

Hamilton Conservation Authority

Climate Change Strategy

Adopted March 1, 2012

Introduction

The Draft Climate Change Strategy defines Hamilton Conservation Authority's (HCA's) role in mitigating and adapting to climate change and lays out a strategic direction for the Authority related to climate change. It contains a suite of principles to aid in decision-making on climate change actions, an overall goal and four major strategic directions (or strategies) that reflect the Authority's mandate and its focus on watershed health. Under each of the four strategies are found examples of actions relating to climate change mitigation or adaptation.

The Climate Change Strategy was developed with input from a number of sources. These include:

- feedback on existing climate change impacts, ongoing activities and priorities for action from participants attending a June 16, 2011 climate change adaptation workshop hosted by HCA and the Ontario Centre for Climate Change Impacts and Adaptation Resources (OCCIAR);
- an extensive literature review of climate change strategies and reports developed in other jurisdictions (i.e., conservation authorities, municipalities, the Province of Ontario, US states and institutes);
- peer review by two scientists working in the climate change field; and
- feedback from a workshop on November 21, 2011 hosted by HCA at which participants reviewed and commented on an early draft ("Straw Dog") Climate Change Strategy.

Background

There is a consensus among international scientists that climate change is occurring, that it is attributable to human activities, that its impacts are already being felt in many regions around the world, and that the impacts will get worse over time. Global emissions of CO₂ are rising at record rates and this suggests that rates of change are likely to accelerate in coming decades and may well exceed previous estimates. International scientists working on the Fifth Assessment Report for the Intergovernmental Panel on Climate Change are beginning to focus less on shifts in average temperatures and more on extreme weather events caused by climate change.¹

There is also a consensus among climate scientists that even with mitigation – measures to reduce society's emissions of greenhouse gases – the earth's climate will continue to change for many decades to come. Because of this, governments around the world are attempting to address not only the mitigation of climate change, but also adaptation to the current and future impacts of climate change.

Projections for the Great Lakes Basin are that because of climate change total annual precipitation could increase by 2 to 6% and annual temperatures could increase by 2 to 4% by the 2050s. It is also projected that the seasonal distribution of precipitation will change dramatically – more winter precipitation will

¹ Associated Press. Nov. 2, 2011. "Climate scientists predict grim future in report," *Hamilton Spectator*.

fall as rain, for example – and the number of extreme rainfall events could increase by 5% per decade.² It is expected that these changes in temperature regimes and the patterns of precipitation from climate change will lead to a host of impacts on river and groundwater systems and on the ecosystems and human settlements they sustain. More frequent and more intense heavy rainfall events will lead to more severe flooding and increased erosion, but will also have adverse impacts on water quality as pulses of contaminated runoff enter river systems from both urban and rural areas.

Some climate changes have already been observed across Ontario. In Southern Ontario, these include an increase in average air temperature, an increase in the number of warm days and nights in winter, an increase in annual precipitation, an increase in lake effect snow, a decrease in precipitation in the form of snow, and an increase in the number of strong cyclones across the Great Lake region.³ (See Appendix B for more detail on these changes.)

While there is still uncertainty as to the exact nature of future climate changes in the Hamilton area, trends in temperature and precipitation as well as occurrences of extreme weather events indicate that some changes have already taken place. Over 41 years of climate records, average annual mean temperatures have risen 0.9 °C, and average mean temperatures have increased in all four seasons. Average maximum and minimum temperatures have followed the same pattern of increase. Total annual precipitation has increased by 26 mm over this period with increases in precipitation seen in spring, summer and fall, and decreases in winter.⁴ **In short, the Hamilton area is warmer and wetter than it was 41 years ago, except in the winter, when it is warmer and drier.** The impacts of these changes, such as periods of prolonged drought, and intense precipitation events that lead to high flows and increased bank erosion, are already being felt in the Hamilton area. (See photographs on following pages).

To adapt to these changes, we need first to recognize when they are occurring or are likely to occur and what the magnitude of the changes will be. This requires a robust water and climate change monitoring network and up-to-date forecasting tools. Secondly, we need to determine the risks and opportunities that are associated with climate change in the Hamilton area. This requires developing future climate scenarios to identify what systems, areas or resources will be vulnerable to the impacts of climate change here. Thirdly, we need to identify adaptation strategies that can be used to reduce the climate change risks to ecosystems, communities and the economy. And finally, we need to implement these adaptation strategies on a priority basis and monitor results over time.⁵

With a watershed-based mandate to deal with flooding and erosion and to ensure that water systems are properly managed – see Appendix A – Hamilton Conservation Authority will play a central role in adapting to climate change impacts that affect river and groundwater systems. More broadly, the Authority can play a leadership role in communicating the need for and taking action on climate change mitigation and adaptation.

² EBNFLO Environmental and AquaResource Inc., June 2010. Guide for Assessment of Hydrologic Effects of Climate Change in Ontario. Ontario Ministry of Natural Resources and Credit Valley Conservation.

³ Ibid.

⁴ OCCIAR, June 2011. Climate Change Impacts and Adaptation in the Hamilton Conservation Authority Watersheds, Final Report.

⁵ For a climate change adaptation planning framework, see Gleeson, J., Gray, P., Douglas, A., Lemieux, C.J., and Nielsen, G. 2011. A Practitioner's Guide to Climate Change Adaptation in Ontario's Ecosystems. Ontario Centre for Climate Impacts and Adaptation Resources, Sudbury, Ontario.



**Flooding on Red Hill Valley Parkway
July 26, 2009**



**Erosion on Spencer Creek
March 12-14, 2010**



**Micro-burst in Christie Conservation Area
Spring 2011**



Drought in Spencer Creek
August 2007

Principles

The following principles have been developed to guide HCA's strategic decisions on climate change.

- Where possible, climate change actions will address **both mitigation and adaptation**.
- **Collaboration** with partners (government agencies, municipalities, academia, the business and agricultural communities, NGOs and the public) will be central to actions on climate change mitigation and adaptation.
- Priority will be placed on **integrating** climate change mitigation and adaptation into core activities.
- Priority will be placed on **"no regrets" actions** that will improve the resiliency of systems, whatever the eventual climate changes.
- **Information-based decision making** will guide actions.
- **Adaptive management** will allow plans and actions to be guided by information obtained over time through environmental monitoring and other means and adapted as circumstances warrant.

Mitigation is action to reduce the emissions of greenhouse gases in order to reduce the potential effects of global warming.

Adapted from IPCC

Adaptation is making adjustments in our decisions, activities and thinking because of observed or expected changes in climate, in order to moderate harm or take advantage of new opportunities.

Lemmens et al. 2008

"No regrets" actions are actions that will yield benefits regardless of future trends in greenhouse gas emissions and climate change. They include items such as:

- Enhancing monitoring systems to improve forecasting of flooding
- Protecting and restoring wetlands to moderate streamflows
- Increasing forest cover to recharge groundwater, moderate streamflows and act as a carbon "sink"
- Protecting systems that are already at risk from other stresses

Overall Goal

To increase the resiliency of our watersheds, systems (natural and man-made) and communities to meet the challenge of climate change.

In ecology, “resilience” is the capacity of an ecosystem to withstand disturbance, recover from it, and continue to function. The concept of resilience can also be used for man-made systems (such as water supply systems) and social systems (such as the City of Hamilton). Improving the resiliency of our watersheds, natural and man-made systems and communities will provide many benefits including the following:

- reduced property damage and potential loss of life;
- reduced impacts from extreme events including flooding;
- reduced impacts from erosion;
- healthier aquatic and terrestrial habitats;
- reduced risks to drinking water;
- reduced risks to municipal infrastructure;
- reduced impacts on outdoor recreation;
- reduced impacts on local food production;
- reduced costs from climate change impacts and extreme events;
- a better informed and better prepared public; and
- healthier people and communities.

The Importance of the Watershed Approach

Watershed adaptation strategies using watershed scale information and local collaborative decision making will be critical to successful adaptation [to climate change]. Conservation Ontario recommends that the Climate Change Adaptation Directorate adopt an integrated watershed management approach as the most viable process for coordinating the water management response to climate change.

Conservation Ontario’s Response to Climate Ready:
Ontario’s Adaptation Strategy and Action Plan, June 2011

Strategies for Addressing Climate Change

1. **UNDERSTAND THE PROBLEM:** Increase our understanding of changes to climate, what can be done to mitigate it, the impacts of climate change on watersheds, systems and communities and what needs to be done to adapt to these impacts
2. **SHARE INFORMATION:** Share knowledge and information about climate change with and between other partners (government agencies, municipalities, academia, the business and agricultural communities, NGOs and the public)
3. **INTEGRATE INTO EXISTING POLICIES:** Work with partners to integrate mitigative and adaptive measures for climate change into existing policies, plans, programs and practices
4. **DEVELOP NEW POLICIES:** Where needed, work with partners to develop new policies, plans, programs and practices to mitigate climate change and reduce vulnerability to its impacts

Actions Under Each Strategy

1. **UNDERSTAND THE PROBLEM: Increase our understanding of changes to climate, what can be done to mitigate it, the impacts of climate change on watersheds, systems and communities and what needs to be done to adapt to these impacts**
 - Develop climate change science partnerships
 - Work with provincial and federal governments and science partners to develop and/or refine tools to improve climate change projections and forecasting for the Hamilton area
 - Assess current vulnerability of systems in the Hamilton area and identify future climate change vulnerability, risks and opportunities
 - Identify priorities for assessment or action (e.g., highly vulnerable areas, resources, habitats, species and systems)
 - Identify adaptation measures to reduce the impacts of climate change on priority areas, resources, habitats, species and systems
 - Identify how existing water and climate monitoring networks can be enhanced to better monitor climate change and its impacts
 - Identify opportunities for HCA to corporately reduce greenhouse gas emissions
2. **SHARE INFORMATION: Share knowledge and information about climate change with other partners (government agencies, the City of Hamilton, the Township of Puslinch, academia such as McMaster University, local business, and Hamilton area agricultural communities, NGOs and the public)**
 - Communicate the projected changes to climate and their impacts in the Hamilton area to partners
 - Educate staff, the HCA Board and partners on the need for both mitigation and adaptation to climate change
 - Educate the public on need for both mitigation and adaptation to climate change and what individuals can do about it

- Report on key indicators of climate change and its impacts as well as actions to mitigate and adapt to climate change
- Provide information, forecasts, models and tools to stakeholders

3. INTEGRATE INTO EXISTING POLICIES: Work with partners to integrate mitigative and adaptive measures for climate change into existing policies, plans, programs and practices

- Work with partners to develop integrated watershed plans for the HCA watersheds
- Work with municipalities to develop more detailed water budgets for the HCA watersheds
- Work with partners to enhance the water and climate monitoring and reporting network to better address climate change and its impacts
- Work with partners to integrate climate change projections into hazard assessment (e.g., floodplain mapping and Intensity, Duration and Frequency [IDF] curves)
- Work with municipalities to review stormwater management guidelines
- Work with partners to reduce non-point source (overland) runoff from priority urban and rural areas
- Work with landowners and partners to increase tree canopy coverage in priority areas
- Work with landowners and partners to restore and enhance wetlands in priority areas
- Work with local farmers to implement low impact farming methods

4. DEVELOP NEW POLICIES: Where needed, work with partners to develop new policies, plans programs and practices to mitigate climate change and reduce vulnerability to its impacts

- Develop and implement a plan to reduce HCA's corporate greenhouse gas footprint.
- Work with City of Hamilton and adjacent conservation authorities to carry out a shoreline study that integrates the impacts of climate change
- Work with municipalities to identify and implement low impact development approaches for urban development and redevelopment
- Work with municipalities to identify and acquire priority lands for connecting existing greenlands

HCA's Mandate and Activities

The mandate of HCA is set out in the *Conservation Authorities Act*. Created in the 1946, the *Act* provides the legal basis for actions associated with renewable natural resource management. The provincial legislation is based on the recognition that the issues associated with flooding and erosion are best managed on a watershed basis.

Generally speaking objectives for Conservation Authorities include to:

- ensure that Ontario's rivers, lakes and streams are properly safeguarded, managed and restored;
- protect, manage and restore Ontario's woodlands, wetlands and natural habitats;
- develop and maintain programs that will protect life and property from natural hazards such as flooding and erosion; and
- provide opportunities for the public to enjoy, learn from and respect Ontario's natural environment.

There is a wide range of issues that are addressed by HCA. These include:

- watershed strategies and management;
- flooding and erosion protection;
- water quality and quantity;
- reforestation and sustainable woodlot management;
- ecosystem regeneration;
- environmental education and information programming;
- land acquisition;
- outdoor recreation;
- environmental land use planning;
- habitat protection;
- stewardship activities that include agricultural and rural landowner assistance; and
- protection of sensitive wetlands, flood plains and valley lands.

HCA is uniquely positioned to begin to address impacts from climate change because of its understanding of the watersheds and because the Authority:

- conducts monitoring on many aspects related to water quality and water quantity and climate indicators such as temperature and precipitation;
- implements good risk management through policies, floodplain management, subwatershed planning, and storm water management;
- works with the City of Hamilton to develop good flood emergency plans;
- maintains flood mitigation structures such as the Christie Dam;
- maintains updated watershed hydrology; and
- carries out reforestation.

Observed Changes in Ontario's Climate

Changes in the climate system have also been observed at the local scale – in Ontario and within the Great Lakes Basin, as summarized below:

- Annual average air temperatures across the province increased from 0 to 1.4°C; the greatest warming occurred in the spring for the period 1948 to 2006, (Lemmens et al., 2008).
- The number of warm days and night-time winter temperatures increased between 1951 and 2003 (Bruce et al., 2006a).
- Total annual precipitation increased 5-35% since 1900, (Zhang et al., 2000) and the number of days with precipitation (rain and snow) increased (Vincent and Mekis, 2006).
- Water vapour in the Great Lakes Basin and Southern Ontario has increased more than 3% from 1973 to 1995, contributing to higher intensity rainfall events (Ross and Elliott, 2001).
- Increased night-time temperatures in the summer has been linked to more intense convective activity and rainfall contributing to greater annual precipitation totals (Dessens, 1995).
- The number of strong cyclones increased significantly across the Great Lakes over the period 1900 to 1990 (Angel and Isard, 1998).
- Heavier, more frequent and intense rainfall events have been detected in the Great Lakes Basin since the 1970s.
- The maximum intensity for one-day, 60-minute and 30-minute duration rainfall events increased on average by 3-5% per decade from 1970 to 1998 (Adamowski et al., 2003).
- The frequency of intense daily rain events increased from 0.9% (1910 to 1970) to 7.2% (1970 to 1999) for very heavy events and from 1.5% to 14.1% for extreme events (Soil and Water Conservation Society, 2003) for the same periods.
- An increase in lake-effect snow has been recorded since 1915 (Burnett et al., 2003).
- Precipitation as snow in the spring and fall has decreased significantly in the Great Lakes-St. Lawrence basin between 1895 and 1995, although total annual precipitation has increased, (Mekis and Hogg, 1999).

Source: EBNFLO Environmental and AquaResource Inc., June 2010.
Guide for Assessment of Hydrologic Effects of Climate Change in Ontario,
Ontario Ministry of Natural Resources and Credit Valley Conservation.