

EXECUTIVE SUMMARY

Climate change is a feature of the planet Earth and has been going on since the planet was formed. Within the recent past (Pleistocene 1,8 million to 8,000 years BP and Holocene 8,000 to present), there have been warm and cool periods, and the Great Lakes region has experienced periods in which the land was covered in ice. Since the last ice age approximately 10,000 years BP, the land has risen, lake drainages have changed and the climate has gone through periods of warming and cooling. In the past hundred years, as a result of human activities, greenhouse gases in the atmosphere have increased to levels that scientists have concluded are changing our climate. The rate of change is faster than that which occurred in the Pleistocene, and our coastal communities are vulnerable to the impacts of these changes.

Prior to European settlement in the Great Lakes basin, First Nations people utilized the resources found in coastal locations and evidence of their presence can be found in many locations from the rivers draining into Lake Ontario to the rocky shores of Lake Superior in Pukaskwa National Park. Their impact on the coastal area was minor and there was no impediment to the movement of fish or wildlife. Much has changed since European settlement and the Great Lakes basin now is home to approximately 31% of Canadians. Major cities such as Toronto, Hamilton, Sarnia, Windsor and Thunder Bay are located on the shores of the Great Lakes and are very dependent on the lakes for their fresh water supply, for marine transport and for recreation.

This project set out to examine the impacts of climate change on coastal communities. We have researched the literature, organized workshops with expert speakers and have sought input from community representatives. We wished to determine what impacts may occur in the foreseeable future (100 years) and what we can do to adapt to them. We examined the historical climate records for the Lake Ontario, Erie, Huron and Superior regions and examined information for eleven coastal sites: Presqu'ile Provincial Park, Toronto, Hamilton, Long Point, Point Pelee, Walpole Island, Goderich, Sturgeon Bay, Sault Ste. Marie, Pukaskwa, and Thunder Bay. Workshops were held in Belleville, Toronto, Port Rowan, Parry Sound and Sault Ste. Marie and a total of 41 presentations concerning the Great Lakes were given and are available on CDs available with this report.

The climate changes that can be expected to occur with a doubling of CO₂ levels during the 21st century are warmer temperatures (annual increase of 2-50°C) and increased precipitation (up to 15% more annually and 25% in some seasons) with more falling as rain than occurred in the 20th century. It is expected that as a result of a shorter winter with warmer temperatures, and a warmer climate overall, there will be increased evaporation resulting in a general lowering of water levels (up to 1 m) of the Great Lakes. The warmer air temperatures will result in warmer water temperatures, particularly in shallow coastal waters and this will affect the timing of the seasonal mixing of water that occurs in the spring and fall and keeps the deeper waters oxygenated.

The adaptation options that are available to coastal communities vary considerably depending on their size, location and other pressures that may influence their vulnerability. For instance, heavily urbanized areas will now be vulnerable to severe rain events and this should be reviewed in light of recent high intensity storms such as the August 2005 rain event in north

Toronto that resulted in considerable loss and damage to roads, sewers and buildings. Likewise the January 1998 ice storm in eastern Ontario and Quebec had a major impact on hydro transmission facilities and water control devices on dams. Adaptation options are available to reduce the impacts of future ice storms.

Adaptation opportunities can improve the situation for some coastal communities. Warmer winters will reduce heating costs and allow for a reduction in salt use on roads, improving water run-off quality. Lower snowfall and more rain during winter months should serve to cleanse urban areas and reduce the spring run-off toxic surge that has been a phenomenon of urban areas for many decades. Longer summers will allow coastal resorts to have longer seasons with the associated economic benefits, though lower water levels may result in marinas having to dredge harbours or relocate their operations. Both commercial and recreational fisheries may be able to expand their operations with increased productivity of coastal waters, provided that pollution levels are reduced, wetlands protected and new fish stocks such as warm water species (like Smallmouth Bass) are utilized. The presence of invasive non-native species (Grass Carp and Zebra Mussel) is an increasing threat that is likely to change the lake ecology significantly, while impacts to other ecosystem components are unpredictable.

To properly address the threats and opportunities to coastal communities will require the full cooperation and financial commitment of federal, provincial and local governments. Local communities can assist in providing direction. They have the knowledge of local systems though often not the resources and expertise available to upper tier governments. The most significant impact of climate change is likely to be on water levels. These will continue to fluctuate seasonally and inter annually and will at times drop below historic lows. Low water levels will affect riparian properties and waterfronts and there must be a major effort to introduce legislation regarding ownership of newly exposed lake beds. An adaptation option may require the regulation of water levels in Lake Huron with control devices near its outfall at Sarnia. However, regulating water levels will impact and put at risk the natural processes of coastal wetlands.

The increased frequency and size of extreme weather events is likely to have major impacts on coastal communities and preparing for such events should be a priority. Actions include updating and revising (as required) design criteria, codes and standards for structures and facilities such as culverts, bridges, and water treatment plants as well as community disaster management planning. Prevention is more cost effective than rebuilding or restoration, so all new coastal initiatives should be designed with the effects of a changing climate in mind. Many changes have been made to coastal communities in the past two decades as a result of the implementation of remedial action plans. Improvements to water quality and wetlands have been made, but the ecosystems are dynamic and continue to change. Therefore it is imperative that monitoring programs be in place to measure the adaptation actions and the environmental responses to ensure that we continue to learn how best to adapt to a changing environment.