



GLOBAL WATER FUTURES
SOLUTIONS TO WATER THREATS
IN AN ERA OF GLOBAL CHANGE

UN 2023 Water Conference

Statement on the Research-Water-Climate Nexus: Accelerating the Water Action Decade

Global Water Futures (GWF) is hosted by University of Saskatchewan's Global Institute for Water Security partnered with McMaster, Waterloo, and Wilfrid Laurier Universities in Canada. It comprises over 200 faculty, 18 universities, 70 observatories, and community, government, civil society, and private sector partners.

The climate crisis is the water crisis. As average global temperatures continue to rise, we see significant changes in the hydrological cycle. Cold regions provide water for half of humanity and are under threat. In Canada, we already experience record glacier melt, permafrost thaw, shorter snow and ice seasons, rain rather than snowfall, harmful algal blooms, and increased extreme events.

Urgent and ongoing threats drove the genesis of GWF, funded by the Canada First Research Excellence Fund. Advances have been made in scientific underpinnings for disaster warnings and risk assessments, and new models and technologies generated to deliver state-of-the-art prediction systems.

For example, we now have continental-scale snow and glacier hydrology models and models to predict thaw of permafrost (frozen ground) and effects on critical infrastructure. We also have an enhanced understanding of climate warming induced land cover change in norther regions and implications for water quality and quantity. This is critical given strong links with human health and well-being and food security/safety, particularly for Indigenous Peoples. We have hydrological models for the Great Lakes and for each of the six other major river basins in Canada run for current and future climates. This may seem insignificant until we are reminded that some of these river basins are the size of Western Europe and many sub-basins are ungauged. We also work with federal, provincial, territorial governments, municipalities, and others to develop cooperative flood forecasting systems for Canada. All of our models open source and are contributing to a unified modeling framework.

We have advanced research on nature-based solutions, particularly roles of wetlands. We have quantified the build-up of nutrients in our soils and sediments and determined how these nutrient legacies will threaten water quality for decades if not managed properly. Based on our research, we have proposed best management practices that help prevent nutrient legacies

from leaching into our rivers, lakes, and groundwaters. We have developed in situ and remote sensing monitoring technologies for advanced forecasting of harmful algal blooms, with associated protocols to manage drinking water treatment plant operations. We continue to make rapid progress in predictive understanding of how climate change is affecting Canada's vast surface and groundwater quality and associated risks to health and economy. We have also supported assessments of land cover change, water governance, and local water insecurity on general, mental, and maternal health in First Nation communities. Throughout this work, we have engaged with local communities, industries, agriculture, governments to understand needs, and co-develop tools to help adapt to current and future water stressors.

Perhaps most importantly, we are linking our models and research to human decision-making, livelihoods, health, and wellbeing; promoting equity, diversity, and inclusion in research and in knowledge mobilization; and, co-creating protocols and research projects with Indigenous communities, organisations, and governments towards engagement in multiple ways of knowing and co-development of appropriate sensors and tools.

However, challenges still remain. Moving forward, together, we must:

- Develop and apply **fully integrated coupled human-water system approaches** to identify solutions in research, policy, and practice using river basin scales.
- Continue to **ensure access to advanced prediction models, open water quality data, management tools, and sustainability solutions** to reduce climate change-induced harm to people and ecosystems, particularly for those in equity deserving groups or climate vulnerable regions.
- Make a **greater effort to equitably engage all stakeholders and rightsholders in co-generation and dissemination** of targeted knowledge, braiding all of humanity's ways of living, knowing, and caring with modern science to develop appropriate solutions to the water crisis.

And finally, we must **continue to support evidence-informed decision-making to ensure investments in appropriate, equitable, and therefore sustainable water access and management solutions.**

The climate crisis *is* a water crisis, but it is also an adaptation crisis. We must tighten links between knowledge *generation* and knowledge *application* to halt the serious adverse impacts on people and our environment.

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