International Watersheds Initiative (IWI)
Climate Change Guidance Framework Workshop

May 4, 2017 Washington, DC

Workshop Report

Prepared by Alec Bernstein and Casey Brown, University of Massachusetts

Representatives of eleven International Joint Commission (IJC) Boards met in Washington D.C. during the IJC's semi-annual meeting to attend a workshop on the elements of the recently developed 'Climate Change Guidance Framework for IJC Boards' (Guidance Framework) document.

Professor Casey Brown and Alec Bernstein of the University of Massachusetts, and Bill Werick of Creative Solutions, LLC., presided over the workshop, leading attendees through the climate change Guidance Framework and through a Global Café discussion on three questions related to the deployment of the framework within the IJC Boards. A full attendance list can be found in Table 1.

Background

As part of its ongoing International Watersheds Initiative (IWI), the IJC held a workshop in April 2016 at which Board members identified the need for a framework that would help the Control, Watershed, and Pilot Boards prepare for climate change as it pertains to their respective Board mandates. In response, the IJC developed a draft "Climate Change Guidance Framework for IJC Boards" document that outlined a four-step preparedness process. The draft report, which proposed a general climate change framework, including a recommended planning guidance methodology that could be used by IJC Boards, was presented in the autumn of 2016. The May 4th, 2017 workshop was the next step in the socializing and implementation of the climate change framework.

Climate Change Framework Development

The goal of the Guidance Framework is to provide clear guidance to the Boards for addressing climate change in IJC policy and operations using the best available stakeholder inputs and science. The framework provides a process for the IJC to maintain resilience of ecological, economic, and social systems and manage benefits and impacts within preferred ranges in the face of future change and uncertainties.

Workshop attendees were provided access to the Guidance Framework in advance of the workshop through the IJC's website. The Guidance Framework can be found at:
http://ijc.org/files/tinymce/uploaded/IWI/IWI_CAWG_2017_02.pdf

A French translation of the Guidance Framework can be found here:
http://ijc.org/files/tinymce/uploaded/IWI/IWI_CAWG_2017_02_FR.pdf

The following considerations contributed to the development of the Guidance Framework presented during the workshop:

- Build upon work conducted at previous IWI workshops and complete a baseline review of the existing climate change activities for all IJC Boards.
- Identify and synthesize the social, economic, and ecological impacts triggered by climate change across the transboundary basins where IJC has a mandate, particularly any emerging impacts not currently addressed by IJC Boards.
- Prioritize the social, economic, and ecological impacts relative to the mandates of IJC Boards and the use of vulnerability assessments, risk analysis, and/or other appropriate methods.
- Develop an adaptive management plan to monitor progress, document and share lessons, and adjust activities and strategies as appropriate.

The planning Guidance Framework consists of four primary steps: (1) **organize**, (2) **analyze**, (3) **act**, and (4) **update**. In the **organize** step, each Board would formulate its climate change related objectives and assess what information is available and what is needed to prepare to meet those objectives successfully. In the **analysis** step, the Board would produce quantified estimates of how a change in climate might produce different outcomes from Board activities. The Board would prioritize the most critical, and evaluate the likelihood of the outcomes. In the third step, **act**, the Board would use the tools and networks to evaluate different responses and based on this, the Board would make decisions it believes would improve their preparedness for the potential impacts of climate change. The final step, **update**, is adaptive management, the establishment of a process to improve the Board's "act" decisions based on a formalized, ongoing effort to systematically assess the Board's challenges over time.

Through consultation with the IJC's Climate Adaptation Working Group (CAWG), the Commission implemented a pilot project to introduce the four-step planning guidance methodology to Control, Pilot, and Watershed boards in January 2017 that is currently underway. The pilot project consists of two elements: a "horizontal" engagement and a "vertical" engagement with the boards. The first element of the process ("horizontal") involves the completion of Step 1 of the four-step planning method across all aforementioned boards. The second element of the process ("vertical") involves completing the entire four-step planning guidance methodology with one board. Through consultation with IJC liaisons, The International St. Croix River Watershed Board was selected as the Board to be used for the "vertical" pilot project.

Table 1 - List of Workshop Attendees

BOARD MEMBERS	
Name	**Board**
Aaron Thompson	Niagara Board of Control
Andy Gendaszek	Osoyoos Lake Board of Control
Arun Heer	Great Lakes - St. Lawrence River Adaptive Management Committee, Lake Superior Board of Control
Barbara Blumeris	International St. Croix River Watershed Board
Bill Appleby	International St. Croix River Watershed Board
Bruno Tassone	Osoyoos Lake Board of Control, International Columbia River Board of Control, International Kootenay Lake Board of Control
Bruce Davison*	Accredited Officers for the St. Mary Milk Rivers
Bryce Carmichael	Great Lakes - St. Lawrence River Adaptive Management Committee
Charlene Mason*	Rainy-Lake of the Woods Watershed Board
Chris Hilkene	Great Lakes Water Quality Board
Cindi Barton	Osoyoos Lake Board of Control
David O'Connell	International Souris River Board
Gwyn Graham	Osoyoos Lake Board of Control, International Columbia River Board of Control, International Kootenay Lake Board of Control
Jacob Bruxer*	Great Lakes - St. Lawrence River Adaptive Management Committee
Jean Aubry-Morin	International Lake Ontario - St. Lawrence River Board
Joan Frain	International Lake Ontario - St. Lawrence River Board
John Kilpatrick	Accredited Officers for the St. Mary Milk Rivers
Kathryn Parlee*	International St. Croix River Watershed Board
Marc Hudon	International Lake Ontario - St. Lawrence River Board
Mike Renouf	International Red River Board
Mike Shantz*	Great Lakes - St. Lawrence River Adaptive Management Committee
Rebecca Seal-Soileau	International Red River Board
Scott Jutila	Rainy-Lake of the Woods Watershed Board and International Souris River Board
Shelley Weppler	International Souris River Board
Teika Newton	Rainy-Lake of the Woods Watershed Board
Tim Takaro	Health Professionals Advisory Board
Wendy Leger	Great Lakes - St. Lawrence River Adaptive Management Committee

IJC STAFF	
Name	**IJC Staff/Other**
Brian Maloney	Washington
David Fay	Ottawa
Mark Colosimo	Washington
Pierre-Yves Caux	Ottawa
Samantha Klaus	Ottawa
Shannon Runyon	Washington

Workshop Content

The goal of the 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 workshop agenda is included in Appendix A. The goal of this workshop was to combine the expertise of the consultants and Board members across the U.S.-Canadian boundary to improve both "horizontal" and "vertical" elements of the initiative. The specific objectives were:

1. Present an updated view of the three elements of the "Climate Change Guidance Framework for IJC Boards": (1) a four-phase planning guidance method, (2) a shared information pool, and (3) assistance in establishing adaptive management.
    a. Discuss how this guidance framework relates to IJC boards and their mandates
    b. Discuss the guidance framework pilot project – the goal (addressing element (1) a four-phase planning guidance method)
2. Obtain feedback from workshop participants on the guidance framework and pilot project.
3. Socialize the process of implementing the framework, improving understanding and building social capacity for conducting the climate change framework process.

The feedback received will be used to update the Guidance Framework document as necessary, and assist the IJC in developing a suggested methodology for implementing the Guidance Framework once the pilot project is complete. The workshop attendees are listed in Table 1.

Self-Assessment Questionnaire

In preparation for the workshop, each Board was sent a questionnaire to ascertain board specific perceptions of their climate change preparedness and needs. The results of the Self-Assessment Questionnaire were used to focus the discussion during the Global Café and to monitor progress for Boards as they continue to implement the Guidance Framework. The first part of the workshop presented the Boards with the results of this survey and discussed their self-assessments. In each Self-Assessment, Board members identified strengths and weaknesses as well as challenges they might have in dealing with climate change using a 1 to 10 rating scale. If the board member selected a rating of 1, it indicated that their Board has not yet considered how climate change could affect their Board's missions. If they selected a rating of 10, the Board had a clearly established process and adaptive management plan for climate change. More details on the rating scale are available in Appendix B. In general the Board members rated their preparedness as fairly low. Board members also identified specific issues that, in their view, are most critical to address. Another objective of the questionnaire was for Board members to inventory their resources to meet the challenges associated with climate change. Questions and Board member responses are included in Appendix B, and a summary of climate change notes for each Board are included in Table 2 below.

Table 2 – Summary of Self-Assessment Questionnaire

Board	Rating (1-10)	Issues Identified before and during workshop
St. Croix	3	-issues of climate variability -issues of changing temperatures and the effects on fisheries -flood and drought due to lake and flow levels -fluctuating water quality (ecological health)
Niagara	1	-the Board may be constrained in addressing climate change concerns by the 1950 Niagara Treaty -hydropower generation over the falls – climate change impacts on generation? -concerns of how to manage the ice boom given climate uncertainty
Red River	2	-balancing drought and extreme rain when managing water -climate change is not yet a work plan objective -evaluating models for how to work with weather and climate
Great Lakes Science Advisory Board	7	-issues of water level extremes -issues of waves, winds, storms, ice -want to improve climate projections: issues with 'connecting' datasets to get the whole climate picture -there is a disconnect between upper lake and lower lake scenarios
Health Professionals Advisory Board	3	-Board is focused more 'globally' than 'regionally' (not basin-specific) – issues of water quality and algal blooms (runoff, nutrient load, water contamination) -gastrointestinal illnesses related to extreme rain events -interested in 'who is drinking what, when' -oscillations in precipitation events
Great Lakes Water Quality Board	-	-are we equipped from a policy perspective? -how does extreme variability due to turbidity affect contaminants? -determine the legislative authority and filling in gaps where policy needs come into play -recommend a bi-national approach to climate change adaptation
Osoyoos Lake Board of Control	7	-Okanagan salmon run affected by high temperatures and low water levels -governing orders are focused on lake levels, not water quality -need for governments to provide accurate forecasting to predict drought -reduced snowpacks (lower freshets) -variability in precipitation -higher water demand -2010 climate change assessment for the Osoyoos is due for an update -need to collaborate with stakeholders to make them aware of issues and adaptive management
Columbia River & Kootenay River Boards of Control	4	-ran a climate change analysis on reservoir operations -elevations are high, influences on snowpack and spring runoff -timing of spring runoff changes -reduced snowpack -concerned about accuracy in April forecast -if the rule curve is changed, drought considerations can be made -the new order has adaptive management element
Lake Ontario-St. Lawrence Board, Lake Superior, GLAM	7	-'operational reality' of basin operators – need to manage short-term and long-term changes however there is jurisdictional variabilities in priorities (short-mid-long-term planning) -unintended consequences of climate change -requirements for the board vs. the reality of the situation not aligning -> there are limits to what the board can do in climate variability

		-algal blooms/phosphorous effects on lake and river infrastructure (economic impact) -the 'silo effect' – how do we get the message across to municipalities? -how do we protect the floodplain in climate variability? -ice is a problem, even in a mild year -collaboration between sides with an emphasis on education is crucial
Rainy Lake of the Woods Watershed Board	3	-starting to address step 1 of the framework -climate change was considered in the development of the Water Quality Plan of Study (POS) and climate science that is being undertaken in the basin has been showcased during the annual Science Forum over the years -Board has not synthesized this information nor has it explicitly considered how climate change will impact its mandate at this time

Global Café – Climate Change Framework Implementation

During the Global Café session, the workshop attendees were split into three groups, and three questions were asked of the participants:

1. *What can the consultants do to help Boards identify the responsibilities that will be affected?*
2. *What should the consultants do to help Boards determine which issues are most important, most urgent?*
3. *What should the consultants do to help Boards determine the information and organizational challenges they should focus on?*

The original plan was to rotate the groups among the three consultants and each consultant would lead a discussion on one question. However, as the first session began, each group's conversation advanced well and there was much overlap between questions. It was decided to complete the remainder of the Global Café without switching groups. Each group had a lively discussion on each of the three questions, and the entire group closed the joint-session with a discussion to highlight some of the key discussion points for each question. Summaries of the discussions for each question are included below.

1. What can the consultants do to help Boards identify the responsibilities that will be affected?

The first step of the planning guidance method, "Organize", is to enumerate all the issues the Board is responsible for that could be affected by climate change. These are the objectives in the framework process. Once these are identified, the next step is to consider how those objectives could be impacted by plausible climate changes (covered by Question 2).

The Boards identified a need to make a connection between what impacts climate change may have to the basin and how they may affect their procedures in order to understand their accountabilities that may be impacted by climate change. For example, changes in precipitation or water temperature may have an effect on water quality, species health, ice formation, etc. Boards need to understand if their current mandates do not or cannot fully address climate change possibilities they can choose to enumerate the climate change impacts that they are worried about in their basin and flag these concerns to the Commission.

We received very practical ideas for helping the boards develop lists to address their concerns and the discussion question, including presenting them with a list of things climate change is likely to impact

(precipitation, temperature, water temperatures, etc.), and a standard list of objectives that are likely to be affected (minimum flow releases, floodplain delineation, etc.). These can be compiled from other studies and it is not necessary to duplicate efforts at this stage. Boards can then choose which impacts are most likely to occur in their watershed or affect their mandate. For example, the Osoyoos Renewal of Orders comprised eight larger scale studies that helped develop new rule curves. These studies added flexibility to the Board's rule curves. Looking forward, with a changing climate, flexibility in Boards' mandates and rule curves may be necessary to address climate uncertainties.

Boards also discussed creating a single 'living document' for each Board that would be useful to synthesize changes and strategies over time. The most critical climate change impacts now may be different in the future as populations, demographics, and economies change. How humans react is important to determining how resilient plans are. Additionally, some Board members noted that they likely will be gone by the time some changes are realized. As such, they suggested a dynamic document that will be periodically or continuously reviewed to meet changing expectations in the future.

Some Boards recognize their limited mandate jurisdiction, and in those instances, it becomes important to identify responsibilities and actions that may be out of the specific mandate but still can be influenced by the Boards. In watersheds with narrow mandate jurisdiction, out of the box thinking may be necessary to mobilize Boards into public policy action with the help of the IJC to support the science of decision making. Some specific Board objectives may be achieved through indirect action, for instance, how lake levels (within a Board's mandate) affect salmon runs (out of the scope of the mandate, but influenced by lake levels). Success can vary by board, and not every board needs to achieve a level '10' assessment. Specifically, the Niagara Board may be constrained in addressing climate change concerns by the 1950 Niagara Treaty, while the St. Mary-Milk Board may be similarly limited by a narrow mandate.

Many Board members view collaboration amongst IJC Boards as a crucial component to identifying responsibility that will be affected by climate change. This cross pollination amongst Boards will allow knowledge and information to be shared spatially. Consultants could assist boards by providing a platform where Boards can easily collaborate on shared climate change issues.

2. *What should the consultants do to help Boards determine which issues are most important, most urgent?*

The Boards provided examples of how they identified the most important issues within their basins. The Osoyoos Board performed a climate change assessment in the basin, which has influenced their Rule Curve. The Kootenay Board recently performed a climate change assessment similar to Osoyoos. The Upper Great Lakes Study included a climate vulnerability assessment. The Red River Board is working with the U.S. Army Corps of Engineers to evaluate models of the basin. Some other Boards have begun processes to acquire more data, as St. Croix has done through the addition of flow and temperature gages. The Niagara Board has acquired hydropower data. The Columbia Board is examining the frequency and magnitude of snowfall events that can feed predictive models. These are all constructive steps necessary to help Boards identify how to cope with the most important and urgent issues.

Those Boards with more experience in identifying priorities helped to coach the discussion. This ultimately led to some practical suggestions for determining the objectives to focus on for climate change, including looking at issues the Board is facing generally: for example, alewife population runs (St. Croix Board), ice buildup (Lake Ontario/St. Lawrence), droughts (Columbia River, Osoyoos River), or flooding

(Red River Board). Forecasting and changes in water demand and ecosystems services are crucial and were identified as resources that are needed by Boards.

The Boards need to ensure they identify the difference between climate change and natural variability when analyzing climate change implications. In many locations, there have been extensive impact analysis performed, by either local municipalities or regional authorities, and it is useful to gather an inventory of the applicable studies already completed.

It is important for Boards to bring the right stakeholders to the discussion to determine which issues are most important. The appropriate representation from stakeholder groups, agencies, communities, and other responsible parties is crucial to leveraging resources. Boards should attempt to engage regional stakeholders, such as universities, grant-making institutions, and other industrial partners to complete studies and perform other necessary analysis and would benefit from any assistance/guidance on how to reach out to these stakeholders.

Feedback from several Boards reveals that 'Best Practices' should be shared amongst Boards to help each other and get those Boards that are lagging in their climate response started off on the right foot. Data and information sharing are useful for Boards across the IJC.

In some locations, it may be beneficial to stay away from using the words 'climate change' directly, and just focus on the impacts. One cannot deny flooding and/or droughts that affect his/her life. It is crucial to take advantage of these "teachable" moments to disseminate climate change impacts. A large flood, drought, or other event that can be influenced by climate change is an opportunity to publicize how climate change may impact communities and ecosystems in the future.

3. *What should the consultants do to help Boards determine the information and organizational challenges they should focus on?*

The most compelling stories told by Board members were leveraging stories in which the Board helped to identify, trigger and organize recommendations for action even when they had little authority to carry out these recommendations themselves. Instead, Boards engaged with local, regional, or federal agencies who did have the necessary authorities and resources through coordinating with Board members who were associated with these agencies. In addition, several Boards either sponsored or participated in an annual basin forum or were part of a standing basin organization that aimed to engage local people and organizations. Through facilitating discussions amongst local stakeholders across the basin, Boards hope to facilitate more coordination between upstream influencers and downstream effects and harmonize these interactions across the border.

There are many lessons to be learned from the actions of these Boards. By utilizing a bottom-up approach to information dissemination, some Boards can benefit from socializing the data to a wider audience by writing technical reports in simple jargon. Consultants and the IJC can provide guidance on how to write for a broader audience. Focusing on the broader policy context will allow the Boards to leverage their decisions based on their legislative authority. Consultants and the IJC can work with Boards to recognize where there are gaps and identify these to the Commission. Boards recommended increased collaboration with education systems, however, more resources are necessary to increase such outreach efforts. Education and outreach is a key pillar of the IWI, so consultants and the IJC should help the Boards identify appropriate resources for their work.

Boards might also influence universities and other research institutions to develop, award, or respond to grants in a way that serves the Board's view on what is good for the basin. Climate change impacts everything the Boards do, and some Boards need help linking scientific and technical operations with planning. IJC liaisons can suggest and help connect the Board to universities and other stakeholders that could assist with their objectives.

There was agreement amongst Boards that success in the basin is more important than success of the IJC Boards' mandates. In some Boards, revisiting the scope of the mandate may be necessary to inform users of the change potential. Consultants and the IJC can assist with providing interpretations of the Board mandates. Transferring ownership of climate change to the stakeholders is crucial to acquire buy-in from populations within the basin.

More scientific collaboration between Boards is important to share information and practices that can be universally accepted regardless of geographic location (i.e. rainwater harvesting, water metering, etc.). The IJC Boards should operate in harmony and are together the collective tissue that helps cope with climate change. The IJC can facilitate working groups and more active collaboration between IJC Boards to ensure that information is shared and practical climate change considerations are taking place.

Key Recommendations and Next Steps

The key recommendations from this workshop include:

To assist Boards in identifying their responsibilities that will be affected:

- Provide Boards with a list of phenomenon climate change is likely to impact (precipitation, temperature, water temperatures, etc.) and a generic list of objectives that are likely to be affected (minimum flow releases, floodplain delineation, etc.).
- Create a 'living document' for each Board that is updated periodically to synthesize changes and strategies over time for addressing climate change (e.g. story maps, web pages) – this will also be beneficial for retaining knowledge as board members change and in assisting in the development of adaptive management strategies.

To assist the Boards in determining which issues are most important and most urgent:

- Look at the issues the Boards are facing generally and see if there are connections to potential climate change impacts.
- Provide an inventory of research that has already been done in the region, or that is relevant, to help disentangle climate change impacts from natural variation.

To assist the Boards in determining the informational and organizational challenges they should focus on:

- Clearly outlining what IJC and other agency resources are available to Boards that are aiming to address climate change in their basin (for example, education and outreach efforts could be leveraged through IWI).
- Explore the possibility of general analytical platforms for inventorying observations and assessing possible adaptation options

Common recommendations across discussions:

- Support a platform whereby Boards can collaborate and knowledge and information can be shared spatially and temporally (this demonstrates a desire to continue into the next element of the Guidance Framework, which is to develop a "shared information pool" for boards).
- Assist Boards in engaging stakeholders in addressing climate change, including guidance on how to 'get the message across' appropriately for their target audiences.
- Assist Boards in determining if climate change is covered by their existing mandate, and what actions need to be pursued if their mandate does not and the Board considers it to be an important issue.

IJC staff will revise the Guidance Framework to provide recommendations for implementation of the Guidance Framework based on attendee feedback. Both a draft of this workshop report and a draft of the revisions will be submitted to workshop attendees and the CAWG for their feedback this summer. The recommendations from this report, along with a final copy of the workshop report, will be presented to Commissioners at their September 2017 executive meeting.

Conclusion

Throughout the workshop there was great enthusiasm for the climate change framework and expression of interest in its further development and implementation. The Boards are different in terms of responsibilities, issues, and capacity but discussions also identified clear potential synergies for information sharing and lessons learned from the process implementation. At present the climate change framework is being piloted vertically through the entire implementation process with the St. Croix Board, and the first step is being conducted horizontally with each board. Results from these piloting activities will be delivered to the Commission at their September 2017 executive meeting.

Appendix A: Workshop Agenda

International Watersheds Initiative (IWI)
Climate Change Guidance Framework Workshop

Date and time: May 4th, 2017 (8:30am -12:00 pm)
*Coffee and tea will be served at 8:00am, the workshop will begin promptly at 8:30am

Remote Participation Information:
1-866-352-2219
Participant#: 95487644

Location: Capitol Skyline Hotel
10 I Street SW
Washington DC 20024-4266

Participants:

- Representatives from the Boards
- Commission staff
- Workshop facilitators

Workshop objectives:

1. Present an updated view of the three elements of the "Climate Change Guidance Framework for IJC Boards": 1) a 4-phase planning guidance method, 2) a shared information pool, and 3) assistance in establishing adaptive management.
    - Discuss how this guidance framework relates to IJC boards and their mandates
    - Discuss the guidance framework pilot project – the goals and what has been achieved thus far

2. Obtain feedback from workshop participants on the guidance framework and pilot project.

3. Socialize the process of implementing the framework, improving understanding and building capacity for conducting the climate change framework process.

FINAL AGENDA
May 4th, 2017

Time	Topic	Lead
8:00-8:30	Coffee	All
8:30-8:45	Workshop Begins • Introductions • Review workshop agenda and objectives	All Bill Werick and Casey Brown (Facilitators)
8:45-9:30	Climate Change Guidance Framework • An introduction to the three elements: 1) a 4-phase planning guidance method, 2) a shared information pool, and 3) assistance in establishing adaptive management • How this guidance framework relates to IJC boards and their mandates • The guidance framework pilot project – the goals and what has been achieved thus far • Present pre-workshop questionnaire responses • Propose discussion questions for the Global Café • Address any questions of clarification • Provide directions for breakout groups	Bill Werick and Casey Brown (Facilitators)
9:30-9:45	Health Break	
9:45-10:45	Global Café (3 groups – 20 minutes each topic): The Global Café will involve three rounds lasting 20 minutes each of simultaneous breakout group discussions. At the end of each round, participants move to the next discussion. Discussion topics are: a) Board Objectives and Performance Metrics b) Thinking through climate change effects on objectives c) Possible Adaptation Actions	All
11:00-11:45	• Plenary - Reports from breakout groups on their facilitated discussion • 15 minutes allocated for each topic • 5-10 minutes presentation of findings • Remainder of time for discussion, next steps	Bill Werick and Casey Brown (Facilitators) All

Appendix B: IJC Board Self Assessment Responses

Questions

1. On a scale of 1 to 10, how prepared for climate change is this Board in your opinions? You can add your own words to the number rating. To give more universal meaning to each score, here are some standards. You may have done something we don't refer to in these guidepost ratings or doesn't seem to fit in the four steps. Please adjust your rating as you see fit and let us know what your Board did.

> **10** means the Board had clearly established in a public process that climate change would not impact their responsibilities or had gone through all four guideline steps, had an adaptive management plan in place with some actions already taken and the ability to take more as needed, all documented and worked out with stakeholders. Note: We think even the Great Lakes Boards aren't quite there yet.
>
> **8** means the Board had gone through the first three steps (i.e., Organize, Analyze and Act) to produce a quantified assessment of how outcomes related to the Board's missions were likely to be impacted because of climate change, but there was no adaptive management effort established that would allow the Board to update that assessment with new information and in collaboration with their partners and stakeholders.
>
> **6** means the Board has done steps one and two (i.e., Organize and Analyze) but had not agreed on actions
>
> **4** means the Board had completed step one (i.e., Organize). The Board had discussions about how its mission might be affected by climate change, some relevant science had been identified and considered by the Board, and the Board had made a statement on the potential impact of climate change on specific responsibilities of the Board. No quantitative analysis had been done, but the Board had determined what would be necessary to do that.
>
> **2** means the Board had some elements of step one but hadn't produced a summary report. For example, Board minutes might show which missions Board members were concerned about; the Board may have invited presentations on climate change and discussed what actions the Board should be considering.
>
> **1** means the Board had done nothing to consider how climate change could affect the Board's missions.

2. What are the next one or two actions you think the Board has to consider to improve its preparedness? Consider both urgency and importance.

3. Do you have suggestions about what you would most like to learn from the other Boards and this collective planning effort?

4. Which do you consider a bigger challenge to planning for climate change, gathering information and monitoring conditions in your basin, accessing information about possible climate changes or having a planning process to follow?

5. Is there something you know that we're overlooking, or do you think we should we shift our emphasis in some way?

Self-Assessments

St. Croix – 3/10

Current Assessment: We have held 2 scientific forums as well as done a state of the river report and discussed and had presentations on climate change issues such as flooding and drought. However we have not completed a Board statement specific to climate change. We have discussed a potential project in our 5 year plan to assess climate change.

Next Steps: We have to conduct a climate change assessment of the issues that relate to the basin. Bring together the data and do an analysis. We have discussed this for our planning period. From this work, we would be in a better position to publicly discuss the topic. We feel this will be an important initiative but has been overtaken at the moment by other more pressing issues. It will also require additional resources.

Learning from other Boards: We would like to know where they stand and what approaches they are taking.

Gathering, accessing information or process: They are all challenges. At the moment gather information and monitoring conditions is challenging because we require resource support. The basin is small with small communities and we will have to seek out where long term information exists.

What is missing in the guidance?: I think your approach is good. The problem is finding the resources and the time of the Board members to oversee the studies necessary to address climate change.

Red River – 2/10

Current Assessment: Means the Board had some elements of step one but hadn't produced a summary report. For example, Board minutes might show which missions Board members were concerned about; the Board may have invited presentations on climate change and discussed what actions the Board should be considering. **This question is structured to miss much of the work done by the IRRB.** To date work of the IRRB has been couched in the terms used in its assigned mandate: flood preparedness; water quality; ecosystem health. It is only recently that the IJC has suggested that work should be focused via a climate change lens.

Next Steps: 1. Continue the good work already initiated. 2. Begin to organize work under a climate change umbrella.

Learning from other Boards: Has (or will) work on currently mandated responsibilities been slowed or deferred in order to organized under a climate change umbrella?

Gathering, accessing information or process: Having a process to follow and finding the capacity to implement the process.

What is missing in the guidance?: What effect will the attitude of the current US Administration have on this initiative?

Niagara – 1/10

Current Assessment: Means the Board had done nothing to consider how climate change could affect the Board's missions.

Next Steps: Invite a presentation on climate change from GLAM and it's potential impacts on Lake Erie water levels and temperatures which would provide an indication of potential impacts on Niagara River flows with impacts on Chippawa Grass Island Pool operation and/or Lake Erie/Niagara River Ice Boom rules.

Gathering, accessing information or process: Separating out the differences between climate variability and climate change and knowing when it is for certain the latter.

GLAM, Lake Superior, and Lake Ontario – St. Lawrence River – 7/10

Current Assessment: GLAM is established and working. Climate Change initiatives are in our strategic plan and we've done some initial surveillance on potential factors that may be influenced by climate change. GLAM has not revisited the climate change analyses conducted during the IUGLS and LOSLRS. The GLAM will be looking at the CCFWG framework to see how aspects can be integrated into the GLAM strategic plan.

Next Steps:

1) Improve our understanding of existing Great Lakes Basin climate change science and associated confidence and uncertainty.

2) Assess options for using the climate science to test the robustness of the existing regulation plans - How will we apply this new information?

Learning from other Boards: It would help to understand the issues and needs of other (non-Great Lakes) Boards to see where collaborative efforts would be most beneficial.

Gathering, accessing information or process: All three items pose challenges. However, the big question is what is the uncertainty in the climate change projections and how that affects our planning processes.

What is missing in the guidance?: How will climate change affect other things that will impact our planning? There may be secondary impacts because of climate change that would fundamentally change the vulnerability of interest groups beyond just the management of water levels and flows.

Kootenay Lake – 4/10

Current Assessment: Means the Board had completed step one (i.e., Organize). The Board had discussions about how its mission might be affected by climate change, some relevant science had been identified and considered by the Board, and the Board had made a statement on the potential impact of

climate change on specific responsibilities of the Board. No quantitative analysis had been done, but the Board had determined what would be necessary to do that. During the 2016 water year the IKLBC supported a preliminary analysis and presentation of regional climate change data at the board and public meeting.

Next Steps:

1. The board should continue to review and disseminate information on regional climate change impact assessments of relevance to hydrologic conditions in the Kootenay(ai) River Basin using the Board website for the purpose of public access.
2. Develop a statement describing the dynamics and drivers for the system, how sensitive the system is to changes in those drivers, and how climate change may challenge the board in carrying out its responsibilities. February is a month that is warming the most relative to other months with the potential to impact low and mid elevation melt water, will this impact the ability to achieve the rule curve or should a modification be considered to allow for earlier runoff periods especially episodic warmings.

Learning from other Boards: The IKBLC would like to learn what level of analysis and action other boards are taking with respect to climate change.

Gathering, accessing information or process: The biggest challenge in the Kootenai basin will be to determine whether or when to take action based on changes in the climate.

Rainy Lake of the Woods – 3/10

Current Assessment: The Board has yet to officially organize however, we will be starting to address step one of the framework as part of the webinar with the project contractors on April 28th. Although not part of the IRLWWB, the Rainy- Namakan Rule Curve Review Study Board has considered climate change in its work which will be directly applicable to the IRLWWB's work on water quantity. In addition, climate change was considered in the development of the Water Quality Plan of Study (POS) and climate science that is being undertaken in the basin has been showcased during the annual Science Forum over the years. The Board has not synthesized this information nor has it explicitly considered how climate change will impact its mandate at this time. Some CAWG members from the IRLWWB have compiled relevant climate science presented at the annual science forum as well as the 2014 State of the Basin Report as a starting point.

Next Steps:

1. Essentially Step 1 - Organize - Set aside some dedicated time for the Board to discuss how it's mandate is affected by climate change.
2. Have a presentation by he Rule Curves Study Board on what they have learned and will be proposing with regards to climate change.

Learning from other Boards:

1. What **benchmarks** are other boards using/considering with respect to more **extreme events being more normal?** (e.g. 50year floods and droughts, 100year..)
2. What are the political pressures facing each Board about identified climate change issues/developments and how are these being addressed?
3. Climate change impacts on water quality may be as significant as impacts on water quantity: **what are other boards seeing or learning about the links to algae blooms, AIS, etc?**
4. What challenges are other boards identifying and what kinds of creative solutions are they proposing to address them?
5. Learning more about the **depth and breadth of climate change impacts** various jurisdictions are facing.

Gathering, accessing information or process: Determining the biggest challenge in planning for climate change will require further discussion by the entire Board. From the small number of responses received, widespread and long-term monitoring data was cited are being a challenge as well as having a planning process to follow.

What is missing in the guidance?: One aspect that may require consideration is the level of harmonization between American and Canadian science, policy, preparedness and governance for a given basin. A discrepancy in the level of science and monitoring on either side of the border in the Rainy-Lake of the Woods basin was identified as an example.

Health Professionals Advisory Board – 3/10

Current Assessment: As an advisory to the IJC our responsibilities are not defined geographically and we have not gone through the adaptive mgt. plan process. However, climate related hazards to health are high on our list of priorities and figure prominently in our work. For example our recent report on harmful algal blooms has clearly delineated climate related impacts. Our health indicators of GL water quality are all effected by climate and our pilot project on acute gastro-intestinal illness is driven largely by extreme weather events related to climate.

Next Steps: Develop a robust understanding of the implications for transboundary water security of new policies related to GHG mitigation on both sides of the border.

Learning from other Boards: How do other boards view the interplay between mitigation measures and adaptive capacity in their jurisdictions?

What is missing in the guidance?: Communication of CC hazards and policy options in local and trans-national context is crucial. Do we have a geographically referenced primer for commissioners on the implications of climate change for transboundary waters? This could be very helpful.

Osoyoos Lake – 7/10 (note: there were multiple responses)

Current Assessment:

- This board is about a 7 prepared for climate change more because of our limited preview (we only oversee lake elevation of Osoyoos Lake and more specifically only in relationship to the orders) than because we have good information.
- I think we are at about a 6. Yes we have limited scope at present with the order but we do have to maintain a watch on issues such as this that will impact the system in order to provide advice to the commission.
  We need to have a better understanding of potential impacts on flows and water levels to be able to provide advice/recommendations on changes in the orders. An understanding of impacts on potential biological and species changes in the system due to climate change is important.
- Suggest this board is a "7". In preparation for order renewal this board completed a study titled "Climate Change and its implications for managing water levels in Osoyoos Lake: Summary Report", April, 2011. This report organized and analyzed climate change information available at the time and made recommendations for the order renewal process. While the report could use updating it was a strong first step.

Next Steps: We need to read scientific reports, and be pushy with public awareness.

Learning from other Boards: Sharing ideas and workable plans gives us food for thought on what we can pursue.

Gathering, accessing information or process: All parts are challenging. Plans change and we need to have adaptive strategies. Weather patterns are not always predictable, and social media comments can be misleading and confusing.

What is missing in the guidance?: As an educator, we need to pay attention to our youth and inform them of appropriate information. Wearing seatbelts and recycling campaigns worked because of young people insisting that parents change their thinking.

Souris River – 2/10

Current Assessment: 2 rating means the Board had some elements of step one but hadn't produced a summary report. For example, Board minutes might show which missions Board members were concerned about; the Board may have invited presentations on climate change and discussed what actions the Board should be considering.

Next Steps: The Souris basin is a basin of extremes, driven by a variable climate. The Board has been addressing a change in the spring freshet with great influence from heavy spring and early summer rains. The operating references and actions are being reviewed to address this.

Learning from other Boards: It will be interesting to hear what climate variability the other boards face and how they are managing this variability**.**

Gathering, accessing information or process: The most significant challenge is greater knowledge and understanding of the potential cycles of climate variability, which will affect the basin, and implications for the Board to administer its Directive.

What is missing in the guidance?: Climate variability increases the potential for conflict and the Board governance mechanism must be sound in order to manage through these situations. Some thought on tools and approaches for the Boards to address this potential conflict situation will be required.