

A Climate Change Adaptation Strategy for the Lake Simcoe Watershed: The planning process

Case Study, Summer 2012

Getting to know the Lake Simcoe watershed...

With a surface area of 744 km², Lake Simcoe is the largest inland lake in Southern Ontario apart from the Great Lakes. The Lake is bordered by Simcoe County, Durham Region and York Region, with the watershed being home to more than 350,000 people, with many more seasonal cottagers. The watershed is also home to the Chippewas of Georgina Island First Nation, who are one of a handful of First Nations in the Greater Toronto Area.

The Lake Simcoe watershed contains significant natural, urban and agricultural systems, including parts of the Oak Ridges Moraine and the Ontario Greenbelt. In addition to its natural beauty, the area is also valuable to the Ontario economy. For example, recreational activities contribute approximately \$200 million per year to Ontario's economy. As well, with nearly half of the watershed being prime agricultural land, agriculture generates another \$300 million per year.¹



Climate change is already a reality for the Lake Simcoe Watershed

Measurements taken at one station over a 31-year period show that average annual temperatures in the Lake Simcoe watershed have increased by 1.7°C, average winter temperatures have increased by 2.2°C, and there has been little change in average annual precipitation. Climate models suggest that by mid-century, the Lake Simcoe watershed could see a temperature increase of up to 2.7°C with a 6% increase in average annual precipitation.¹

Some potential impacts of climate change for Lake Simcoe include:

- A shorter winter season affecting ice quality, ice cover, water temperatures and thermal regimes;
- A more suitable climate envelope for invasive species;



Aerial view of Lake Simcoe

- Earlier snowmelt resulting in earlier spring runoff with less streamflow in the summer;
- Warmer lake and river water temperatures leading to degraded fish habitat, beach closures, and algae blooms;
- More frequent extreme events (wind and rain) leading to flooding, affecting houses and municipal infrastructure, including roads and stormwater infrastructure.

With these changes in store, installing or enhancing adaptive capacity to respond to this change will be important to the health and well-being of people living and working in the Lake Simcoe watershed throughout the 21st century.²

"The overall purpose of the Lake Simcoe Climate Change Adaptation Strategy will be to increase the resiliency of the Lake Simcoe watershed to the impacts of climate change."²

Adaptation through legislation

The Lake Simcoe long-term health of Lake Simcoe is restored and protected both now and in the context of future climate changes. To support the development and implementation of the adaptation strategy, **MOE, in collaboration with other ministries and partners, will:**

The purpose of the strategy is to increase the resiliency of the Lake Simcoe watershed to the impacts of climate change and ensure that the

long-term health of Lake Simcoe is restored and protected both now and in the context of future climate changes.

To support the development and implementation of the adaptation strategy, **MOE, in collaboration with other ministries and partners, will:**

- 1) Assess and evaluate the risk of climate change impacts on the watershed;
- 2) Promote, conduct and support additional research to better understand the impacts of climate change in the watershed;
- 3) Develop an integrated climate change monitoring program to inform decision making and to

assist with modeling the impacts of climate change on the watershed;

- 4) Develop climate change adaptation plans and promote the establishment of a Lake Simcoe Adaptation Planning Community of Practice (CoP).

Furthermore, recommendation #34 in Ontario's Expert Panel on Climate Change report, "Adapting to Climate Change in Ontario", states that the Climate Change Adaptation Strategy called for in the Lake Simcoe Protection Plan should be considered a **pilot project**, with potential application to strategies for increasing the climate resilience of other watersheds.³

The Lake Simcoe adaptation planning process

In collaboration with other ministries and partners, MOE initiated a process designed to **gather and summarize adaptation recommendations to inform the development** of the Lake Simcoe Climate Change Adaptation Strategy.

The planning process described below is based on a conceptual model for adaptation that was derived from **adaptive management** principles. Given the uncertainty of future conditions at specific locations or points in time, adaptive management is important because it is an **iterative process**

based on monitoring, new learning, and the re-evaluation of management goals. In other words, the framework used is not strictly linear; where new data and learning can be integrated, re-evaluations and changes can be made over time.⁵

The following sections outline the steps involved in the adaptive management planning process which was used to inform the development of the Lake Simcoe Climate Change Adaptation Strategy.²

“Adaptation is an adjustment in natural or human systems to moderate and cope with the consequences of climate change. The essence of adaptation is to “learn while doing”. This process involves learning about vulnerabilities and risks, evaluating possible responses, implementing adaptation action, and revising choices with new learning.”⁵

Step 1: Build team, engage experts and identify indicators

The planning team engaged **scientists and practitioners** to complete preliminary vulnerability assessments for 11 themes

and established a forum of climate change experts to generate adaptation options to address the known and potential vulnerabilities of natural assets and infrastructure to climate

change described by the scientists.

The 11 themes include: hydrology, aquatic habitat, wildlife, insects, species at risk, invasive species, vegetation cover, natural heritage areas, agriculture, tourism and recreation, and infrastructure. (Note, time and budget limitations, availability of data and information, and the availability of expertise helped determine the selection of themes).²

Step 2: Assess current vulnerability

In reference to climate change, **vulnerability** is the degree to which an asset is susceptible to, and unable to cope with, the forces and factors of a changing climate. Developing meaningful adaptation strategies requires an understanding of the vulnerabilities of species, ecosystems, and social systems to climate change.⁵

A **vulnerability assessment** uses

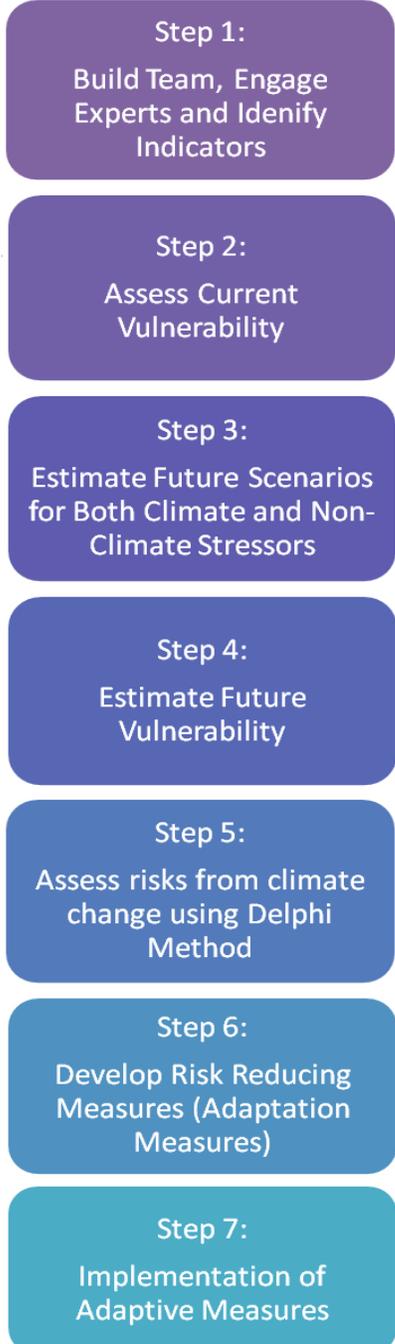
ecological or socio-economic indicators to quantitatively or qualitatively describe how an asset is being or could be affected by climate change. Using a guiding framework (see flowchart on page 3), experts assessed the vulnerability of natural and built system components to the impacts of climate variability and climate change in the context of current system stresses.²

Step 3: Estimate future scenarios for both climate and non-climate stressors

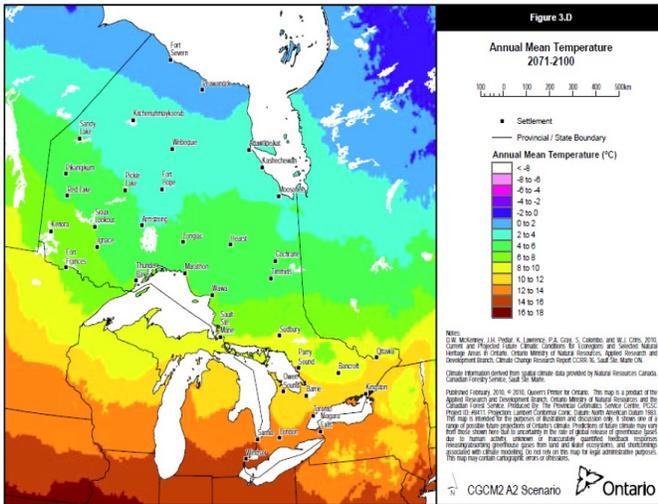
Climate models and emissions scenarios based on different types of human behavior are a useful tool to engage people in strategic discussions (e.g. ‘what if questions’) and decisions about potential future climates, vision-based targets, and adaptive responses.

The scientists and practitioners of

the Lake Simcoe project were provided mapped projections derived from Version 2 of the Canadian Global Climate Model and the A2 scenario prepared by Colombo et al. (2007). Socioeconomic scenarios and projections of population growth and land use change were also sought and used as context for the analysis of climate vulnerability.²



Steps involved in the Lake Simcoe Climate Change Adaptation Strategy planning process²



Step 3: Temperature projections for Annual Mean Temperature for Ontario (2071-2100) derived from CGCM2 A2 Scenario

Step 4: Estimate future vulnerability

Using the future scenarios gathered in Step 3, scientists completed **vulnerability assessments** for 9 of the 11 themes (hydrology, aquatic habitat, wildlife, insects, species at risk, invasive species, vegetation cover, natural heritage areas, and tourism and recreation).

Indicators were developed for each of the themes and used to assess vulnerability. Some of the indicators included impacts of warmer tem-

peratures on streamside vegetation, coldwater fish habitat, wetland water levels, tourism activities, and the composition of tree species in the forest.

Each team of scientists prepared a **background discussion paper** describing methods and results. They also provided a list of 3 primary consequences of climate change for their theme/sector, which were communicated to a forum of climate change experts at a workshop.²

Step 5: Assess risks from climate change using Delphi Method

At the workshop, the planning team convened a meeting of experts to review the results of the vulnerability assessments, facilitate an initial round of discussion about adaptation options, and introduce the Policy Delphi method.

A **Policy Delphi** is an iterative group-oriented Idea Generating Strategy (IGS) that seeks to identify the strongest possible opposing views on the potential resolutions of a policy issue. The approach permits a diverse group of experts to interact anonymously on a policy issue and provides a structured method for assembling ideas and recommendations.

Following the initial workshop discussion of adaptation ideas, the planning team used an **electronic survey with two rounds of questions**. The first round pro-

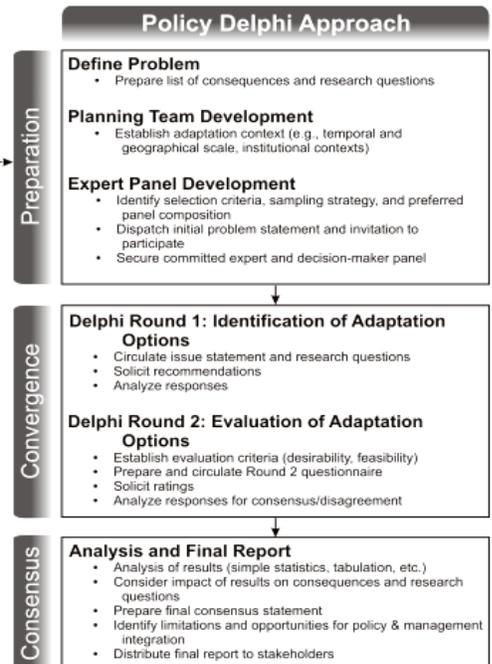
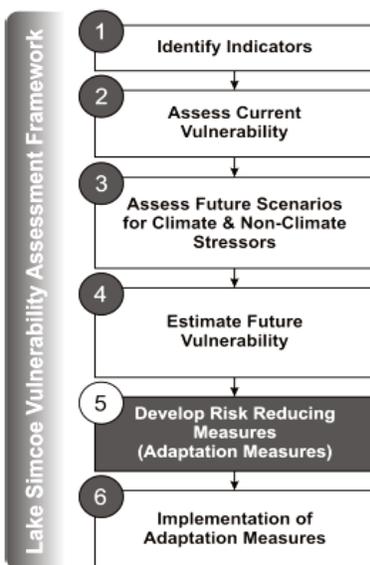
vided survey participants with the climate change vulnerability reports prepared by the scientists, including the list of 3 primary consequences of climate change.

The survey contained 11 questions organized according to 7 general categories: legislation and policy, strategic plan-

ning, land use and/or resource management planning, management and operations, monitoring, research, and knowledge dissemination (communication).

In total, 43 individuals responded to the first-round survey and more than 900 recommendations were submitted.²

"Of the 74 individuals who were invited to participate in the first round of the Policy Delphi survey, 20 did not feel qualified to answer the questions. Of the remaining 54 participants, 43 (84%) responded to the first-round survey. Of the 43 respondents, 39 (88%) completed the second-round survey."²



Methodological approach used to identify and evaluate climate change adaptation options for the Lake Simcoe watershed. The Policy Delphi approach is nested within the Lake Simcoe Vulnerability Assessment Framework.⁴

Step 6: Develop risk reducing measures (adaptation measures)

The Lake Simcoe planning team reviewed the 900 recommendations, eliminated redundancies, and re-drafted 695 recommendations for use in the second-round survey.

These 695 recommendations were used to develop a synthesized suite of adaptation options for each of the 11 themes and were evaluated in the second-round survey for their perceived priority and feasibility in each of the 7 categories.

With the ranking system developed for the round-two survey, the



team identified first-order or high priority adaptation options. In total, **92 recommendations were identified as first-order priorities** with an additional **48 recommendations identified as second-order priorities**. In addition, 76 recommendations and observations related to infrastructure were gathered and summarized.

Following a second workshop, during which participants evaluated the 92 first-order recommendations, **a final suite of 30 recommended strategies were selected** and/or written for consideration in the development of the Adaptation Strategy.²

Examples of first-order priority recommendations

1) **Strategic Planning:** Develop a Lake Simcoe Climate Change Adaptation Strategy that includes quantified targets and objectives for socio-economic and ecological conditions that are resilient to the impacts of climate change.

2) **Legislation and Policy:** Climate change should be integrated into species at risk assessments and Species at Risk Act recovery strategies.

3) **Enablers:** Adaptive management should be a principle embedded in all climate change related planning.²

Next Steps

The next step in the planning process is **Step 7: Implementation of Adaptive Measures**. The recommendations that were generated in Step 6 will be revised and will form the basis for the Lake Simcoe Climate Change Adaptation Strategy.

At present, the Ontario Ministries of the Environment and Natural Resources

have formulated a draft of the Strategy that was posted to the Ontario Environmental Registry for **public comment** on October 31, 2013. Once public comments have been considered, the Strategy will be enacted, and implementation will commence.

Want to learn more?

To access Lake Simcoe documents, visit the OCCIAR website:

http://www.climateontario.ca/p_ls.php

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References

1. Neilson, G. (2011). *The Lake Simcoe Climate Change Adaptation Planning Process: Adaptation Through Legislation*. Presentation at a Credit Valley Conservation Authority Workshop. October 15, 2011. Accessed from: <http://www.creditvalleyca.ca/wp-content/uploads/2011/11/Lake-Simcoe-CC-Adaptation-Final-CVC-Workshop-Oct-15-2011.pdf>
2. Douglas, A.G., C. Lemieux, G. Nielsen, P.A. Gray, V. Anderson, and S. MacRitchie. 2011. *Adapting to Climate Change -- Tools and Techniques for an Adaptive Approach to Managing for Climate Change: A Case Study*. Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR), 935 Ramsey Lake Road, Sudbury, Ontario, P3E 2C6. Unpublished Report. 66p.
3. Ontario Ministry of the Environment. (2009). *Lake Simcoe Protection Plan*. Accessed from: http://www.ene.gov.on.ca/environment/en/resources/STD01_076301.html
4. Ontario Ministry of the Environment. (2011). *Lake Simcoe Climate Change Adaptation Science Workshop*. Kempenfelt Conference Centre, Innisfil, Ontario. Delegate Package.
5. 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. 74 p.