Response to the Province of Manitoba "Engaging Manitobans on Water Management"

Faculty of Environment Earth and Resources
University of Manitoba, Winnipeg, MB. Canada

August 13, 2021

Cite as: Barber, David G., Pflugmacher Lima, Stephan, McCullough, Greg, Herbert, Claire, Papakyriakou, Tim. (2021). *Response to the Province of Manitoba "Engaging Manitobans on Water Management*. Center for Earth Observation Science, Faculty of Environment, Earth, and Resources, University of Manitoba. {url}

Introduction

As the Province of Manitoba engages with Manitobans on a Water Management Strategy, we must keep in mind that our freshwater is not an endless resource. We have to live with our finite water resources and understand that we are all responsible to keep water healthy and accessible to everyone. Access to clean water is a basic human right, mandated by many countries, including the United Nations.

Freshwater should not be thought of as a separate (or self-contained) issue from the rest of the hydrosphere and cryospheric systems of our planet. The impact of hemispheric and especially Arctic climate on freshwater in the mid and lower latitudes in Canada is integral to understanding how to manage freshwater resources. While we understand this is a Manitoba strategy as acknowledged in the Guiding Principles in the Water Management Strategy document, water is a transboundary issue, both provincially and nationally.

Background

Over the past 25 years, the University of Manitoba has emerged as one of the leading research institutions in the world in the field of Arctic system science and technology. The Centre for Earth Observation Science (CEOS) within the Clayton H. Riddell Faculty of the Environment, Earth and Resources serves as the focal point for this activity. CEOS has earned national and international recognition in conducting system-level research, as well as in technological development focusing on the physical, biological, geological and biogeochemical processes operating within rapidly changing Arctic systems. The research conducted by faculty and staff at the Centre has evolved, becoming more collaborative and multidisciplinary - working on many regions around the world, with a strong focus on freshwater in the Hudson Bay Drainage Basin and on Arctic marine system science. This long period of focus on the core objective has made CEOS one of the largest national and international research centres on Arctic system science and has allowed CEOS to become an internationally renowned research centre, expanding our understanding of the Arctic system and looking at the issues of freshwater upstream of the marine environment. CEOS members include leading researchers in land use and management, soil and water conservation, remote sensing, hydrology, landscape ecology, wetland ecology, watershed processes, statistical and modelling techniques and cross-scale interactions of drivers of water quality parameters. Their experience includes (amongst other regions) research throughout the Nelson River watershed, which spans five ecoregions (Prairies to Subarctic) and four provinces in Canada, two ecoregions (Great Plains and Northern Forests) and four U.S. states.

In this response document, we will address, by Key Focus Areas, points we feel are either not adequately considered, or missing from the current Provincial Water Management Strategy.

Key Focus Areas

Focus Area 3: Support coordinated water management and governance across watersheds and basins

A Water Management Strategy should support a range of geographical scales in freshwater engagement. We acknowledge that many solutions will require research and action at local scales, for example, finding water storage solutions in wetlands, or reducing

nutrient export from fields. However, local processes are affected by and have cumulative impacts on hemispheric and global systems. For example, runoff into northern rivers such as the Nelson travels to the Arctic and is eventually delivered to the North Atlantic where this freshwater can have dramatic impacts on the Meridional Overturning Circulation (MOC), a strong driver of the global climate.

Successful management of freshwater is only possible by acknowledging that water flows across the Métis homeland, First Nations communities, municipal, provincial or even international borders, and therefore should not be studied as if it stops at a political boundary. The Provincial Water Management Strategy should include a clear plan for coordinating data sharing, analysis and collection with our provincial and national border partners. We understand there is some ongoing work via organizations such as the Red River Basin Commission, the International Joint Commission and the Prairie Provinces Water Board. These interactions should be strengthened, expanded, data should be accessible via centralized data hubs, and work should be made more transparent and accessible.

Focus Area 4: Advance Indigenous inclusion in water management.

A clear and well-defined plan for inclusion of Indigenous peoples in water project planning from conception through to implementation, and guidelines for integration of Indigenous knowledge should be integral to the development of a Water Management Strategy. This should include meaningful engagement and clear contributions by Indigenous organizations and governments to the document itself.

Focus Area 5: Increase our understanding of groundwater supply and quality and its inter-relationship with other parts of the environment.

Atmospheric, glacial, surface and groundwater freshwater should be an *integral* part of a Water Management Strategy—and Manitoba must support an *integrated* understanding of their processes and functions. Better data is needed to calculate more accurate long term average ground and surface water availability, including from sources such as precipitation (and losses by evaporation), groundwater recharge and surface inflows, not only from within Canada but also from transboundary sources (*e.g.* the upper Red River, Lake of the Woods watershed leading to Lake Winnipeg). This can only be accomplished through better integration between existing networks such as Environment and Climate Change Canada's (ECCC) national atmospheric and hydrometric monitoring networks, provincial hydrometric monitoring agencies and groundwater monitoring agencies, and harmonization with sister agencies in the United States

Focus Area 6: Build our resilience to a variable and changing climate

Understanding and managing freshwater issues related to climate change in Manitoba requires understanding the effects of global teleconnection effects as well as downstream, local climate issues. In particular, Hudson Bay is affected by meteorological or environmental influences that occur thousands of kilometres away. Freshwater is extremely buoyant compared to seawater and supports long-range transport of nutrients (*e.g.* carbon, phosphorus) and contaminants (*e.g.* mercury) to the marine system and through it (via Hudson Bay), as far as the North Atlantic Ocean. A better understanding of the downstream effects on the marine system from the long-range transport of these compounds is necessary.

Extreme weather, an important aspect of climate change, can affect freshwater hydrology and water quality at local, regional and hemispherical (*e.g.* the Arctic) scales. These weather events need to be considered in relation to how they are modulated by climate gradients across the continent-water-ocean systems; as well as how they affect lakes directly through mechanisms such as momentum exchange, evaporation, warming and increased nutrient and contaminant mobilization by runoff and flooding due to high-intensity precipitation events (the latter two impacts contributing to eutrophication of downstream lakes (*e.g.* as has been demonstrated in Lake Winnipeg).

Greenhouse Gases

While it is increasingly recognized that inland waters play a significant role in the global carbon cycle, the greenhouse gas (GHG) source/sink status of Canadian waterways remains, with few regional exceptions, poorly quantified. An important knowledge gap relates to the role of reservoirs and associated flow regulation in support of hydroelectric production. Studies suggest water impoundment could be a major contributor to greenhouse gas emissions, yet, again, little is known of the net impact of the reservoirs on regional carbon budgets, outside of perhaps, Quebec. The demonstration, using scientifically defensible data, that Canadian hydroelectric production is green would not only benefit our export market but also improve Canada's chances of meeting international commitments to curb GHG emissions.

CO_2 (in addition to other GHGs) emissions, the relationships between the aquatic systems and their management and the effect on climate through GHG dynamics in regards to climate change has not been addressed in the Water Management Strategy (WMS). The WMS should comment on the possibility of aligning water management with a CO_2 emission reduction strategy (for example, maintaining or expanding wetlands to optimize for flood control, sequestering nutrients and CO_2). Opportunities exist at both the regulatory and ecosystem management levels, in the form, for example, of wetland management and enhancement programs for water quantity/quality management and limiting peat mining on the regulatory side.

Focus Area 8. Improve Surface Water Quality

Freshwater quality and quantity are intrinsically linked. The impact of flooding on the mobilization of nutrients and contaminants from both rural and urban watersheds is well known, if not well quantified. Less often considered is the link between droughts and nutrient supply, to support, for instance, healthy fisheries in downstream water bodies.

There are hundreds of freshwater bodies throughout Manitoba, including wetlands, lakes, rivers, reservoirs and dugouts, confounding our ability to establish a well-distributed database for water quality measurements. The Water Management Strategy should include support for facilitating the integration of long-term monitoring data with community-based monitoring work to provide the most detailed coverage available at the local and regional levels. The sampling density and frequency of the current provincial water quality monitoring design is insufficient to develop, for example, a spatially focused strategy for phosphorus reduction in the province as it often misses key sampling events (i.e. spring runoff, major precipitation events, hotspots of phosphorus release in localized areas that feed into major watersheds). Without this type of information, we will not be able to meet short or long-term targets for Provincial or Federal nutrient reduction strategies. Strategic sampling—higher spatio-temporal frequency in regions of concern identified by the current survey-level monitoring program should be applied as well to other pollutants or contaminants of concern.

Data collected by different organizations will be more useful if a list of core (priority) variables is developed, and methods standardized. Perhaps a panel of experts from government, industry and academia could provide leadership in these areas.

Algal Blooms and Cyanobacteria

The presence of algae, both in type and quantity, is not mentioned in the current strategy. Algae pose challenges related to both climate change and cultural eutrophication and should be approached using a multi-tiered strategy. Algal blooms may or may not be composed of toxin-producing algae, conversely, toxin-producing algae may be present in high numbers in a water body but never present as an actual "bloom". Regardless of toxicity, algal blooms may have an adverse impact on both individuals and commercial fisheries (*e.g.* through net fouling), recreation and aesthetics. Moreover, with regard to the fishery, the impact is complicated—fishers may be concerned by net fouling, but also recognize the need for sufficient nutrient loading to support productivity. On the other hand, toxins present a direct human and animal health concern. New toxins like BMAA have been shown to be involved in Alzheimer and Parkinson disease development. Algal blooms in water bodies used by people, livestock and pets are major health concerns, even after they are not visible on the surface. A water management strategy should address both communication to communities as well as a strategy to pro-actively monitor or report water quality concerns from the public to the province and vice-versa.

Focus Area 10: Improve the information and knowledge available for effective water management decision making.

Universities and other academic institutions should be engaged more directly in the consultation and development of a Water Management Strategy. Understanding where specific research questions are most appropriate, and which institutions are best placed to address these questions would help guide the development of capacity and collaboration between the province and institutions.

Manitobans need more open and transparent communication of the science behind decisions about freshwater. The Water Management Strategy could facilitate this by supporting research and educational institutions in the collection and sharing of scientific information. For example, the agriculture sector hears many conflicting messages when it comes to the proper method of keeping nutrients from water bodies – is it "keep water on the land", for how long? Is it return water to crops via local storage and irrigation? How should the soil be treated, does it depend on the type of soil? How do the types of crops or animals affect water management decisions?

Focus Area 11: Enhance engagement and participation of Manitobans in water management.

Engaging Manitobans in managing and protecting freshwater can only be accomplished through education, open access to data and demystifying scientific data for the public. Only when we teach people to understand the value of water will we be successful in protecting our freshwater resources. (We still flush drinking water via the toilet in most countries). If the public does not value water, they will not protect it.

Open, accessible data

Clear, open and accessible communication of past and current water quality data should be a keystone of the Water Management Strategy. Transparent and accessible sharing of data according to the FAIR and CARE principles will encourage and facilitate users of all skill levels the opportunity to turn the data into information that Manitoba needs to guide the development of programs to further strategic goals. The significant time delays or outright refusal of access to water quality data collected with public funds (whether due to lack of staff capacity or size of the request) to researchers and water managers does not facilitate Manitoba being able to meet its vision statement or Water Management Strategy goals and principles. There exists already well-established examples of Federal[1] and provincial (e.g. Alberta[2], BC[3], and the Atlantic Regions[4]) hydrometric and water quality data available via open data portals.

[1] https://open.canada.ca/en/open-data
[2] https://open.alberta.ca/opendata?q=water&sort=score+desc
[3] https://catalogue.data.gov.bc.ca/dataset?q=water+quality&sort=score+desc%2C+record_publish_date+desc
[4] https://atlanticdatastream.ca/explore/#/?sort=create_timestamp&active=false&zoom=5.300000000000001&lat=52.69091244690686&lng=-61.521620830861146

Summary

In summary, we reiterate several key messages:

1. Atmospheric circulation, ice, groundwater and surface freshwater should be treated as one integrated system. In the face of a changing climate, support for research and management of water quantity and quality must incorporate this understanding of the larger system into every regional situation.
2. Water flows across borders: municipal, Indigenous, inter-provincial and international. Freshwater science and management should be organized by watershed boundaries, not political boundaries.
3. A clear strategy for inclusion of Indigenous peoples in water management planning from conception through to implementation, and guidelines for integration of Indigenous knowledge into the process should include meaningful engagement and clear contribution by Indigenous organizations and governments and be reflected in the Manitoba Water Strategy document.
4. Clear, open and accessible communication of past and current water quality data is critical to the success of any strategy. Transparent and accessible sharing of data should be shared according to the FAIR and CARE principles
5. A clear plan for coordinating data sharing, analysis and collection w/ provincial & national borders should be implemented. Organizations conducting Community Based Monitoring/Citizen Science and scientific research can be used to fill in key gaps in current monitoring programs.
6. Without including researchers as partners in supporting a Water Management Strategy, important climate-related issues such as teleconnection effects and the role of the Polar Vortex in modulating precipitation (and temperature) at southern latitudes; the changing persistence of the polar jet and how this manifests in floods and droughts throughout Canada, including Manitoba, and the effects of greenhouse gases on aquatic ecosystems cannot be addressed.