

Toronto, Canada

Moving From Assessment to Action on Climate Change



The City of Toronto's climate change adaptation strategy 'Ahead of the Storm' is a comprehensive plan to prepare the city for the adverse effects of climate change. As part of the plan, the city developed a new tool for assessing potential risks to its services and infrastructure. The Climate Change Risk Assessment Tool is an essential part of Toronto's overall climate change adaptation strategy.

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Abstract

In response to increasing climatic risks, the City of Toronto has created a comprehensive and innovative Climate Change Risk Assessment Tool. The tool was developed to help the city identify and prioritize risks specific to various services run by the municipality. It is able to handle large amounts of data, and with this, has the capacity to assess multiple kinds of risk (eg. climate, environmental, health and safety), provide a record of due diligence, and capture and store the knowledge of experienced staff. As a result, the tool improves the knowledge base and institutional memory of the city. Through the use of the tool and the formation of the 'WeatherWise Partnership', the adaptive capacity of the community as a whole has been improved.

Importance of climate change adaptation

It is widely recognized that the climate is changing. While local, regional and federal governments continue their efforts to reduce greenhouse gas (GHG) emissions, it is important to prepare for those climate change impacts that are already underway. This includes more extreme heat and flooding, as well as increased damage to energy, water and transportation infrastructure from extreme weather events. Adapting to these impacts must take place at all levels of government. However, as most impacts will be felt at the local level, municipalities in particular need to, and are the most suitably positioned, to respond to these local challenges.

Toronto has already begun to feel the effects of climate change. During the summer of 2005, the city experienced 41 days with an average temperature of over 30° Celsius, almost three times the number of hot days experienced on average between 1961-1990. In the same year, the city was hit with an extreme precipitation event (where more than 150mm of rain fell in three hours), which caused flash flooding and resulted in an estimated CAD 500 million in property damage, the most expensive storm in Toronto's history. Conversely, in 2007, the city experienced its driest summer in 50 years with 95 consecutive days without significant rain and in 2011, Toronto experienced its hottest day on record. Events of this kind affect the ability of the city to deliver key programs and services, and impact some of the most vulnerable populations in Toronto, including at risk-groups that may suffer from chronic or pre-existing illnesses, the homeless and the elderly.



Population/Land area

~ 2.5 million (2006)
632 km²

Municipal budget

CAD 10.3 billion (2009),
US\$ 10.2 billion

Toronto joined ICLEI as a founding member in 1992



This case study is part of a series of local sustainability case studies compiled as part of ICLEI's preparation for Rio+20.

Case Study

City context

The City of Toronto is the provincial capital of Ontario and the largest city in Canada. With a population of over 2.5 million, the city is situated on the north-western shore of Lake Ontario. The climate in Toronto is moderate with cold winters and hot summers, due in large part to its location on the banks of the lake.



Photo: © Flickr by ikerender

The City of Toronto skyline.

The city has been a leader in climate mitigation policy. The Toronto Atmospheric Fund was established in 1992 with an endowment of CAD 23 million from the sale of city property. It has helped the city save CAD 55 million on energy costs. The city is now once again taking a leadership position in its work on climate adaptation.

In July 2007, the city unanimously adopted the 'Climate Change, Clean Air and Sustainable Energy Action Plan'. Although the plan focused primarily on mitigation activities, it also directed that a strategy be established which outlines adaptation actions to reduce the impacts of climate change. Following a series of extreme weather events between 2000-2010, and with

future climate projections indicating that more frequent and intense weather patterns will occur, the Toronto's Environment Office (TEO) developed a city-wide climate change adaptation strategy - 'Ahead of the Storm' which was unanimously adopted by council in 2008. The city has also begun to implement both short and long term adaptation actions.

Moving the City of Toronto from assessment to action

According to Lawson Oates, Director of the Toronto Environment Office, one of the key components [of Ahead of the Storm] was the development of a process to identify and prioritize risks, and identify, assess, and implement adaptation actions that will reduce the city's vulnerability to changing weather patterns, including more frequent and severe extreme weather events generated by climate change.

The TEO began by creating internal mechanisms to secure ongoing support and leadership from city departments and Council for the development of a comprehensive, multi-year adaptation process. A key component of this has been the development of the 'Climate Change Risk Assessment Process and Tool' - a computerized program that helps service and infrastructure providers prioritize and rank risks stemming from climate change.

The tool. The tool provides a mechanism to evaluate existing and proposed controls that can mitigate the impacts of extreme weather and helps providers identify where adaptation actions are needed to reduce the effect of climate change

impacts, thereby reducing risk. The tool was developed to be used by all major city divisions, and hopefully, other public and private organizations in Ontario, to evaluate and assess risk.

According to the TEO, the purpose of the tool is to assist the city in avoiding significant costs and service disruptions that could harm citizens, businesses or the natural environment in Toronto. It was developed using a Microsoft Access platform and systematizes an initial screening process to test the significance of climate change risks in relation to the city's organizational objectives. It is a comprehensive method to analyze and highlight risks to municipal assets and services that are potentially affected by climate change and extreme weather. It also provides a way to look at the social, economic, reputational, environmental and operational impacts of a given risk.

Additional features of the tool include its ability to:

- Assess multiple kinds of risk (e.g. climate, environment, health & safety);
- Handle large amounts of data;
- Capture and store the knowledge of experienced staff ('corporate memory' or 'institutional memory'); and
- Provide a record of due diligence as it ensures consistency and accountability through a structured, documented approach.

The development of the tool involved input from key stakeholders such as the Province of Ontario, as well as a review of current city practices and relevant literature. The tool also incorporates insights derived from a benchmarking study which analyzed existing approaches to climate risk assessment from around the world, including Chicago, New York and London, as well as practical learned experiences. Modelled on the international risk management standard - ISO 31000 - the tool is also aligned with the international environmental management standard ISO 14001. It is an important component for ensuring compliance with the City of Toronto's draft 'Policy on Environmental Risk Management'. It has since been used by divisions responsible for Transportation Services and Shelter, Support and Housing

Stakeholder involvement. An important aspect of the initiative was the creation of the 'Toronto Region Action Group on Extreme Weather Resilience', which has since been rebranded as the 'WeatherWise Partnership'. The group was convened by the City of Toronto and 'Civic Action', a non-profit group which brings together members of the private sector to promote the prosperity of the region and initiate dialogue with the community regarding risk.

Due to the participatory nature of the group and the diversity of the stakeholders involved - ranging from key corporate actors in the city, to municipal staff, NGO's and community groups - the WeatherWise Partnership embodies fundamental Local Agenda 21 objectives of participatory governance. The group brings together members of the private sector, city staff, the non-profit community, and other levels of government to work together and identify actions to reduce risk. Drawing on the collective knowledge of various stakeholders, the group hopes to find the most efficient and cost effective way to reduce risk and improve the resilience of the city's infrastructure to the adverse impacts of climate change.

Results

Application of the tool. The application of the Climate Change Risk Assessment Tool to specific services within the city allows each division to identify high priority assets, critical services and near, medium and long term risks to these assets and services. Both Transportation Services and the Shelter, Support & Housing Administration Divisions participated in a pilot assessment of the process and the application of the tool. Of the two pilot projects, Transportation Services examined more than 90 road infrastructure assets and services (roads, bridges, culverts, traffic control signals, snow plowing, salting, inspections, etc.) While, Shelter Support and Housing Administration examined a large apartment building,

a women's shelter and one program for the homeless known as 'Streets to Homes'. At the time of writing both divisions were working to finalize their respective reports.

Impact findings. The risk assessment team from Transportation Services identified seven relevant weather phenomenon based on historical experiences, including: freeze/thaw cycles, extreme snow, extreme heat, extreme cold, extreme freezing rain, extreme rain and extreme wind. Three areas were identified as having priority assets, infrastructure and services:

1. Infrastructure Asset Management and Programming.
2. Infrastructure Operations.
3. Traffic Management Center.

Within each area, the team assessed 95 high priority assets and services. The assessment examined two time horizons: 2010 to 2020 and 2040 to 2050. Dozens of 'high risks' were

identified, many of which tended to lead to even higher risks in the future.

Risk assessors, risk training and staff participation for risk scenarios. One lead assessor and eight risk assessors from within the Transportation Services Division, with a high level of expertise and experience, were selected and trained in the risk assessment process. In total, 15 half day risk assessment sessions and three half day risk treatment sessions were held, in which 14 full-time staff members participated. Selected staff members were identified on the basis of their specific knowledge of the assets and services being assessed. Longer serving staff were given priority to participate as they were more likely to have seen examples of how extreme weather can impact infrastructure and services. Approximately 1700 risk scenarios were developed for each of the two time horizons.

Identification of priority areas. The results of the Transportation Services assessment indicated three major areas on which to focus resources and funding for future adaptation actions:

1. Aging infrastructure.
2. Interdependencies (particularly looking at how Transportation Services relies on the performance and service delivery of other city and non-city infrastructure).
3. Best practice techniques.



Toronto City Hall.

Taking into account the results from the risk assessment, the city identified the need for a more detailed vulnerability assessment of culverts due to the expense that would be incurred in the event of a washout. In 2005 a major culvert washed out and cost the city approximately CAD 44 million, as well as disruption and potentially dangerous health and safety issues for the community. In addition to the vulnerability assessment further detailed technical studies regarding culverts may be necessary as a result of the climate change risk assessment work.

Formulation of recommendations. Based on these findings, the Transportation Services Division developed a series of recommendations to plan for the physical effects of climate change. Recommendations focused on building an integrated environment and climate risk management program, including: developing a climate risk management governance structure; implementing a communication and training program to educate staff in the risk management process, and ensuring that divisional risk assessments continue. In all of these recommendations, there is a strong focus on prudent cost management in the present and the future, but not at the expense of providing the core services required by residents. The TEO will be promoting the practice of climate change risk assessment and the understanding of interdependencies of infrastructure. A core approach will be to identify any unacceptably high risks where action is necessary to reduce risks to an acceptable level

Action group meetings to identify cost-effective options. The TEO has a mandate to work with all stakeholders to support co-operation, communication and research amongst all levels of government, universities, colleges, non-governmental organizations and the private sector on climate change adaptation actions and strategies relevant to Toronto. As part of this work, the WeatherWise partnership has been meeting and working to find cost effective ways to reduce risks with an initial focus on electrical power continuity. The partnership had their first meeting in June 2011 with individuals from more than 30 organizations, representing billions of dollars of assets. The group met again on September 2011, and is currently working to develop a strategic action plan that will be released in 2012.

Growing body of knowledge. The Climate Change Risk Assessment Tool contributes to a growing body of knowledge on climate change risk management around the world. Based on the results of the benchmarking study done as part of the development of the tool, as well as consultation between the City of Toronto staff and other leading international experts, it appears that this tool is one of the most advanced in the world.

Development and sharing of the tool has given the City of Toronto the opportunity to demonstrate leadership in addressing the very pressing and complex issue of climate change. The city now has the ability to contribute to the field of climate change adaptation research through the sharing of this tool. Sharing experiences has helped to garner interest in the potential use and application of the tool within a global network, in the spirit of collaboration, information, and resource sharing. City staff are currently working with the Council and legal services to develop a licensing agreement to enable the sharing of the tool with other interested parties.



The Finch Avenue washout after an extreme precipitation event in Toronto 2005.

Photo: © Transportation Services Division, City of Toronto

Lessons learned

Collaboration is a key component of increasing the resilience and adaptive capacity of municipalities across Canada and globally. The TEO has long been at the centre of collaborative efforts on climate change adaptation. In 2007, it convened the first ever gathering of all three levels of government, local academics and NGOs on the issue of climate change adaptation in Canada. With the formation of the WeatherWise Partnership, Toronto is again working collaboratively with public, private and not-for-profit organizations to protect residents, infrastructure, and the environment from extreme weather events.

Knowledge Transfer Through its continued use, the tool has enabled city divisions to gain the knowledge and capacity required to prepare for the adverse effects of climate change. By storing information, it can save staff time and money, while

creating a broader understanding of climate change risks and vulnerabilities throughout the municipality.

Stakeholder engagement has been essential to Toronto's adaptation efforts. The establishment of the 'WeatherWise Partnership' brought on board various stakeholders in an effort to raise awareness of the risks associated with climate change and how the community as a whole can adapt to meet this challenge.

Demonstrated practical use. The current application of the tool and the risk assessment process to city services has demonstrated its practical use and applicability to service and infrastructure providers. This has also demonstrated

the relevance of the tool to other public and private organizations wanting to evaluate and assess risk. The wider use of the tool by other city divisions will also facilitate an examination of the top ranking risks across departments.

Challenges. Even in a large municipality such as the City of Toronto, a key limiting factor in the development of the tool was staff time and resource availability. Due to the fact that it is a highly specialized tool, its successful application requires both training and expertise. To overcome this, a user's manual and training course for risk assessors has also been developed.

Replication

Increasingly, communities across Canada and internationally are developing local actions plans for adapting to climate change. Regardless of whether a municipality has the capacity to develop a tool of this kind, there are many valuable insights which can be taken from the process that the City of Toronto undertook that can be replicated in other municipalities.



Photo: © Flickr by Onshi

Extreme Weather Damage Toronto.

Adaptation planning requires support from a diverse group of departments and stakeholders. Key to the success of this project has been the engagement of stakeholders and the targeted training of the risk assessors. By facilitating training workshops and creating interdepartmental working groups or teams, the city enabled and encouraged a rich engagement process throughout the development and implementation of 'Ahead of the Storm' and the Risk Assessment Tool. A participatory process, like the one employed by the City of Toronto, is one which can be used and applied in communities across the globe.

As acknowledged in the city's report to the Council (2010), there is a need for collaborative local, regional, national and international action on climate change, including the need and ability to respond to climate change through adaptation measures. The City of Toronto will be creating a licensing agreement protocol to enable the sharing of the tool with other interested parties, and to ensure no liability for the City of Toronto, but mainly to encourage users to share best practices and enhancements regarding the tool

Budgets & finance

The tool itself was funded through a council vote for a project budget. One third of the total budget was allocated for the development of the tool, while the remaining two thirds were used for other related projects.

One staff person from the Toronto Environment Office is mandated to work full-time on climate change adaptation. The city also has staff from other divisions informally assigned to work on adaptation as part of their regular duties. Currently, the WeatherWise Partnership is unfunded.

In the Transportation Services Division alone, the replacement value of the city's built infrastructure assets totalled CAD 12.2 billion. It is for this reason that the city felt that both the cost and effort of developing a tool to assess risks against extreme weather events was both a necessary and cost effective effort.

Key Contacts

Toronto Environment Office

David T. MacLeod
100 Queen Street West.
Toronto.
Ontario M5H 2N2
Canada
Tel. +1- 416 /39 24 340
Fax. +1-416 /33 80 808
Email. Dmacleo2@toronto.ca

ICLEI Canada Office

401 Richmond Street W. -
Studio 204
Toronto, Ontario M5V 3A8
Canada
Tel. + 1- 647 / 72 84 308
Email. iclei-canada@iclei.org
www.iclei.org/canada

ICLEI World Secretariat (WS)

Capacity Center
Kaiser-Friedrich Strasse 7
53111 Bonn Germany
Tel. +49-228 / 97 62 99-00
Fax. +49-228 / 97 62 99-01
Email: capacity.center@iclei.org
www.iclei.org

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