Climate Change

335 (75%) of all municipalities in Ontario are either rural or partially rural. According to the Rural Ontario Municipal Association, in Ontario, there is an estimated \$60 billion gap over the next ten years between what municipalities currently spend on infrastructure and what is needed for maintenance and growth. About 50% of that gap is accounted for by road and bridge assets. In rural spaces, infrastructure problems are compounded by lagging broadband and other telecommunication deficiencies, losses in the natural resource extraction sector threatening economic stability, and lack of adequate education and health care facilities.

In our survey of Ontario rural community personnel, 72% of rural municipal government respondents indicated that they expected to experience the impacts of climate change (CC) over the next ten years including an overall increase in the number, severity and unpredictability of extreme weather events.



Downtown Goderich building destroyed by the 2011 tornado. Archival photograph provided by photovoice participant 3 (2016)

Lifeline Vulnerability

Critical infrastructure, as it relates to emergency management, are those elements of infrastructure that, if damaged or lost, could pose a significant threat to needed supplies (e.g., food, energy, medicines), services (e.g., police, fire, and EMS), and communication or a significant loss of service

coverage or efficiency. These services and supplies are often termed ‘lifelines’ and losing capacity of a lifeline could have severe consequences on a population.

The vulnerability of particular infrastructures depends on the sensitivity to climate risk (i.e., vulnerability due to age, composition and design) and the capacity of the sector to adapt by minimizing negative impacts and/or maximizing positive opportunities. Canada’s infrastructure will likely be forced to withstand more frequent and more extreme weather events, more climate variability and changes in the average conditions in which most major infrastructure operate. Increased rainfall, cold, heat and intensity of storms can all raise havoc with existing and planned infrastructure projects. From our survey, the top four recent weather-related emergency events experienced were 1) high winds and/or tornadoes, 43%, 2) flooding, 39%, 3) high snowfall events, 37%, and 4) ice storms, 25%. These type of events are likely to continue into the future and their impacts will likely increase.



Washed-out culvert and temporary bridge installation in Wawa. Photovoice participant 6 (2016)

Climate Resilience

Ontario’s Climate Ready Adaptation and Action Plan mandates effective management of the extreme events associated with CC and the impacts on critical infrastructureⁱⁱ. Climate change adaptation encompasses adjustments in practices, processes or structures in response to projected or actual climate and extreme weather events. It is the capacity to manage and influence resilience and to act, despite uncertainty and limited knowledge. Climate resilience is the ability to resist, cope or recover from impacts such as extreme events and the potential to innovate, reorganize and take advantage of opportunities.



Photovoice participant 3 holds-up a photograph taken shortly after the 2011 Goderich tornado, while photographing one of many new downtown buildings constructed to replace what was lost.

Best Practices

Advocate for sufficient time and resources to adequately undertake the tasks needed to help your rural community adapt to the expected impacts from climate change

Two of the key challenges facing rural emergency management practitioners are both related to capacity; constrained budgets and limited personnel. It will be important to work with the local Municipal Council and staff to access available funding opportunities and to carve out time to undertake activities that will improve climate resilience and adaptation.

44% of respondents ranked having the needed financial resources to protect critical infrastructure as the #1 factor most impeding effective emergency management planning. While both the federal and

provincial governments have initiated programs to provide much needed access to monies to support infrastructure upgrades, it is particularly challenging for small, rural municipalities with limited staffing to undertake the needed planning and grant development work to access this funding.

Unlike urban municipalities with larger dedicated emergency management departments, 56% of our survey participants indicated that they did not have a dedicated community emergency management coordinator, instead this role was shared with other responsibilities, most often combined with that of fire chief. Practitioners should clearly identify if, and how, role-sharing is impacting their capacities and activities. For instance, as identified in our survey, local emergency management planning tended to be limited to those activities that were provincially-mandated such as hazard identification, risk assessment, and developing, revising and testing plans. Time for undertaking important, but more time-consuming activities such as outreach to the managers of privately-owned critical infrastructure, public education and examining insurance and liability costs arising from extreme events received much less attention.



Photovoice participants emphasized the importance of lost trees in Goderich. This picture shows a grove that was affected by the 2011 tornado, now named '*not like any other Sunday grove*' (tornado struck on a Sunday afternoon). Photovoice participant 3 (2016)

Acquire reliable information about the long-term impacts of climate change for your local region

Rural emergency management practitioners will need good data to inform long-range CC adaptation. From our survey, 30% of respondents ranked adequate knowledge of CC impacts as the #2 factor most impeding effective emergency management planning. Historical data, used in hazard identification and risk assessment processes, will not provide an accurate picture of future weather-related risks, particularly related to extreme events. In addition, information from general Ontario CC trends will not provide the location-specific information needed for evidence-based decision-making. Through this project, we have outlined a methodology, in both written form and through videos, to allow communities to undertake an analysis for their locality of likely future conditions under a changing climate to the year 2100.ⁱⁱⁱ We also provide examples using two case studies.



Flood damaged deep-water wharf near Wawa. Photovoice participant 2 (2016)

During recovery efforts, focus on opportunities to mitigate future climate change risks and undertake proactive preparedness

Especially during disaster reconstruction, advocate for approaches and targeted funding that will help your rural community ‘build back better’. The third edition of the ‘Emergency Management Framework for Canada’^{iv}, emphasizes the strong relationship between long-term sustainable recovery and mitigation of future disasters. In particular, reconstruction should be undertaken with the goal of disaster risk reduction. In the international agreement, to which Canada is a signatory, the ‘Global Platform for Disaster Risk Reduction’ encourages all jurisdictions to ‘risk-proof’^v development since the increasing toll from disasters could well out-pace the capacity to effectively respond and recover from these events.

Coordinate your efforts with your neighbours to increase the efficiency and effectiveness of your adaptation efforts

Consider developing and strengthening Mutual Aid Agreements and coordinating critical infrastructure services with nearby jurisdictions^{vi}. These efforts help regions capitalize on available capabilities and enhance climate resilience. One of the key strengths in rural communities is the strong bonds within and between communities and the unflinching willingness to help each other in times of need. Build on these networks during quiet times, by actively undertaking joint efforts to improve risk mitigation and preparedness. Following a disaster, the disaster recovery period is a key window of opportunity to coordinate upgrades and 'build back better' across a region such as a watershed (e.g. roads, bridges and culverts).

Advocate for the consideration of climate change impacts into all local planning initiatives – this is called 'mainstreaming' adaptation.



During quieter times, proactively advocate for the 'mainstreaming' of CC adaptation efforts. While 73% of respondents agreed that their community had undertaken consideration of critical infrastructure during emergency management planning, only 30% indicated that they had thorough knowledge of critical infrastructure vulnerabilities and only 24% felt that new critical infrastructure development had incorporated CC risk mitigation. The survey results suggest that there is a need for more activities related to mainstreaming such as: planning risk mitigation strategies for new or existing critical infrastructure; encouraging a wide range of local government departments to plan for climate change; changing existing land use zoning to mitigate risk; and implementing bylaws aimed at changing public behavior, such as water use restrictions.

Many photovoice participants emphasized the importance of trees as 'green infrastructure'. Goderich photovoice participant 2 (2016)

Customize definitions of what is considered 'critical infrastructure' to meet the needs of your community. Consider including 'green infrastructure'.



Damaged trees and Sifto salt mine from 2011 tornado in Goderich. Achival photograph from photovoice participant 2 (2016)

Work with your community to identify the lifelines that contribute most to its security and wellbeing. Our survey respondents reported that the critical infrastructure most damaged by recent weather-related extreme events were electrical and transportation networks as well public safety and security systems and 60% felt that this trend will continue over the next ten years. In addition, consider advocating for the ecosystem services provided by 'green

infrastructure'. Most rural communities are deeply connected to the natural landscape and the services provided by the environment are fundamental to achieving successful CC adaptation. For instance, wilderness trails can serve as secondary access and egress routes, while trees reduce the impact of extreme heat and protect against erosion and flooding.

ⁱ For these and other publications associated with this project, please see: <http://www.resilientresearch.ca/research-publications/> The results of the case study projects can be found at: http://scholars.wlu.ca/ges_mrp/6/ and http://scholars.wlu.ca/ges_mrp/5/.

ⁱⁱ <https://www.ontario.ca/document/climate-ready-adaptation-strategy-and-action-plan-2011-2014-0>

ⁱⁱⁱ Although the project has used the most straight-forward methods possible, some communities will still likely need technical and personnel support to be able to undertake this local assessment. This could include access to sufficient band width and data, compatible hardware and software and knowledgeable staff.

^{iv} <https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/2017-mrgnc-mngmnt-frmwrk/index-en.aspx>

^v <https://www.unisdr.org/we/coordinate/global-platform>

^{vi} See the Mutual Aid documents at the following link for a detailed discussion:

<http://www.resilientresearch.ca/research-publications/>