2019 GLISA Small Grant White Paper

Applying Climate Information to Build Resilience: Translating Technical Results into Practical Tools for Community Decision Makers

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Background and Approach

Climate change is affecting local communities across the Great Lakes region, including the Durham region, which is located on the northern shore of Lake Ontario in Ontario, Canada. In 2016, the Regional Municipality of Durham (or Durham Region) released its award-winning[1] Community Climate Adaptation Plan (DCCAP)[2], and in 2020, the Region joined a growing number of governments in Canada and around the world in declaring a climate emergency[4]. With funding from GLISA's Small Grants Program[5], Toronto and Region Conservation Authority (TRCA) partnered with Durham Region to build capacity and equip community decision-makers with the information and resources they need to move from climate data to climate action.

Between 2019 and 2020, TRCA's Ontario Climate Consortium (OCC) worked with the Region and other partners to develop updated downscaled climate projections for the region with funding from the Greenbelt Foundation[6]. This resulted in climate projections for a total of 52 climate parameters under a high emissions scenario (RCP 8.5) and an intermediate emissions scenario (RCP 4.5) for the short (2011-2040), medium (2041-2070), and long-term (2071-2100) future. This data is currently available to the public through the Region's Open Data portal[7]. Downscaled climate projections were also developed for each of the region's eight lower-tier municipalities, TRCA[8], and Ganaraska Region Conservation Authority[9], thereby making more consistent local climate data available to help inform adaptation planning efforts. Recognizing that developing and making updated climate projections available is only a key first step in the adaptation process (Figure 1), TRCA and Durham Region applied for small grant funding from GLISA to translate the newly available climate projection data into practical information and tools for community decision-makers to encourage and support uptake and application of the data. This project kicked off in September 2020 and concluded at the end of August 2022. A multi-pronged approach was undertaken, including:

1. Refinement of a section of the Durham climate projections final report[6] to improve and expand on the limitations and uncertainty in the climate modeling results associated with natural features that may influence local climate, including Lake Ontario, Lake Simcoe, and the Oak Ridges Moraine, along with strategies for overcoming modeling limitations.

2. Development of a suite of communication products:

- A menu of key messages to communicate what the climate projections mean for local communities in the region, with a focus on natural systems and human health;
- A climate trends infographic[10] that provides a visual summary of the climate projections, including mean temperature, days above 30°C, days below -20°C, and total annual precipitation; and,
- A climate change impacts infographic[11] that provides a visual summary to communicate the impacts of climate change across the region, including impacts on ecosystems and biodiversity, agriculture, extreme heat, vector-borne disease, urban heat island effect, flooding, power outages, food, transportation, and winter recreation.

3. Hosting two training workshops on applying climate data to build resilience in Durham region, with one workshop targeting public health stakeholders and another targeting natural systems stakeholders.

4. Hosting a climate and health scenario planning workshop with public health stakeholders with focus on extreme heat and compounding impacts.

5. Development of site-level adaptation plans for two pilot sites in Durham region based on the results of the Durham Natural Systems Climate Change Vulnerability Assessment (2022) completed as a separate project by TRCA.

Figure 1. Illustration of the traditional adaptation planning process (Warren and Lulham, 2021[12]).

PROJECT TEAM AND CONTRIBUTORS

This project was led by TRCA's Ecosystem and Climate Science (ECS) team (formerly the Ontario Climate Consortium) with support from Durham Region's Sustainability team in the Office of the Chief Administrative Officer, and GLISA (Figure 2).

Figure 2. Project team composition, roles, and responsibilities

The project was managed by Sharon Lam, Project Manager with the ECS team in TRCA. Various current and former members of the ECS team contributed to the development and review of project outputs and helped to facilitate the workshops, including Noah Gaetz, Senior Manager; Yuestas David, Senior Research Scientist; Meaghan Eastwood, former Senior Research Scientist; Kristina Dokoska, former Project Coordinator; Jessica Akande, former Coordinator; and, Lubna Seal, former Data Analyst.

This project also benefited from the contributions of many other TRCA staff. Notable contributions include Michael Bortolussi, Project Manager, Marketing, and Dana Lambert, Senior Graphic Designer/Photographer in TRCA's Marketing team, who provided support in the development of the climate trends and impacts infographics; and, Andrew Chin, Research Analyst, Ecosystem and Climate Science; Andrew Ramesbottom, Senior Project Manager, Restoration Projects; Patrick Esson, Senior Project Manager, Restoration Projects; Mary Anne Young, Project Manager, Restoration Projects; Clifton Coppolino, Senior Project Manager, Restoration Projects; and Colleen Gibson, former GIS & Data Analyst who provided support in the desktop-based screening to inform the selection of the two pilot sites.

From Durham Region, the primary project partners include Ian McVey, Manager of Sustainability, Office of the Chief Administrative Officer; Melanie Kawalec, Climate Change Coordinator, Office of the Chief Administrative Officer; Sendi Struna, Manager, Health Protection; Dianne San Juan, Senior Environmental Health Specialist; Alexandra Swirski, Epidemiologist, Health Analytics & Research; Amanda Bathe, Senior Planner, Planning and Economic Development Department; and, Kate Potter, former Implementation Coordinator for the Durham Community Climate Adaptation Plan. Judy Christianson, Program Coordinator-Accessible Documents, and Liam Hatch, Communications Advisor in Durham Region, also supported the development of the infographics to ensure web accessibility.

From GLISA, project administrators and contributors include Jenna Jorns, Program Manager, GLISA; Laura Briley, former Climatologist, GLISA; Kimberly Channell, Climatologist, GLISA; and, Lunia Oriol, Intern, GLISA.

The next section provides more information on GLISA's contributions to this project.

Relationships

TRCA-GLISA RELATIONSHIP

TRCA has enjoyed a strong, collaborative relationship with GLISA prior to this grant. TRCA was the recipient of 2012 and 2014 GLISA small grants[13,14], which helped to drive climate change adaptation in several regions throughout our jurisdiction, including Peel region and York region. TRCA featured GLISA team members as climate experts at the 2019 State of Climate Modelling in the Great Lakes Basin workshop[15]. GLISA has provided advisory and review support to various TRCA-led projects, such as the update to Durham's climate projections and the Climate Change in the Great Lakes Basin: Summary of Climate Trends and Impacts report[16], which was developed in support of Annex 9 of the Great Lakes Water Quality Agreement (GLWQA). Conversely, TRCA has provided similar advisory and review support to various GLISA-led projects, such as the creation of Ontario climate divisions[17] and Great Lakes Retrospectives and Prospectives[18].

For this small grant, GLISA provided valuable technical support over the course of this project, helping to review and provide input on project outputs, as well as participating in the various workshops, including providing an overview of GLISA's work at the training workshops. Since climate projections had already been developed for the region, GLISA reviewed the messaging and framing of the communications materials to ensure a balance of scientific accuracy and plain language. GLISA's Future Climate Scenarios for Great Lakes Cities[19] was also relied upon in the development of the scenarios for the climate and health scenario planning workshop, particularly the "Sustained Heat & Storms" scenario. We look forward to continuing our collaboration with GLISA to help advance climate data and adaptation capacity in the Great Lakes region. For example, there may be an opportunity to further extend and deepen the impact of the climate and health scenarios developed through this project and GLISA's Future Climate Scenarios for Great Lakes Cities and scenario planning approach[20].

STAKEHOLDER NETWORK ENGAGED

A total of 22 organizations were actively engaged through this project. Stakeholders attended and participated in the various workshops and supported the development of project outputs through review and input (Figure 3). A wide range of organizations were engaged, covering regional/local municipalities (7), conservation authorities (5), private sector (3), academic institutions (2), non-profit organizations (2), federal department (1), school board (1), and state department (1). Table 1 summarizes the number of people engaged through each project component.
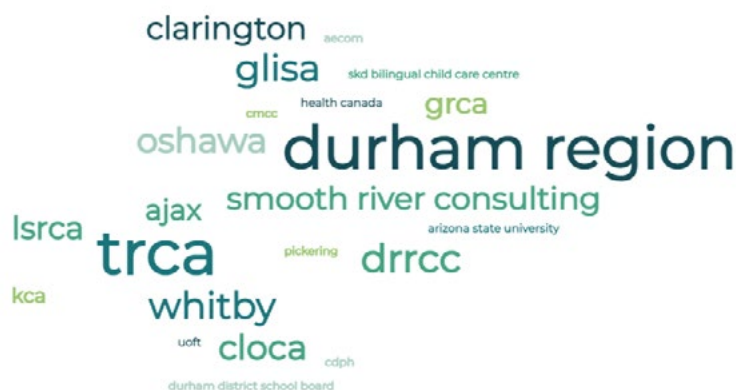
Acronyms	Full Name
CDPH	California Department of Public Health
CLOCA	Central Lake Ontario Conservation Authority
CMCC	Euro-Mediterranean Center on Climate Change
DRRCC	Durham Region Roundtable on Climate Change
GRCA	Ganaraska Region Conservation Authority
KCA	Kawartha Conservation
TRCA	Toronto and Region Conservation Authority
UofT	University of Toronto

Figure 3. Word cloud of organizations engaged

Project Component	No. People Engaged
1. Refinement of a section of the Durham climate projections final report	1
2. Development of a suite of communication products	
i. Menu of Key Messages	20
ii. Climate Trends Infographic	8
iii. Climate Change Impacts Infographic	10
3. Hosting two training workshops on applying climate data to build resilience in Durham region	
i. Public Health	44
ii. Natural Systems	50
4. Hosting a climate and health scenario planning workshop	22
5. Development of site-level adaptation plans for two pilot sites	25

Table 1. Number of people engaged by project component

Each training workshop began with an overview of the updated Durham climate projections[7] to raise awareness and understanding of the updated climate data and improve ability to communicate what the region's future climate could look like. The training workshops featured guest presentations that further drilled home what the future climate means for people's health and natural systems (based on preliminary vulnerability assessment results) and offered practical examples of how climate data can be utilized and applied to support health/natural systems adaptation. These included presentations on:

- CCHVIz[21] – a visualization platform for the Climate Change and Health Vulnerability Indicators for California, presented by Meredith Milet, Epidemiologist, Office of Health Equity, California Department of Public Health;

- Change Game[22] – a free videogame that immerses players into different climate change scenarios based on real climate data and scientific research, presented by Eleonora Cogo, Senior Scientific Manager, Euro- Mediterranean Centre on Climate Change

- Peel Ecosystem Climate Adaptation: Best Practices for Addressing Vulnerabilities, presented by Kristin Tremain Davis, Nature-based Solutions Practice Lead for the Americas, AECOM; and

- The co-production of sustainable future scenarios[23], presented by Dr. Marta Berbés-Blázquez, Assistant Professor, School for the Future of Innovation in Society, Arizona State University.

Finally, the training workshops concluded with an interactive brainstorming activity to collectively identify how climate data is currently being used, how climate data can be used, and what additional climate data/information is needed.

The climate and health scenario planning workshop began with a presentation by Durham Region's Health Department on the connections between climate change and people's health and existing socio-economic and health vulnerabilities in communities across the region. This was followed by a brief introduction to scenario planning before diving into a scenario planning activity focused on extreme heat. Three related scenarios were presented, followed by a group discussion after each scenario.

The selection of two pilot sites was based on a desktop-based screening by TRCA staff to identify areas of overlap among highly vulnerable natural areas and features and:

- Completed, ongoing, and upcoming TRCA restoration projects;
- Management recommendations from the Carruthers Creek Watershed Plan[24] (2021);
- Results from another study completed by TRCA for Durham Region which assessed flood vulnerable culverts and crossings; and
- Priority health neighbourhoods[25].

The pilot sites were confirmed with Durham Region staff and local municipal staff in the City of Pickering and the Town of Ajax where the selected sites are situated. Finally, the concept of site-level adaptation plans was explored at a meeting with members of the Region's Natural Environment Climate Change Collaborative (NECCC). Potential ecosystem adaptation best practices were reviewed based on best practices research completed for Peel region.
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Use of Climate Information and Services

The purpose of this project was to foster increased awareness and uptake of the updated Durham climate projections (as noted in section 1.1 Background and Approach). Durham climate projections[6], developed with grant funding from the Greenbelt Foundation prior to this project, were used in this project as originally anticipated. Dr. Michael Notaro with GLISA, University of Wisconsin-Madison, provided review and input on the development of the climate projections. Table 2 presents an overview of the models/ensembles used; summary data is currently available to the public through the Region's Open Data portal[7].

Driving Global Climate Model	Regional Climate Model	RCPs Model Runs are available for
CanESM2	CRCM5-UQAM	RCP 8.5
CNRM-CM5	CRCM5-OUR	RCP 8.5
GFDL-ESM2M	CRCM5-OUR	RCP 8.5 and RCP 4.5
MPI-ESM-LR	CRCM5-OUR	RCP 8.5
GEMatm-Can	CRCM5-UQAM	RCP 8.5
GEMatm-MPI	CRCM5-UQAM	RCP 8.5
MPI-ESM-LR	CRCM5-UQAM	RCP 8.5
CanESM2	CanRCM4	RCP 8.5 and RCP 4.5
GFDL-ESM2M	RegCM4	RCP 8.5
HadGEM2-ES	RegCM4	RCP 8.5
MPI-ESM-LR	RegCM4	RCP 8.5
GFDL-ESM2M	WRF	RCP 8.5
HadGEM2-ES	WRF	RCP 8.5
MPI-ESM-LR	WRF	RCP 8.5
MPI-ESM-MR	CRCM5-UQAM	RCP 8.5
CanESM2	CRCM5-OUR	RCP 8.5 and RCP 4.5

Table 2. NA-CORDEX climate model runs used to develop the Durham climate projections

Outcomes and Outputs

This project delivered the following outputs:

- Refined section on "Important Regional and Local Climate Considerations" from the Durham climate projections final report (Word document);
- Menu of key messages (Word document);
- Climate trends infographic (PDF available online);
- Climate change impacts infographic (PDF available online);
- Video recording of the two training workshops;
- Public Health (available on YouTube)
- Natural Systems (available on YouTube)
- Presentation slides from the two training workshops (PDF);
- Video recording of part of the climate and health scenario planning workshop (available on YouTube);
- Presentation slides from the scenario planning workshop (PDF);
- Full draft of the workshop summary report (Word document); and,
- Presentation slides from the site-level adaptation planning process (PDF).

The infographics are published on Durham Region's website (links included above) and have been integrated into staff presentations (e.g. by Durham Region's Sustainability team in the Durham Community Climate Change Action Plan 2021 Update Webinar Series) to help communicate climate trends and impacts affecting Durham region. Compared to the anticipated outputs, this project delivered two infographics – one more than originally proposed, given the Region's interest in communicating what the climate trends mean for communities within the region. Through these outputs, the anticipated outcomes have been met:

- Available content for promotion and community awareness;
- Use of consistent messaging;
- Improved understanding and mainstreaming of climate data for use in the natural environment and human health-related applications;
- Better awareness and availability of visual guidance for practitioners on how to use climate data;
- Increased understanding of key vulnerabilities and management concerns, and preparedness for climate change and human health impacts;
- Model process for how Durham Region staff and stakeholders can work together to identify comprehensive and integrated adaptation actions; and,
- Build capacity among participants to identify opportunities to mainstream climate adaptation into their work.

This project also contributed to various significant outcomes as defined by the NOAA CAP/RISA program:

- **Built, increased, or maintained assets, such as data, infrastructure, tools:** This project refined a section of the "Guide to Conducting a Climate Change Analysis at the Local Scale: Lessons Learned from Durham Region" report[6] and developed new communications tools (i.e. infographics, menu of key messages, and workshop presentation slides).

- **Nurtured the ability of partners to self-organize by supporting peer collaboratives or networks:** This project brought together a wide range of stakeholders through a series of workshops, fostering collaboration and peer-to-peer learning. For example, following the scenario planning workshop, an anonymous participant shared that they

  > **"Really enjoyed the scenarios approach that allows you to look at options with existing resources and then identify gaps and external resources that may be needed."**

  Additionally, collaboration with the Region led to Durham Region's investment in conducting a natural systems climate change vulnerability assessment, completed by TRCA. Ongoing collaboration through the site-level adaptation planning process also led to increased engagement between the Region and TRCA's Restoration Projects team.

- **Boosted learning outcomes, resulting in a deeper understanding of science or local knowledge related to climate, impacts, and adaptation:** The training workshops and scenario planning workshop contributed to this outcome, which included guest presentations and interactive activities (i.e., to brainstorm how climate data is being used now, how climate data can be used, what additional climate data/information is needed, and undertake a three-part climate and health scenario planning exercise). Following the training workshops, an anonymous participant noted,

  > **"inspiring presentations with real-world application".**

- **Shifted mindsets, resulting in documented cases of new readiness to act or acceptance of a need to act:** The climate and health scenario planning workshop was a novel approach used in the Durham region. For example, one anonymous participant noted,

  > **"As an emergency management coordinator, PH [public health] is usually an after-thought during a response. Very much liked how PH can be integrated into planning".**

- **Elevated a sense of agency by building the expertise, confidence, and capability of partners to act:** The training workshops and scenario planning workshop again contributed to this significant outcome. For example, an anonymous participant noted,

  > **"From an EM (emergency management) perspective, the three-scenario format was useful where each one explored new issues to navigate. The third scenario is a good exercise for thinking about our approach to simultaneous disasters (heat wave and a weather event within a Covid environment). It really forces the participant to think about their approach and contingency plans".**

The following is an excerpt from a testimonial provided by Sendi Struna, Manager, Health Protection, Durham Region:

> **"Durham Region Health Department is grateful to have partnered with TRCA and GLISA to facilitate and host two health and climate adaptation workshops for community partners and decision-makers… Sharon and her team helped to initiate the conversation around the health impacts of climate change and how community partners can begin to incorporate a health lens to their climate adaptation planning and other emergency response plans."**

Challenges and Lessons Learned

Over the course of the project, some notable challenges included:

- Staff turnover in TRCA, Durham Region, and GLISA, affecting project team capacity and competing priorities;

- COVID-19 pandemic, which mostly affected public health staff capacity, leading the workshop dates to be pushed back;

- Delays associated with project-dependent variables (i.e., Durham climate and health vulnerability assessment and Durham natural systems climate change vulnerability assessment), which led to the adjustment of plans/timelines; and,

- Transition of OCC to a TRCA climate change program was formally announced in August 2021. No new information has been posted to OCC's website since the transition, so many of the project outputs have yet to be shared online. Discussions are ongoing to identify what content should be migrated from OCC's website[26] to TRCA's website[27].

Based on this project, some advice or lessons learned for future small grantees would be to:

- Maintain flexibility and regular communications with project partners to make/accommodate adjustments as needed;

- Recognize that building on ongoing projects carry risks to project timelines if there are delays; and

- Devising a plan to share and release the project outputs is helpful, which we will continue to explore through ongoing discussions about updates to TRCA's website.

Next Steps

This project has delivered on all of its major commitments with some work still remaining, including finalizing and publishing the workshop summary report; publishing the menu of key messages; and finalizing the site-level adaption plans and work towards their implementation. Future goals include:

- Continue to promote and increase the use and application of available climate data within the Durham region;

- Continue to explore opportunities to extend and deepen the scenario planning approach. For example, Durham health staff have noted interest from other public health units in the scenario planning approach; and

- Continue to explore opportunities to implement based on the results of the Durham natural systems climate change vulnerability, including interest in developing additional site-level adaptation plans and increasing restoration initiatives across the region.

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