

# Global centre for climate change impacts on transboundary waters

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9 May 2024

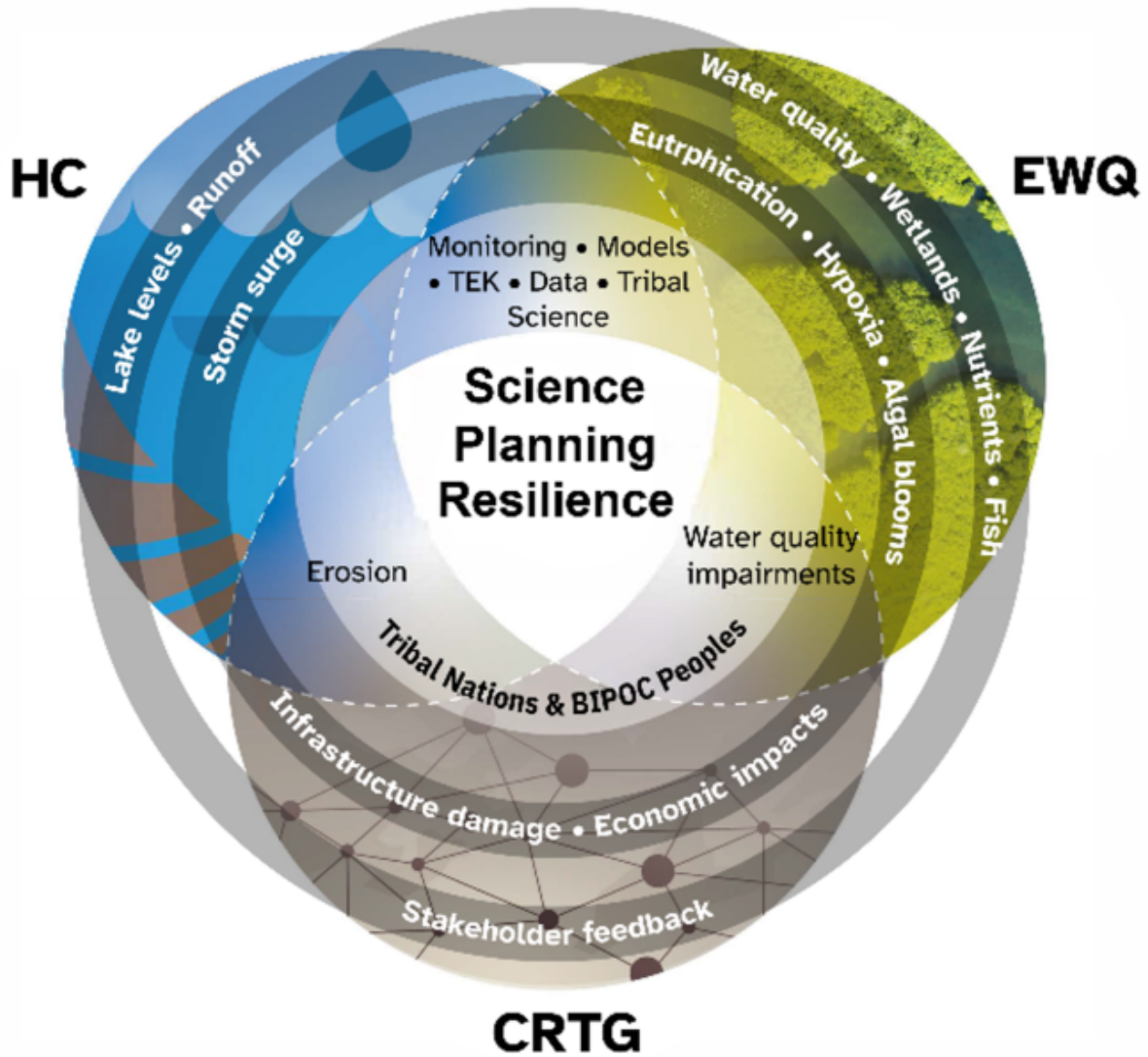


Figure 1. Schematic representation of integrating vision for cluster-based Center activities, including research on foundational climate and hydrological processes (outer ring) and climate-related hazards threatening those systems (inner ring).

## Dr. Gail Krantzberg and Dr. Andrew Gronewold, unpack the priorities of the Global Centre for Climate Change Impacts on Transboundary Waters

Climate change threatens water resources across North America and worldwide. It intensifies floods and droughts, worsens water quality, exacerbates shoreline erosion, and damages homes and other infrastructure. Communities must learn to adapt to these

worsening extremes. However, the tools and knowledge for adaptation are often non-existent, fragmented across jurisdictional boundaries, or simply too difficult to access and use.

This problem is particularly complicated in transboundary water systems encompassing or intersecting multiple sovereign nations, including those of Indigenous Peoples. Managing water resources in these multijurisdictional community settings requires a diverse perspective on governance structures, organizations, and management strategies.

## **Climate change impacts on transboundary waters**

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The Global Center for Climate Change Impacts on Transboundary Waters leads research on understanding and mitigating water crises in transboundary jurisdictions. Leveraging international expertise, it studies water resources spanning the U.S. and Canada geopolitical boundaries and beyond.

### **Specifically, the Center:**

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1. Models climate change and projected impacts on water resources.
2. Improves the understanding of these impacts on ecosystems and diverse communities.
3. Increases capacity for governance, management, and disaster resilience.

The knowledge developed through the Center has international relevance and will be disseminated to and benefit communities worldwide. The Center also supports postdoctoral associates and the training of graduate and undergraduate students at Cornell University, the University of Michigan, the College of the Menominee Nation, McMaster University, Toronto Metropolitan University, Wilfred Laurier University, and Brock University. It engages and supports the Red Lake Nation and the Six Nations of the Grand River.

The National Science Foundation, the Social Sciences and Humanities Research Council of Canada, and the Natural Sciences and Engineering Research Council of Canada fund the Global Center. The initiative involves the dedicated efforts of roughly 20 researchers and dozens of students from the Global Center's affiliated universities and colleges. To ensure that the Global Center's work is well-informed and globally relevant, an external advisory board comprising internationally recognized experts in Indigenous affairs, climate change, and water resource management and governance will inform the trajectory of research and engagement activities.

## **Developing new insights into community resilience**

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The Center applies a unique social science framework emphasizing engaging with communities across transnational watershed boundaries to develop new insights into community resilience. Its use of statistical modeling, state-of-the-art process models, and

novel, data-driven observational studies allows for estimating future climate change trajectories, providing critical insights to community decision-makers.

This approach is designed to be flexible and responsive to community needs, ensuring that research outcomes are relevant and useful to the communities it serves. The scientific and community- engagement models developed by the Center are initially focused on the Great Lakes region. They will be replicable and scalable, amplifying the Center's impact across transboundary water systems and communities globally.

The transboundary water bodies, watersheds, and coastlines on Indigenous Lands and First Nations and all other land between the United States and Canada provide a unique opportunity to study and address these challenges. Multinational representation is a central theme of our Global Center, which explicitly acknowledges that Indigenous Peoples comprise less than 5% of the world's population yet protect over 80% of its biodiversity.

## **Climate change research priorities in North America**

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In addition to this critical ecological linkage, North America is one of the fastest-warming regions on the planet. Indigenous Peoples are, therefore, extremely vulnerable to climate change's impacts and are deeply interwoven into our Global Center's research vision and leadership structure.

The Global Center for Climate Change Impacts on Transboundary Waters integrates research across three organizing clusters (Fig. 1) aimed at addressing three central research priorities. The Hydroclimate (HC) and Ecosystem Function and Water Quality (EWQ) clusters will create a two-way platform for an advanced foundational understanding of how climate change alters the hydrologic cycle and propagates into changes in ecosystem response by applying community-engaged mixed methods harmonizing Indigenous Knowledge (IK) and Western Knowledge.

The HC cluster co-develops a plausible range of future climate variables most relevant to the needs and uses of communities in transboundary watersheds. The HC cluster synthesizes the resulting projections and attribution studies to co-create water quantity and quality scenarios useful for adaptation decision-making across scales and jurisdictions in transboundary watersheds. The EWQ cluster incorporates IK and monitoring protocols into coordinated collection activities to create a robust and comprehensive understanding of climate change impacts on water quality and ecosystems.

The Communities and Transboundary Governance (CRTG) cluster uses mixed social science theories, approaches, and methods to understand better the hydroclimate, ecosystem, and related scientific knowledge needs of Indigenous, U.S., and Canadian communities and their collective capacity to use that knowledge to better adapt to current and potential future climate change hazards and associated ecosystem stressors.

## Communities and ecosystems enhance resilience in transboundary water systems

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Through our research, outreach, and engagement initiatives, we are committed to enhancing the resilience of communities and ecosystems in transboundary water systems, with a particular focus on Indigenous Peoples. Our overarching objective is to ensure that the data, models, and model outputs reflecting these critical connections are not only relevant and accessible but also easily understood and accessible to practitioners, decision-makers, and the public at large.

We are committed to enabling evidence-based decision-making and finding solutions to address the escalating water crises and climate change-induced hazards. We recognize the utmost importance of collaborating with Indigenous populations to co- create scientific knowledge and decision-making. This commitment strengthens our Global Center's ability to make a lasting impact. The scientific and community-engagement models we are developing are designed to be replicable and scalable for communities worldwide as we expand our global outreach and network engagement in the years to come.

### References

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1. McMaster University, Hamilton, Ontario, Canada.
2. University of Michigan, Michigan, United States.

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### More About Stakeholder

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[Global Centre for Climate Change Impacts on Transboundary Waters \(GC3TW\)](#)

Leveraging international expertise, the Global Centre for Climate Change Impacts on Transboundary Waters (GC3TW) currently studies water resources spanning the U.S. and Canadian geopolitical boundaries.

