Climate Change Guidance Framework for IJC Boards:

A Highlights Report 2018

INTERNATIONAL JOINT COMMISSION
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Preamble

As part of its ongoing International Watersheds Initiative (IWI), the International Joint Commission (IJC) held a workshop in April 2016 at which its boards identified the need for a framework that would help them prepare for climate change.

This document presents the essentials of the framework and is supported by a more extensive background piece entitled *A Climate Change Guidance Framework: Background and Process*. The "Background and Process" piece outlines background information as well as the process followed to arrive at the framework.

Given the nature of climate change and the importance of adaptive management in responding to it, this document is intended to be updated yearly based on new information and lessons learned.

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Cover page: Hidden Lake, Glacier National Park – *John Stother*

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Introduction

This document proposes a general framework including a recommended planning guidance method that could be used by IJC control, watershed, and pilot watershed boards. The goal of the framework is to provide clear guidance to the boards for addressing climate change in IJC policy and operations using the best available institutional and organizational science and stakeholder input available to the boards. The purpose of the framework is to provide a process for the IJC to maintain, to the extent reasonably possible, the resilience of IJC's responsible systems such as the ability to continue to maintain ecosystems, economic and social benefits and impacts within preferred ranges relative to water levels and flow management in the face of future change and uncertainties. This framework focuses on water management, control and watershed boards.

Context for developing this framework

IJC boards assist the Commission in carrying out activities under references, orders of approval, treaties and agreements. The way the boards have operated has changed over time as water management has generally become more open and multi-objective. An important milestone in that progression was the creation of the IJC's International Watersheds Initiative (IWI), introduced by the Commission in its 1997 report The IJC and the 21st Century.

In April 1997, the Canadian and United States governments asked the IJC to propose strategies on meeting the environmental challenges of both countries in the 21st century. Even then, climate change was one of the concerns, along with other drivers such as growth, urbanization, and energy demands. The governments were concerned about a variety of impact categories including water supply, air pollution, toxic chemical use and release, habitat loss and biological diversity, exotic species, waste management, and infrastructure needs.

In response to this request from governments, in its 1997 report "The IJC and the 21st Century", the IJC introduced the concept of the International Watersheds Initiative (IWI). The climate change initiative addressed in this document is part of the larger IWI policy initiative.

The IJC's IWI premise in its reporting was that local people, given appropriate assistance, were best positioned to resolve local transboundary issues and that supporting that capability would reduce the need to involve the governments and IJC in more formal dispute resolutions. Through these reports, fueled by consultations with federal governments, relevant states, provinces, tribes,

First Nations, and local interests, the concepts of the IWI and an international watershed board were further developed. In the 2005 report, the IJC also named three boards as the most promising for initial development of an International Watershed Board; the St. Croix, Red River, and Rainy-Lake of the Woods. In 2007, the Souris River Board was added to the list of pilot boards.

As of 2016, along with the two pilot boards (Red River and Souris River), St. Croix River International Watershed Board and Rainy-Lake of the Woods Watershed Board, the IJC has an additional nine standing boards and a committee that can carry out IWI-supported projects to help manage resources, promote communication, and conduct scientific studies within their board mandates. The objectives of these boards are varied, and include apportionment, regulation, water quality, and flow monitoring. Although this framework is intended to support IJC water management, control and watershed boards in their efforts to address climate change as it pertains to board directives, there are other IJC boards, such as the Great Lakes Water Quality Board and the Science Advisory Board, that may also benefit from the framework.

The decision to develop this document stems from an (IWI) Multi-board Workshop that took place in Washington, D.C. in April 2016. About sixty people, including IJC Commissioners, members from all the IJC's control, water management, watershed and pilot watershed boards, and Commission staff participated in the workshop at which actions to address impacts from climate change on water quantity and quality in transboundary basins were suggested. There were two breakout discussion groups, one for water quality and the other for water quantity, but their ideas were very similar and consistent with the IWI perspective. A workshop report that summarizes these discussions is available on the IJC website. Prior to the April 2016 workshop, the IJC identified climate change and its impacts on water quantity and quality in transboundary basins in its 201-202 Strategic Plan and its 2015 IWI Report to Governments as a strategic priority for the Commission. As a strategic priority, the IJC considers activities it can undertake to advance its climate change knowledge that are consistent with its mandate. The recognition of climate change as an important issue for the Commission to address allowed for these activities, including the initial workshop, to move forward.

As an iterative document, this framework has been updated since its initial inception resulting from the April 2016 Workshop. The first update was initiated in spring 2018 and was guided by the lessons learned and recommendations that came out of the IWI Climate Change Guidance Framework Workshop Report (May 2017) and the Climate Change Guidance Framework Pilot Project Report (October 2017). The goal of the May 2017 workshop was to advance the conversation on the recommended planning guidance method to address climate change as outlined in the Guidance Framework with each board to improve the framework and solicit feedback on completing the Guidance Framework pilot project across control, pilot, and watershed boards. The Goal of the October 2017 Pilot Project was to implement the 1st step of the 4 step framework on control, pilot, and watershed boards (10 boards total) as well as implement the full 4 step framework on one board (the St. Croix Watershed Board). Both reports can be found on the IJC website. An additional aspect of the spring 2018 update was to streamline the framework document from its initial format which contained more background and process to a highlights document that contains only the essentials of the framework; the original document, now titled *A Climate Change Guidance Framework for IJC Boards: Background and Process*, (March 2018) will act as a background document going forward.

This document begins by setting the context for this work, the IJC's International Watershed Initiative, and summarizes the principles articulated for this work from the April 2016 IWI workshop, May 2017 IWI workshop, and October 2017 Pilot Project. An outline for the IJC framework is then proposed based on the previous assessments, including a section on the four-step process, along with a process for refining it and carrying it to fruition.

Framework Elements

The framework is presented in broad terms; actual implementation of the framework will require further detailed development and piloting. Given the nature of climate change and the methods that seek to adapt to it, this document is intended to be iterative and updated annually to account for new information and lessons learned.

The framework proposed has three elements, further outlined below:

1. A recommended planning guidance method;
2. A shared information pool; and
3. Assistance in establishing adaptive management.

The Planning Method

The planning method is central to the framework; the other two elements (a shared information pool and assistance in establishing adaptive management) will support each board's successful planning and implementation of the framework. Many approaches have been used for climate change impact evaluation and adaptation planning in the last twenty years. An initial emphasis on projecting future climate and potential impacts based on a specific group of scenarios has given way to approaches that focus on first understanding the responsiveness of the system to climate change, describing the context with regard to the full spectrum of possible future uncertainties, and using climate science to inform the analysis, rather than serving as the starting point and focus. The contrast between the early and later approaches is captured in the terminology; the first downscaling approach focused on developing local climate projections from global models, the latter decision-scaling approach starts with an assessment of how climate change might affect outcomes and then considers the plausibility of those changes occurring. The two approaches can be applied simultaneously, but this framework recommends that the first not occur in absence of the second.

There are a growing number of adaptation or resilience planning methods offered by government agencies or nongovernmental organizations. These methods generally follow common planning approaches, including identification of the problem, cataloging of options, evaluating comparative performance of options and selecting a plan. Examples include the US Climate Resilience Toolkit and the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) "Implementation Framework for Climate Change Adaptation Planning at a Watershed Scale." These provide helpful resources for planners and serve as a basis for the process described here, which is a distillation of the best of these existing planning methods, tailored for application to IJC board responsibilities, and strengthened with advanced approaches for addressing the uncertainty associated with climate change.

Decision-scaling is designed to make the best use of potentially helpful climate information. It recognizes the uncertainty and hazards of using climate projections and is designed to maximize the useful and credible information that can be gained from them. Given the inevitable

How Might Climate Change Affect Board Responsibilities?

IJC boards must consider how climate change could affect the outcomes related to board responsibilities and in turn, seek to manage these potential outcomes. Climate change could affect the quantity and timing of water flowing into a basin, the temperature of the water and hence ice cover, evaporation, and suitability for plants and animals including nuisance and invasive species. More severe storms could affect sediment runoff and water quality. Photoperiodism could disturb life cycles. Climate change may affect evaporation from lakes and reservoirs because of changes in temperature as well as cloud cover or wind speed and direction. It may be that increased evaporation reduces the risks of lakeshore flooding, while increased storm severity will increase the risk of flooding along river banks. Higher temperatures will reduce snowpack, which will reduce safe yields of western water systems but may also reduce spring flooding. Exotic species may migrate northward seeking preferred weather and vegetation as changes in those factors occur because of climate change. Development pressures may change and move as people abandon certain areas and move to others if the climate shifts.

importance of climate change to IJC board activities, and the accompanying inevitable uncertainty, it fits well with the IJCs management responsibilities. Decision-scaling starts with the identification of the most important impacts from climate change, determines the plausibility of those impacts occurring and then frames the evaluation of alternative ways to reduce those risks.

The Shared Information Pool

Information exchange is an important part of dealing with a large-scale issue such as climate change. This framework promotes the facilitation of the exchange of information across boards to support successful planning by sharing scientific and technical knowledge, pilot projects, and lessons learned in order to identify tools that are currently available to address the impacts of climate change, not only on the management of water levels and flows, but also on water quality, as well as tools that may need to be developed to better address this issue. This may be in the form of an online 'information hub' that is accessible to all IJC boards. This 'hub' could allow for an exchange of ideas and as a platform to promote discussion and collaboration among boards on issues being faced from climate change. Notwithstanding the need for increased board resources and capacity, the role of each IJC board would include updating on their research and activities regarding climate change impacts and potential mitigations for management. Ideally this information would be made available to other boards so that they are made aware of the efforts on the landscape and have an opportunity to discuss and make linkages/comparisons amongst the various efforts occurring across the transboundary.

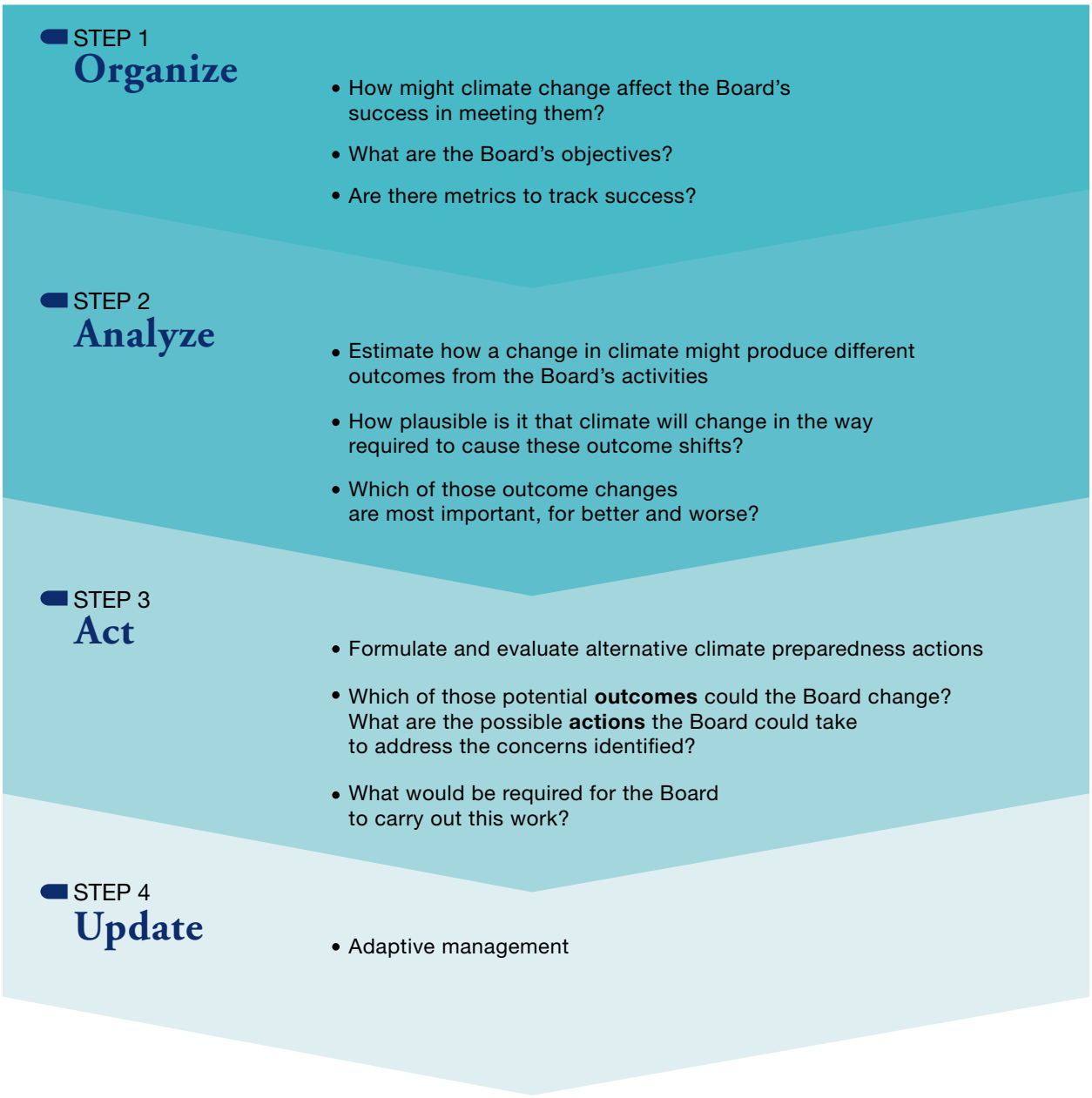
The IJC is working on a data sharing platform that would enable the storing and exchange of information and research outlined above. The platform is planned as an aspect of the IJC's modernized website and the initiative to develop this platform is in progress as of spring 2018. In order to facilitate this, the IWI team is collaborating with the IJC Communications Team to plan and implement this space. This will be further outlined in next steps section.

Assistance in establishing adaptive management

Adaptive management is the practice of continual evaluation and monitoring of management practices in order to adjust and improve them based on new knowledge and experiences. Because change is inevitable and there may be surprises, there is a need to monitor performance and provide feedback to operation policies so that course corrections can be made. Thus, decisions can be effectively incorporated into adaptive management approaches that allow the performance of the system to be maintained even if it requires transformation of different aspects of the operating policy. This framework discusses adaptive management assistance that could be established to support the boards' ability to manage climate change. Some existing examples of the IJC's consideration of climate change in adaptive management is through the process used to review IJC orders on boundary structures and the establishment of the Great Lakes-St. Lawrence River Adaptive Management Committee by the IJC in January 2015.

The Step-by-step Framework

Figure 1: Step by step climate change guidance framework outlined



STEP 1

Organize

What are the objectives the board is trying to achieve?

It's important to begin a self-analysis with a clear, complete, shared understanding of the objectives that the board is trying to achieve. This creates a context within which climate change can be purposefully considered. What is the ultimate objective of the board, what are its roles, and what actions can be taken to achieve them? For example, an objective might be to maintain lake levels or releases within a range that satisfies regulatory requirements and stakeholder preferences. Are there indicators or metrics that are currently used to evaluate whether the objectives are being met? This organizational step also helps identify gaps in information and data collection. The end product from this step is a consensus statement of how climate change may challenge the board in carrying out its responsibilities. The first iteration will challenge the board to think through implications for different responsibilities; later iterations can be better quantified and prioritized.

STEP 2

Analyze

Estimate how a change in climate might produce different outcomes from board activities

This step is based on the board's responsibilities and includes direct and indirect or cumulative impacts. For example, a board charged with making releases to create hydropower, would consider direct impacts in terms of energy production and indirect impacts, such as the potential for brownouts, maximum channel capacity exceedances, structures compromised, etc.

For this step the analyst could use general climate change information products (such as those shown in *A Climate Change Guidance Framework for IJC Boards: Background and Process*) that give some large scale guidance of what kinds of changes they should consider. For example, there is general confidence in warming, and warming causes reduced snowpack, early snow melt, etc. What does this mean for each watershed? Changes in precipitation on the other hand, are less certain. But what is plausible? Boards might consider what might happen if precipitation increased or decreased, on average, and what might happen if extreme precipitation became more intense and frequent.

Which of those outcome changes are most important, for better and worse?

The board would categorize the outcomes from Step 1 according to the magnitude of the impact, independent of the likelihood of occurrence or degree of control the board would have over it.

How plausible is it that climate will change in the way that will cause these outcome shifts?

The board would create a chain of causality for each notable outcome shift; for example, brownout is likely with *these* extra-basin conditions plus *this* much less hydropower from the IJC influenced facility. *That* loss of power would result from *this* head and flow, which wouldn't be a problem until flows were *this* low for *this* long, which is a *x%* departure from the worst drought on record, which is considered plausible or not based on *this* or *that* climate assessment. The brainstorming professional judgment iteration would err on the alarmist side. For instance, if brownouts seemed to require flows half that of the worst drought on record, and there was evidence in paleo studies that flows this low were possible, then the board might continue to the next steps, asking, if this is a plausible but unlikely outcome, can we prevent it, and if so, what are the other consequences of those actions?

In later iterations of this step, the board would consider a range of climate information, including past observations and different projections. For example, if there is a trend in the observations and the same trend is evident in the projections from climate science, which would be strong evidence of plausibility, a reason to bear costs to avoid those outcomes, even though they were not certain.

There is a hierarchy of certainty in climate projections. There is confidence that temperatures are warming because of observations and sound scientific theory supporting it. There's some evidence precipitation extremes are increasing, but projections vary across the border and storm severity is more important in river flooding than lake flooding. The confidence in warmer temperatures creates a concern that evaporation will increase, but the process is more complicated so there is less certainty. On the other hand, the impact of warmer temperatures on snow pack is clearer, and the impact of less snowpack on water supply and flooding is well documented.

When climate was considered stationary for the planning horizon, planners would evaluate decisions using expected values, the product of the magnitude of an impact times

the probability of it. Absent stationarity, the expected value of outcomes cannot be calculated, but it still must be estimated. It may be that most climate change issues boards face can be resolved with little doubt, but there is a possibility that a costly alternative might be the only way to avoid a very bad outcome that is unlikely, but plausible.

STEP 3

Act

Which of those potential outcomes could the board change? What are the possible actions the board could take to address the concerns identified?

In the brownout example provided above, when the board determined that brownouts might be caused by flows of less than *x cfs* through turbines, there might be inflow conditions for which no board decisions would provide flows greater than *x cfs*, meaning there is nothing the board could do to reduce the chance of a brownout. There might be other future inflow scenarios for which there was no concern over brownouts. In these two cases, no action would be required from the board. But in-between there would be inflow conditions that differed from the historical by little enough that the frequency and severity of brownouts could be changed based on what the board did. To the extent to which the board determined that these inflow conditions were plausible, the board would have to consider taking actions to prepare for them or to inform those responsible for water management decisions.

Formulation and evaluation of alternative climate preparedness actions

The Upper Great Lakes Study provides good examples of how this can be done for lake level regulation. The elements of that process that transfer to other management objectives are the creative development of a wide range of alternatives, and the estimate of how those actions affect outcomes under different climate scenarios.

What would be required for the Board to carry out this work?

In some cases, the board has all the power it needs to develop alternatives that produce good outcomes under the plausible range of future climate scenarios. But that may not always be true. For example, land management decisions may be the only way to meaningfully reduce flood risks or improve water quality. In that case, the board might consider actions that it is not prohibited from taking—for example, meeting with local governments and sharing pertinent research—that might mitigate the worst outcomes. The importance of engagement with local stakeholders is echoed in 2 of the 3 recommendations from the Great lakes Water Quality Board Great Lakes Climate Adaptation and Resilience workshop. The Adaptation and Resilience workshop, in addition to the Great Lakes St. Lawrence River Adaptive Management (GLAM) Committee, are two of the other ongoing efforts by the IJC to manage its responsibilities under climate change.

STEP 4

Update

After even the first iteration of the first three steps, boards may decide that based on the plausibility and magnitude of impacts and the costs of preventive measures, that some proposed alternatives should not be undertaken. But the board may at the same time determine that if the scenario became more plausible, or the costs reduced, or a new alternative was offered, that they would revisit the decision. In order to ensure communication and information sharing, results and decisions from each iteration of these steps should be recorded and shared with other IJC Boards through an online 'information hub'. The only safe way to assure this revisiting of decisions based on new information is to create an institutional context for doing so. In simplest form, this might be a short review every five years to ask whether there is any reason to go through the steps again. In many cases, a formal adaptive management process could be designed at a scale proportional to the cost, risk and uncertainty. Again, this has resource implications. If it is going to happen, there needs to be a way of ensuring it can happen. In short, this would entail the designing of an Adaptive Management process.

Conclusions, Recommendations, and Next Steps

The board representatives on the CAWG have clearly identified a need for support to the boards on the issue of climate change, a need also identified by participants at the last 2 IWI workshops. This document proposes a preliminary framework for addressing those needs.

There already has been a substantial amount of work done by IJC boards in advancing the state of climate science and decision making. There are IJC climate change initiatives underway now. The proposed framework would encompass and connect all this work so the contributions in one region could be used by all the Boards.

This Framework explains why a decision-scaling approach is well suited to the IJCs management responsibilities. Decision-scaling starts with the identification of the most important impacts from climate change, determines the plausibility of those impacts occurring, and then evaluates alternative ways to reduce those risks.

The boards need more than climate science to do their jobs. The boards work with stakeholders to carry out their responsibilities, and the effective communication of climate change management issues and positions will be essential in gaining stakeholder support for climate change initiatives. Trend analysis is often important in monitoring the onset of climate change; the framework must facilitate board access to accurate data. Access to planning, decision support and risk management assistance will also be helpful.

The framework outlined in this document was tested and improved through facilitated debate within the CAWG and through lessons learned from implementing the pilot project across control, watershed, and pilot watershed boards. The initial round of pilot project implementation has been completed and the framework document has been updated accordingly in spring of 2018. Remaining boards that have not participated in the vertical pilot are being approached to complete it. Updates to the framework will be ongoing and will be guided by recommendations from the pilot project and discussions with the CAWG.

The IJC is also exploring mechanisms to improve climate change knowledge transfer and lessons learned, both across boards and within them. One potential method is an efficient web-based collaborative space or hub where information can be stored, built upon, and shared such as:

a. Inventory of research already conducted in regions on climate change as well as resources (IJC as well as other agencies). This will be focused on basins where the IJC works.
b. Story maps, improved web page(s), or other long-term knowledge transfer mechanisms; and
c. A general analytical platform (spatial, temporal) for inventorying observations, and research already conducted in regions on climate change and possible adoption options.

The web based collaborative space is being initiated through collaboration between the IWI team and the IJC communications team as a part of the IJC's website modernization (in progress as of spring 2018).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