

### **Acknowledgements**

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### **Disclaimer**

These documents are for guidance purposes only. Information contained in the documents is based on current knowledge of projected climate changes that may affect Halifax Regional Municipality and professional judgment of the potential impacts of climate change on socio-economic and environmental components described. The projected climate changes and potential impacts are subject to change as climate change science evolves and the user should satisfy themselves with currency of the data. No guarantees are implied by Halifax Regional Municipality, the Government of Canada, the Province of Nova Scotia or the authors.

### **Executive Summary**

#### **Background**

According to the Inter-Governmental Panel on Climate Change (IPCC) and other leading climate change researchers, climate change is impacting and will continue to affect the health and well being of people and communities throughout the world even if global greenhouse gas emissions are reduced to the Kyoto Protocol target levels. If left unmitigated, these climate changes are likely to exceed the capacity of natural, managed and human systems to adapt<sup>1</sup>. Furthermore, one of the world's largest reinsurers, Munich Re, states:

“Climate change will significantly increase the frequency and severity of heatwaves, droughts, bush fires, tropical cyclones, tornadoes, hailstorms, floods, and storm surges in many parts of the world.”

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<sup>1</sup> Globally, estimates of the annual cost of climate change impacts range from \$300 billion to over \$2,000 billion.

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Globally, estimates of the annual cost of climate change impacts range from \$300 billion to over \$2,000 billion. While there is no consensus that either Hurricane Juan that affected Nova Scotia, or Hurricane Katrina that devastated New Orleans and other Gulf Coast communities were caused by climate change, the devastating physical, health, and social impacts may foretell the type of impacts on vulnerable coastal communities that are likely to become more frequent in the future as a consequence of global climate change. Halifax Regional Municipality (HRM) has been witness to the physical and social impacts of extreme weather, notably Hurricane Juan in September 2003, and the one-metre snowfall and high winds experienced during the 'Great Maritime Blizzard' of February 2004. These extreme events significantly impacted the region, and severely impacted the region's electrical and communications infrastructure as well as impeding public access to health and emergency service facilities throughout the Province of Nova Scotia but most particularly here in the HRM.

The Conference Board of Canada in a recent briefing note<sup>2</sup> concluded that there as been a lack of discuss on how Canada will adapt to climate change. In addition, the Conference Board concluded that adaptation is not currently a basic consideration in infrastructure or corporate decision making. Because it is a public trust responsibility to do so, adaptation should become as germane to policy and development discussions as public safety and security are today.

In response to HRM's experience with extreme events and the projections that indicate these events are expected to be become more frequent, the Sustainable Environment Management Office (SEMO) in collaboration with members of ClimAdapt (a network of private sector companies in Nova Scotia that provide climate change adaptation expertise) partnered with, the Federation of Canadian Municipalities, Natural Resources Canada, Environment Canada and the Province of Nova Scotia to develop an approach that could be implemented to reduce HRM's contribution to greenhouse gases and manage the impacts of climate change. The result of this initiative was **Climate SMART** (Sustainable Mitigation and Adaptation Risk Toolkit) with the overall objective of mainstreaming climate change into municipal decision making.

This initiative is helping HRM achieve its goal of being *a leader in the mitigation of pollutants to the environment and adaptation to climate change* by providing direction on the incorporation of climate change risk management and adaptation in future corporate business unit plans. The project will provide HRM with tools to assess vulnerability and to adapt to climate change and supports HRM's overall corporate goal of a *Healthy, Sustainable, Vibrant Communities* theme.

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<sup>2</sup> Operationalizing Adaptation to Climate Change. February, 2007. 7 pp.

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## **Projected Climate Changes for HRM**

Based on Environment Canada modeling to date, within the next 80 years climate change impacts on HRM are projected to include:

- an increase in mean temperature from 2° to 5°C, more days above 30°C, longer heat wave duration;
- a decrease in days with temperatures below –10°C;
- longer frost free season;
- increase in precipitation by up to 12% and an increase in rainfall intensity;
- a rise in sea-level of between 50 and 88 cm;
- an increase in peak wind speeds associated with tropical cyclones; and
- introduction of new and exotic pests.

## **Implications**

The Inter-governmental Panel on Climate Change (IPCC) has concluded that where extreme weather events (floods, droughts, heat-waves, storm events) are expected to become more intense and/or more frequent, the economic and social costs of those events will increase. These increases will be substantial in the areas most directly affected, e.g. areas susceptible to coastal inundation, and the impacts will have a trickle down effect spreading from directly impacted areas and sectors to other areas and sectors indirectly through, environmental, economic and social linkages.

Overall, HRM is vulnerable to climate change due to its coastal location and the significant role played in the economy by transportation; health services; forestry; and fishing. The majority of HRM's infrastructure and population is based on the coastline and the municipality has numerous areas of susceptibility to coastal erosion and inundation.

The vulnerability assessment component of the strategy determined a number of key HRM sectors or aspects have the potential to be impacted by the above climate changes including: coastal zones; communities; infrastructure; water resources; human health; fisheries; forestry and agriculture; and environment/ecosystems.

Furthermore, this impact will have a direct effect on a number of HRM's business units, including: Transportation and Public Works (road maintenance); Infrastructure and Asset Management (coastal road infrastructure; recreational park management); Community Development (projected impacts will require possible changes to land uses); Fire and Emergency Services (will be required to respond more often due to extreme events); Communications (dissemination of information on how to adapt to climate change); Legal Services (possible by-law revisions; inclusion of climate change in risk management protocols); and Halifax Regional Water Commission (water quality; stormwater design; dam management).

Understanding these vulnerabilities allows prioritization of what actions to be taken. To that end, one of the key deliverables of the Climate SMART (Sustainable Mitigation and Risk Tool) project is the development of a climate change *risk management strategy*. This strategy provides HRM decision makers with an approach to adapt to the changing climate, that is, to minimize risks from climate change. These adaptation measures can take many forms including planning tools, design tools, legal tools, infrastructure changes, and changes in behavioral patterns.

### **Recommended Actions**

The IPCC suggests that the best approach to addressing climate change impacts is a mix of strategies that includes mitigation (such as HRM's GHG Reduction Plans), adaptation, technological development (to enhance both adaptation and mitigation), research (on climate science, impacts, adaptation and mitigation), and education. This approach needs to combine policies with incentive-based approaches, and actions at all levels from residents through to provincial and federal governments.

A key barrier against the incorporation of climate change in decision making is that municipalities and private enterprise are unsure of or do not know how to assess the risks of climate change as rigorously as risk assessment for other risks such as commercial or security risks<sup>3</sup>. This *risk management strategy* provides HRM with the information necessary and the protocols to assess risks from climate change by adapting risk management guidance from other jurisdictions such as Australia and the Caribbean to HRM.

In addition to implementing a risk management strategy, a number of enabling priorities were identified during the Climate SMART project that need to be in place prior to implementing specific adaptation measures. These key enablers include:

- Leverage innovative and responsive funding through external partnerships for climate change adaptation projects.
- Enhance community outreach and education on climate change to encourage participation and prepare stakeholders for possible controls; e.g. land use planning.
- Integrate up-to-date climate hazard mapping and asset inventory for each business unit with LIDAR mapping.
- Incorporate climate change one of the risk considerations into the integrated risk management program being implemented by HRM.
- As part of a life cycle assessment management system include climate change for building assets and groundwater, in particular.
- Continue to enhance inter-governmental collaboration, communication and coordination that integrates HRM's activities with federal and provincial climate change activities and clarifies lines of responsibility.
- Update of design criteria to account for climate change impacts.

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<sup>3</sup> Ibid.

### **Needs for Future Actions (from external parties)**

The assessment highlights the need for additional data to support and improve the risk management capacities of HRM from other jurisdictions, including the federal and provincial governments, as well as universities and non-governmental organizations to facilitate decision making. These data needs include:

- more downscaling of climate change modeling specific to HRM;
- detailed digital elevation model of the vulnerable areas of HRM;
- assessment of the costs of climate change on the economy of HRM;
- development of a monitoring program and indicators to track changes in water quantity and quality;
- design criteria based on forecasting including climate change;
- improved understanding of coastal changes in response to climate change; and
- further research on the response of ecosystems to climate change.

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