United States Government Accountability Office

Report to Congressional Requesters

July 2020

LAKE ONTARIO-ST. LAWRENCE RIVER PLAN

Improved Communication and Adaptive Management Strategy Could Help Address Stakeholder Concerns

GAO-20-529

GAO Highlights

Highlights of GAO-20-529, a report to congressional requesters

July 2020

LAKE ONTARIO-ST. LAWRENCE RIVER PLAN

Improved Communication and Adaptive Management Strategy Could Help Address Stakeholder Concerns

Why GAO Did This Study

Water releases from Lake Ontario into the St. Lawrence River are determined by a set of regulatory rules and criteria called Plan 2014—issued pursuant to IJC's Supplementary Order of Approval and the Boundary Waters Treaty of 1909. The IJC—a binational commission—developed and issued the Plan and Order with the concurrence of the United States and Canada. The rules affect a variety of users of the waterway, including ecosystems, hydropower, and municipal and industrial water use.

After flooding from the lake and river in 2017, GAO was asked to examine the process IJC used to develop and evaluate Plan 2014 and how IJC has addressed stakeholder concerns. This report examines (1) the extent to which IJC's process to develop and select Plan 2014 was consistent with essential elements of risk-informed decision-making, (2) actions IJC has taken to communicate with stakeholders about its implementation of Plan 2014 and stakeholder concerns regarding IJC's communication, and (3) stakeholder concerns about Plan 2014 and the extent to which IJC has developed a process to assess and adjust Plan 2014. GAO reviewed Plan 2014 and other IJC documents, interviewed IJC and federal officials and a nongeneralizable sample of 14 stakeholders, selected for a variety of user interests and stakeholder types.

What GAO Recommends

GAO is making three recommendations, including that the U.S. Section of the IJC work with its Canadian counterpart to ensure that the communication plan aligns with best practices and the adaptive management strategy fully incorporates key elements. IJC agreed with our recommendations.

View GAO-20-529. For more information, contact J. Alfredo Gómez at (202) 512-3841 or gomezj@gao.gov.

What GAO Found

The International Joint Commission's (IJC) process for developing and selecting the Lake Ontario-St. Lawrence River Plan 2014 (Plan 2014) was generally consistent with relevant essential elements of risk-informed decision-making. During the 18-year process, IJC took steps to define objectives and performance measures to be used in its decision-making, identify various options, assess uncertainties like climate change, and engage with stakeholders, among other steps. These steps are all essential elements of risk-informed decision making.

Plan 2014 Affects Various Users of Lake Ontario and the St. Lawrence River, Including (from Left to Right) Commercial Navigation, Coastal Development, and Recreational Boating, Including Marinas

Source: GAO. | GAO-20-529

IJC uses two mechanisms—a communications committee and a strategic communication plan—and a variety of methods—such as its website, social media, and public meetings—to communicate with stakeholders about its implementation of Plan 2014. Nevertheless, 12 of the 14 stakeholders GAO interviewed expressed concerns about IJC's communication. GAO found that IJC's strategic communication plan and related documents partially align with best practices. For example, the communication plan and related documents do not comprehensively identify target audiences or include mechanisms to monitor and evaluate the effectivness of their communication efforts. Updating its strategic communication plan to align with best practices and principles for risk communication could help IJC ensure improved stakeholder communication.

Of the 14 stakeholders interviewed, nine expressed concerns about the rules and criteria in Plan 2014 and 10 expressed concerns about its implementation. For example, seven stakeholders told us that they do not believe that the Plan allows IJC to act proactively in anticipation of future water conditions. IJC has taken initial steps to develop an adaptive management process that may help address stakeholder concerns and approved a long-term adaptive management strategy in March 2020. However, the document does not fully incorporate the key elements and essential characteristics of an adaptive management process that could help IJC transparently and effectively assess Plan 2014 and adjust future actions to achieve the plan's objectives. For example, the Plan does not fully incorporate a communication strategy for engaging stakeholders throughout the process or information on how IJC will determine if adjustments to the Plan's rules and criteria are warranted.

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Abbreviations

Board	International Lake Ontario-St. Lawrence River Board
GLAM	Great Lakes-St. Lawrence River Adaptive Management Committee
IJC	International Joint Commission
Plan 2014	Lake Ontario-St. Lawrence River Plan 2014
SLSDC	Saint Lawrence Seaway Development Corporation
Study Board	International Lake Ontario-St. Lawrence River Study Board

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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July 23, 2020

The Honorable Charles E. Schumer
Minority Leader
United States Senate

The Honorable Kirsten Gillibrand
United States Senate

The Lake Ontario-St. Lawrence River waterway includes more than 1,100 miles of U.S and Canadian shoreline and supports recreation, commercial fishing, tourism, municipal water systems, industry, commercial navigation, and lakefront and riverfront communities.[1] New York State and the province of Ontario use the Moses-Saunders Dam, located downstream of Lake Ontario on the St. Lawrence River, to generate hydroelectric power. In 2017 and again in 2019, Lake Ontario and the St. Lawrence River experienced record high water levels. Flooding from the lake and river affected homes and businesses, eroded the shoreline, damaged shore protection structures, and led to evacuation of communities. Commercial shipping companies that use the waterway to move tens of thousands of tons of cargo each year experienced increased costs and delays because of safety measures they took to cope with high outflows from Lake Ontario into the St. Lawrence River. The U.S. government obligated over $24 million in disaster relief to the region after the President issued a federal disaster declaration for the 2017 flooding in November 2017.[2]

Water levels of Lake Ontario are determined by water supply balanced against water outflow. Water supply to the lake is primarily from water flowing from the other Great Lakes, through Lake Erie into Lake Ontario, combined with precipitation and runoff from the surrounding watershed, minus evaporation and water releases through the Moses-Saunders Dam. Water levels on the St. Lawrence River downstream from the dam are determined by inflows from the Moses-Saunders Dam, the Ottawa River, and other tributaries. (See fig. 1.) Outflow from Lake Ontario at the Moses-Saunders Dam is determined by a set of regulatory water release

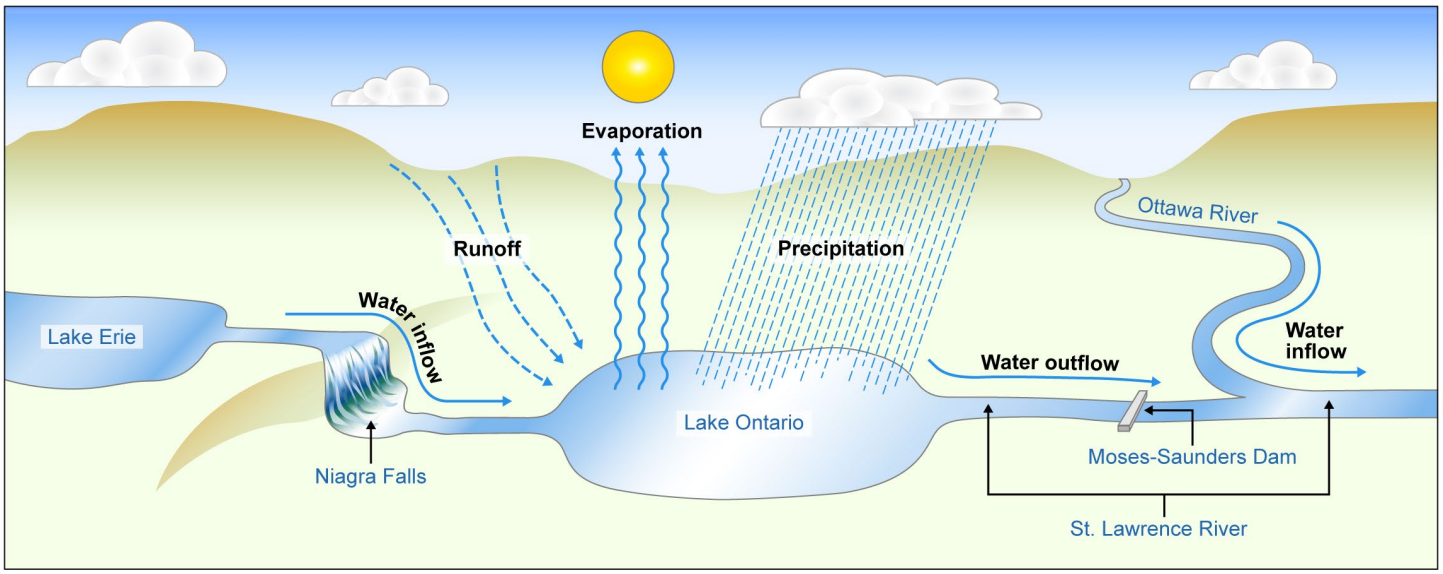
[1]The length of the Lake Ontario and St. Lawrence River shoreline does not include the shorelines of islands.

[2]As of May 2020, the President had not declared the 2019 flooding a federal disaster.

rules—the Lake Ontario-St. Lawrence River Plan 2014 (Plan 2014)—issued pursuant to the Boundary Waters Treaty of 1909 and a Supplementary Order of Approval.[3] The International Joint Commission (IJC) developed Plan 2014 and the Order and provided these documents to the U.S. and Canadian governments for their concurrence. The rules and criteria in Plan 2014 and the Order seek to provide dependable flow for hydropower, minimum depths for municipal water intakes, safe currents for navigation, support for recreational boating, and protection for shoreline property and ecosystem health and diversity, according to IJC. IJC is a binational organization created pursuant to the Boundary Waters Treaty of 1909 with authority to approve uses, diversions, and obstructions of the boundary waters between the two countries that affect the natural level or flow of those waters in accordance with the treaty. The International Lake Ontario-St. Lawrence River Board (Board), which IJC established, implements the Plan 2014 regulations and ensures compliance with the Supplementary Order of Approval.

[3]International Joint Commission, *Lake Ontario-St. Lawrence River Plan 2014: Protecting Against Extreme Water Levels, Restoring Wetlands and Preparing for Climate Change* (Washington, D.C.: June 2014); *Treaty Between the United States and Great Britain Related to the Boundary Waters* (Jan. 11, 1909); and *International Joint Commission in the Matter of the Regulation of Lake Ontario Outflows and Levels: Supplementary Order of Approval* (Dec. 8, 2016).

Figure 1: Primary Factors Determining the Water Level of Lake Ontario and the St. Lawrence River



Source: GAO analysis of information from the International Joint Commission (IJC). | GAO-20-529

Note: A change in outflow from the Moses-Saunders Dam will have a more immediate and larger effect on river water levels compared to Lake Ontario water levels, according to IJC. For example, if outflow through the dam is increased for 1 week to reduce the level of Lake Ontario by 1 centimeter, the water level of the St. Lawrence River at Montreal, Quebec, will rise by 12 centimeters as a result.

In January 2017, the Board began applying the water release rules in Plan 2014 and the Supplementary Order of Approval after more than 18 years of study and consultation with stakeholders to replace the previous set of rules that had been in place since 1963. In 1993, an IJC study board recommended that the commission revise the existing rules to better reflect the current needs of users and interests in the water system.[4] In addition, shoreline property owners and boaters had expressed dissatisfaction with the rules, and IJC had concerns about the potential effects of climate change on lake levels and the adverse effects of the existing rules on area wetlands.

You asked us to examine the process IJC used to develop and evaluate Plan 2014 and the steps IJC has taken to address stakeholder concerns about the Plan. This report examines (1) the extent to which IJC's process to develop and select Plan 2014 was consistent with essential

[4]International Joint Commission, *Levels Reference Study: Great Lakes-St. Lawrence Basin,* submitted to the International Joint Commission by the Levels Reference Study Board (Mar. 31, 1993).

elements of risk-informed decision-making; (2) actions IJC has taken to communicate with stakeholders about its implementation of Plan 2014 and stakeholder concerns regarding IJC's communication, if any; and (3) stakeholder concerns about Plan 2014 and the extent to which IJC has developed a process to assess and adjust Plan 2014, if needed.

To examine the extent to which IJC's process to develop and select Plan 2014 was consistent with essential elements of risk-informed decision-making, we first reviewed Plan 2014 and documentation from the 18-year development process. We also conducted interviews with officials from IJC and federal and state agencies involved in developing Plan 2014 about the process IJC used to develop the Plan and perspectives on the process. In addition, we interviewed academic experts involved in developing Plan 2014 based on recommendations of others we interviewed. We then compared IJC's process with GAO's risk-informed decision-making framework, which identifies essential elements for decision-making when considering trade-offs among risk, cost, and other factors in the face of uncertainty and diverse stakeholder perspectives.[5] We focused our review on the phases of the framework that correspond to IJC's development of Plan 2014: the design phase, the analysis phase, and the decision phase. We assessed whether IJC took actions consistent with each step in each relevant phase. However, because it is outside the scope of this review, we did not evaluate the quality of IJC's actions regarding each step.

To identify actions IJC has taken to communicate with stakeholders about its implementation of Plan 2014, we reviewed IJC documents and interviewed IJC officials, including a former Chairwoman of the U.S. section of IJC and the current Chairwoman and two commissioners who were confirmed in May 2019. In addition, we reviewed IJC's strategic communication plan for alignment with best practices related to outward communication efforts and two-way communication of risk-related information with stakeholders. Specifically, we reviewed the communication plan for alignment with best practices of a typical public relations strategy, identified in our prior work, and with generally accepted principles for communicating risk information outlined in a 2007

[5]GAO, *Environmental Liabilities: DOE Would Benefit from Incorporating Risk-Informed Decision-Making into Its Cleanup Policy*, GAO-19-339 (Washington, D.C.: Sept. 18, 2019).

memorandum from the Office of Management and Budget and Office of Science and Technology Policy.[6]

To identify stakeholder concerns about IJC's communication with stakeholders, we interviewed a nonprobability sample of 14 stakeholders.[7] To select this sample of stakeholders, we identified all the stakeholders that commented at public hearings IJC held in 2013 or that submitted written comments. We then selected stakeholders from a range of stakeholder types and user interests and included a mix of stakeholders that both supported and opposed Plan 2014. The stakeholder types were government (such as county governments and town boards), environmental nonprofit, industrial nonprofit, and commercial (businesses, such as marinas and stores). The six user interests, which IJC identified in its description of Plan 2014, are coastal development, commercial navigation, ecosystems, hydropower, municipal and industrial water use, and recreational boating. Because we used a nonprobability sample, the information obtained from these interviews is not generalizable to other Lake Ontario and St. Lawrence River stakeholders but provides illustrative information about stakeholder perspectives.

To identify stakeholder concerns about Plan 2014, we interviewed the 14 stakeholders that we selected as described above. To determine the extent to which IJC has developed a process to assess Plan 2014 and make adjustments to the Plan if needed, we reviewed IJC documents and interviewed IJC officials. In addition, we compared IJC's adaptive

[6]GAO, *U.S. Public Diplomacy: State Department Expands Efforts but Faces Significant Challenges*, GAO-03-951 (Washington, D.C.: Sept. 4, 2003); GAO, *U.S. Public Diplomacy: State Department Efforts to Engage Muslim Audiences Lack Certain Communication Elements and Face Significant Challenges*, GAO-06-535 (Washington, D.C.: May 3, 2006); and Office of Management and Budget and Office of Science and Technology Policy, *Memorandum for the Heads of Executive Departments and Agencies: Updated Principles for Risk Analysis* (Washington, D.C.: Sept. 19, 2007). The focus of the memorandum is on those risk analyses related to environmental, health, and safety risks, but the memorandum recognized that the principles it presented may be relevant to other fields.

[7]We interviewed officials and representatives from the following 14 stakeholder organizations: (1) Alexandria Bay Fishing Guides Association; (2) Arney's Marina; (3) Business Council of the State of New York; (4) Lake Ontario Riparian Alliance; (5) Monroe County, New York; (6) Sandy Creek Marina; (7) Save Our Sodus; (8) Save the River; (9) St. Lawrence County Legislature; (10) St. Lawrence Seaway Management Corporation; (11) The Nature Conservancy; (12) Town of Greece; (13) Town of Ontario; and (14) Thousand Island Association.

management strategy to GAO's key elements and essential characteristics of an adaptive management process.[8]

In addition, we conducted a site visit to the Lake Ontario-St. Lawrence River region in June 2019. We toured the Moses-Saunders Dam and interviewed officials with the New York Power Authority and Ontario Power Generation. We also conducted in-person interviews with four of the 14 stakeholders in our sample. Appendix I describes our objectives, scope, and methodology in more detail.

We conducted this performance audit from January 2019 to July 2020 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

International Joint Commission

The International Joint Commission (IJC) was established pursuant to the Boundary Waters Treaty of 1909, which was entered into in part to prevent and resolve disputes over the use of shared boundary waters between the United States and Canada. The treaty gave IJC authority, among other things, to approve uses of the boundary waters between the United States and Canada that affect the natural level or flow of those waters in accordance with the provisions of the treaty. The treaty sets out rules for IJC to follow when considering proposals for projects or operations that use, obstruct, or divert boundary waters. These rules include an order of precedence among various water uses that must be observed: (1) domestic and sanitary water purposes, (2) navigation, and (3) power and irrigation. The treaty specifies that no use can be permitted which materially conflicts with or restrains any other use which is given

[8]GAO, *Yellowstone Bison: Interagency Plan and Agencies' Management Need Improvement to Better Address Bison-Cattle Brucellosis Controversy*, GAO-08-291 (Washington, D.C.: Mar. 7, 2008), and *Great Lakes Restoration Initiative: Further Actions Would Result in More Useful Assessments and Help Address Factors That Limit Progress*, GAO-13-797 (Washington, D.C.: Sept. 27, 2013).

preference over it.[9] When IJC approves a project such as a dam or bridge, it does so by issuing an Order of Approval with concurrence of the Canadian and U.S. governments. These Orders also establish conditions and criteria for the application and operation of the project water levels, and outflows. IJC may then adopt a regulation plan with the concurrence of the two governments to govern the release of water from Lake Ontario that implements those conditions and criteria.

IJC is composed of a U.S. section and Canadian section, each with three commissioners as well as advisors and staff to assist the commission in carrying out its responsibilities. In May 2019, the President nominated and the Senate confirmed three new U.S. commissioners. Each respective government pays the salaries and personnel expenses of its section of IJC; both governments pay joint expenses equally. The joint explanatory statement accompanying the Further Consolidated Appropriations Act, Fiscal Year 2020, directed $9.8 million in appropriations to the U.S. section of IJC.

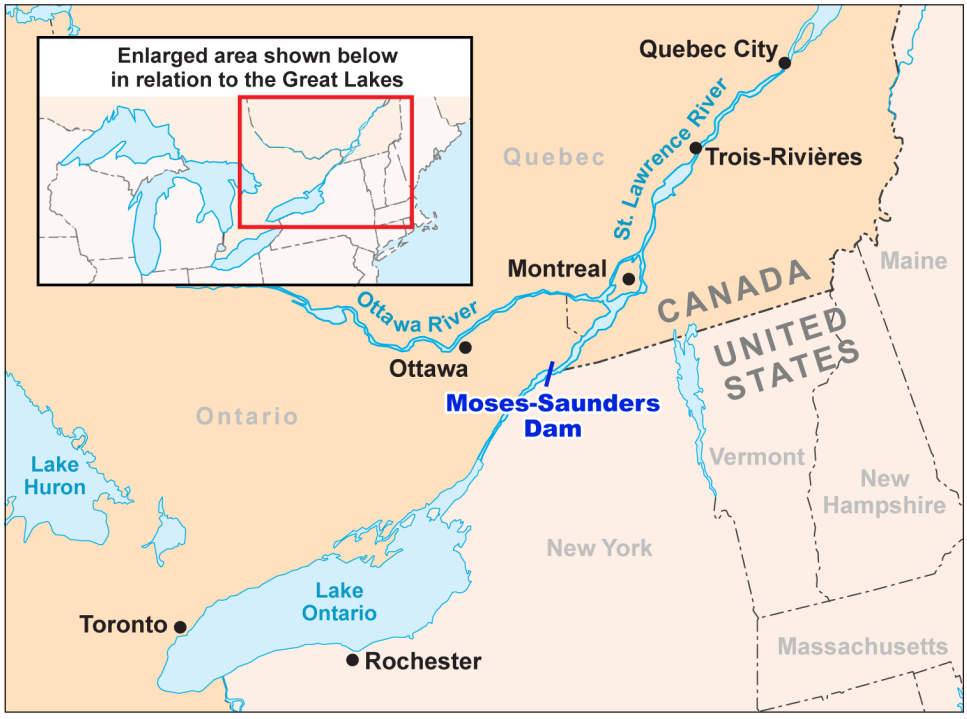
Several U.S. federal agencies work with or are affected by IJC's decisions. For example, the U.S. section receives support services from the Department of State in matters of budget, personnel, and general administration. In addition, the U.S. Army Corps of Engineers provides staff and technical support to IJC. For example, its officials serve on both the Board and the Great Lakes-St. Lawrence River Adaptive Management Committee (GLAM), and as the regulation representative, carrying out the day-to-day regulation activities of the Board. The U.S. Army Corps of Engineers also provides technical support to the Board, such as collecting water level and flow data. In addition, the Saint Lawrence Seaway Development Corporation, a government corporation subject to the direction and supervision of the Secretary of Transportation, operates and maintains the U.S. infrastructure and waters of the St. Lawrence Seaway in cooperation with its Canadian counterpart and seeks to work with IJC and the Board in order to ensure safe and efficient navigation for ships.

[9]The Treaty also requires that, in cases involving the elevation of the natural level of waters on either side of the border as a result of projects on the other side, IJC must require as a condition of approval that "suitable and adequate provision, approved by IJC, be made for the protection and indemnity of all interests" on either side of the boundary which may be injured.

IJC Regulation of Outflows from Lake Ontario through 2016

In 1952, IJC, with concurrence from the United States and Canada, issued an Order of Approval for the construction of a hydropower project near Massena, New York, and Cornwall, Ontario.[10] Operation of the project would determine outflow from the power dam and thus affect the water levels of Lake Ontario and the water levels and flows of the St. Lawrence River downstream as far as Trois Rivières, Quebec. (See fig. 2.) The Order of Approval established conditions and criteria for the application and operation of the project, water levels, and outflows.

Figure 2: Lake Ontario and St. Lawrence River Waterway



Sources: Map Resources and International Joint Commission. | GAO-20-529

[10]International Joint Commission, *In the Matter of the Applications of the Government of Canada and the Government of the United States of America for an Order of Approval of the Construction of Certain Works for Development of Power in the International Rapids Section of the St. Lawrence River: Order of Approval* (Oct. 29, 1952).

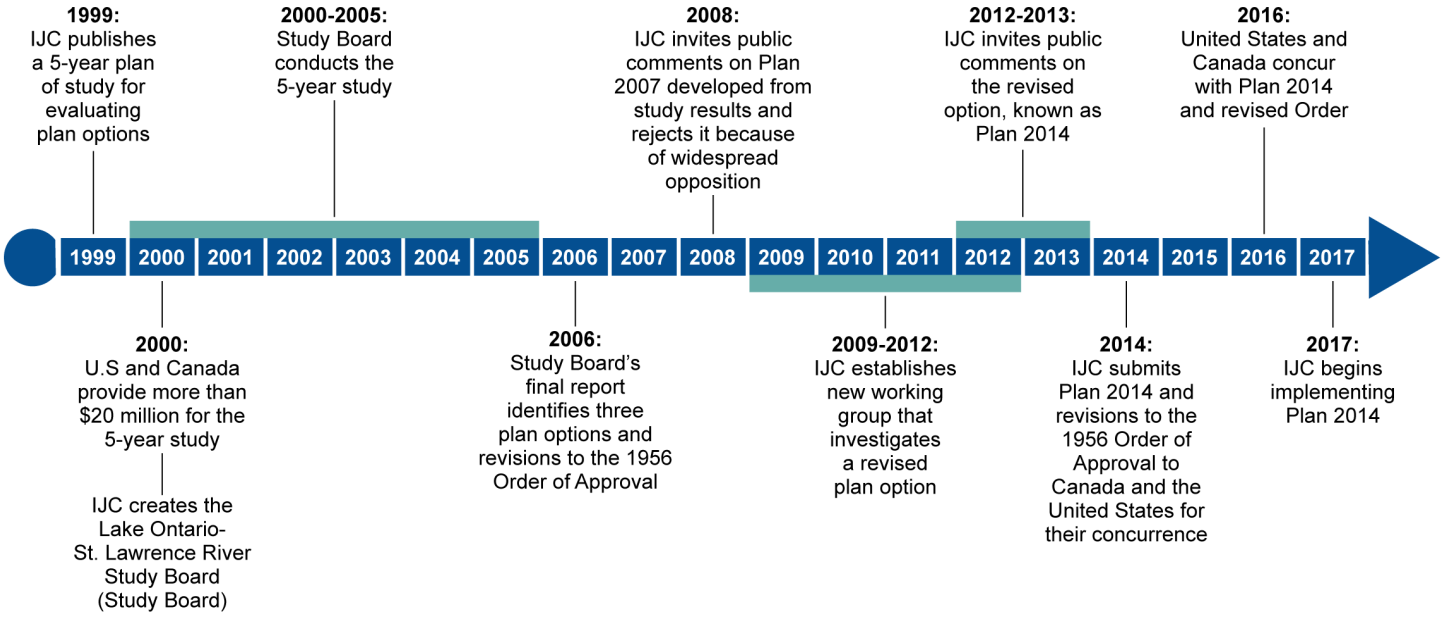
In 1956, IJC amended the 1952 Order of Approval with the concurrence of Canada and the United States (hereafter, 1956 Order of Approval).[11] New conditions in the 1956 Order included a requirement for regulating the level of water in Lake Ontario within a range of 4 feet and in accordance with 11 criteria for outflow and water levels of Lake Ontario and the St. Lawrence River, except, according to IJC, when water supplies were more extreme than those in the historical record. For example, one of the criteria was reducing the frequency of high Lake Ontario levels to benefit shoreline property owners, according to IJC. Another criterion was to set the minimum regulated monthly outflow from Lake Ontario so as to secure the maximum dependable water flow for power generation, consistent with other requirements. In addition, another criterion was for outflows to provide all possible relief to upstream and downstream shoreline interests when water supplies were greater than those of the past, and to navigation and power when supplies were less than those of the past. In 1960, pursuant to the 1956 Order of Approval, IJC put into operation a set of regulatory rules that determine the amount of water to release through the dam. According to IJC, it used a set of rules known as Plan 1958-DD to determine water releases from 1963 through 2016.

Development of Plan 2014

In 1999, IJC began reassessing Plan 1958-DD and the 1956 Order of Approval because of increasing dissatisfaction from shoreline property owners and boaters, the potential effects of climate change on lake levels, and growing concerns about degradation of coastal wetlands from constrained water level variability. The process to develop, approve, and implement Plan 2014, including issuance of a Supplemental Order of Approval, took 18 years. A timeline of key steps in the process is shown in figure 3.

[11]International Joint Commission, *In the Matters of the Development of Power in the International Rapids Section of the St. Lawrence River and the Regulation of the Level of Lake Ontario*: *Supplementary Order to Order of Approval Dated 29 October, 1952* (July 2, 1956).

Figure 3: Timeline of Key Steps in Developing and Implementing Plan 2014 and Revisions to the Order of Approval by the International Joint Commission (IJC), 1999 through 2017



Source: GAO analysis of IJC documents. | GAO-20-529

In 1999, IJC directed the development of a 5-year plan of study to evaluate the effects of water level fluctuations on stakeholder interests in the Lake Ontario-St. Lawrence River system and recommend improvements for the regulation of Lake Ontario outflows.[12] In 2000, the U.S. and Canadian governments provided more than $20 million to IJC to implement the study plan. IJC established the International Lake Ontario-St. Lawrence River Study Board (Study Board) to direct the study from 2000 to 2005. The Study Board comprised seven U.S. members and seven Canadian members that IJC appointed. To conduct the study, the Study Board commissioned research involving over 180 specialists on topics that included wetlands, coastal erosion, and flooding.

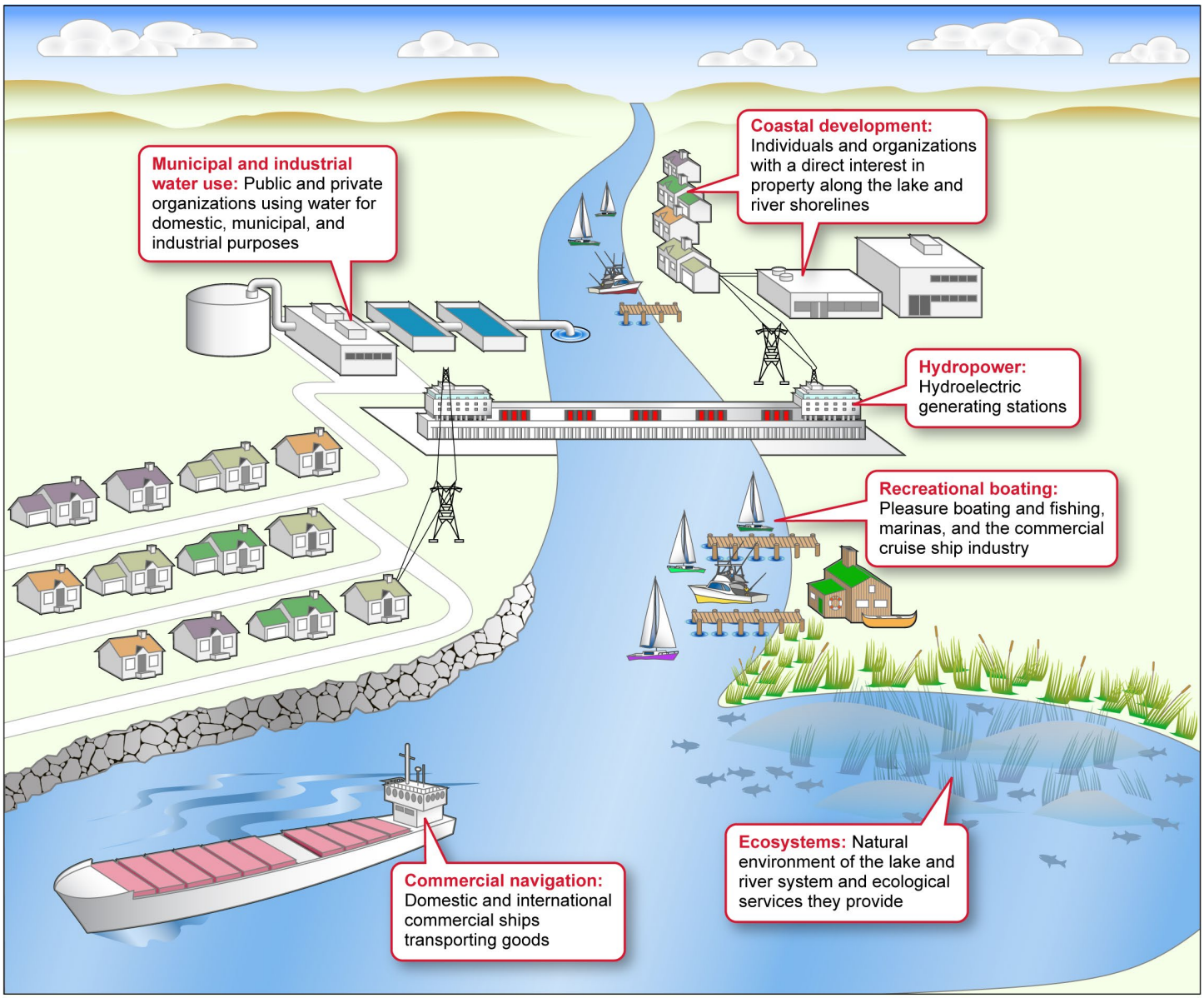
The Study Board identified six user interests in the region that live or work along the shore or use the lake and river for recreation or business and that potentially would be affected by new regulatory rules: (1) coastal

[12]International Joint Commission, *Plan of Study for Criteria Review in the Orders of Approval for Regulation of Lake Ontario-St. Lawrence River Levels and Flows*, prepared for the International Joint Commission by the St. Lawrence River-Lake Ontario Plan of Study Team (September 1999).

development, (2) commercial navigation, (3) ecosystems, (4) hydropower, (5) municipal and industrial water use, and (6) recreational boating.[13] (See fig. 4.) Representatives of these stakeholder groups were on the Study Board and participated in study working groups as well as a public advisory group. The study group developed performance metrics to measure the impacts of water fluctuations on each of the six user interests and developed models to test the impacts in a variety of potential scenarios, including extreme high and low water levels and potential changes from climate change.

[13]The Boundary Waters Treaty of 1909 identifies three of these uses of the boundary waters in its order of precedence—(1) municipal water use (as part of domestic and sanitary water uses), (2) commercial navigation, and (3) hydropower—and states that no other uses are permitted which tend to materially conflict with or restrain these three uses. The Treaty also requires that, in cases involving the elevation of the natural level of waters on either side of the border as a result of projects on the other side, IJC must require as a condition of approval that "suitable and adequate provision, approved by IJC, be made for the protection and indemnity of all interests" on either side of the boundary which may be injured. The 1956 Order of Approval contained provisions addressing shoreline property owners, and the 2016 Supplementary Order of Approval contains provisions addressing ecosystems and recreational boating.

Figure 4: Illustration of Six User Interests in the Lake Ontario-St. Lawrence River System



Source: GAO depiction of user interests as identified by the International Joint Commission. | GAO-20-529

Commercial Navigation

Hundreds of domestic and international commercial ships carry cargo through the Great Lakes and St. Lawrence Seaway system each year, transporting mainly bulk goods, such as grains, coal, and chemicals, as well as manufactured goods, such as steel products, according to the Saint Lawrence Seaway Development Corporation (SLSDC). In 2017, ships carried 143.5 million metric tons of cargo valued at $15.2 billion, according to a study commissioned in part by the SLSDC. Low water levels on the lakes or rivers may require ships to carry reduced loads, and high water levels and flows on the river may necessitate reduced speeds and interruptions of navigation to ensure safety. The SLSDC, a government corporation subject to the direction and supervision of the Secretary of Transportation and the Canadian St. Lawrence Seaway Management Corporation work jointly to ensure safe and efficient commercial navigation on the waterway.

Lake Ontario and the St. Lawrence River reached record high water levels in 2017 and 2019. In response, the International Lake Ontario-St. Lawrence River Board—which determines the amount of water released from Lake Ontario through the Moses-Saunders Dam into the St. Lawrence River in accordance with the Boundary Waters Treaty of 1909, Supplementary Order of Approval, and the Lake Ontario-St. Lawrence River Plan 2014—increased outflows at certain times to record levels in an effort to reduce Lake Ontario water levels and provide relief from flooding to upstream shoreline property owners. To ensure safe navigation in these outflows, the U.S. and Canadian seaway corporations implemented operational measures, such as slowing ship speeds and requiring the use of tugboats at one of the locks.

Sources: GAO; GAO (image) | GAO-20-529

In 2006, the Study Board issued a report outlining its work and findings.[14] Overall, the final report found Plan 1958-DD had degraded 64,000 acres of coastal wetlands and that environmental conditions could be improved by changing Plan 1958-DD, but not without trade-offs that would reduce some existing economic benefits to some other user interests. The report identified three sets of regulatory rule options and related revisions to the 1956 Order of Approval that would provide net economic and environmental improvements when compared to Plan 1958-DD. Each option involved different trade-offs between the impacts on various user interests.

After the Study Board issued its final report in 2006, IJC took a series of steps that ultimately led to the selection of Plan 2014 and revisions to the 1956 Order of Approval. First, IJC invited public comment on revisions to the 1956 Order of Approval and the three plan options identified in the study that would implement the criteria and conditions in a revised Order of Approval. In response to the comments it received, IJC then developed a variant of one of the proposed options, which was called Plan 2007, and sought public comments on the new option and revisions to the Order. Because of widespread opposition to Plan 2007 throughout the region, IJC concluded it was not viable. With input from the U.S. and Canadian governments, IJC established a new binational working group in 2009 to advise IJC on what plan options would be acceptable to the governments. The working group, which included officials appointed by the U.S. and Canadian governments and the governments of New York, Ontario, and Quebec, advised IJC that they could accept a variant of one of the other plan options that the Study Board proposed. IJC sought public comments in 2012 and 2013 on this variant option, which eventually became known as Plan 2014, and related revisions to the 1956 Order of Approval.

IJC concluded that Plan 2014 offered the best opportunity to revise some of the harm done by the existing regulations to the shoreline environment while balancing the effects on upstream and downstream user interests and minimizing possible increased damage to shoreline protection structures. IJC also concluded that related changes to the conditions and criteria in the 1956 Order of Approval were necessary, including new criteria that the outflow from Lake Ontario be regulated to help restore

[14]International Joint Commission, International Lake Ontario-St. Lawrence River Study Board, *Options for Managing Lake Ontario and St. Lawrence River Water Levels and Flows: Final Report to the International Joint Commission* (March 2006).

ecosystem health and to benefit recreational boating on Lake Ontario and the St. Lawrence River.

In 2014, IJC submitted Plan 2014 and a Supplementary Order of Approval to revise the 1956 Order to the United States and Canada. In 2016, both governments concurred with IJC on Plan 2014 and the Supplementary Order of Approval, with the understanding that the Order would be implemented in a manner that observed the order of precedence set forth in the 1909 treaty. After receiving their concurrence, IJC issued the Supplementary Order of Approval and two directives that would govern the implementation of Plan 2014. The first directive created the International Lake Ontario-St. Lawrence River Board (Board), assigning it responsibility for ensuring compliance with the Supplementary Order of Approval and setting outflows from Lake Ontario into the St. Lawrence River through the Moses-Saunders Dam in accordance with the Order.[15] The Directive also outlined Board duties related to adaptive management, communications, and public involvement. IJC's second directive provided specific protocols and guidance to the Board for implementing Plan 2014, including those on making operational adjustments, deviating from Plan 2014, and managing extreme conditions.[16]

Description of Plan 2014

Depending on the water levels of Lake Ontario and the St. Lawrence River and other factors, Plan 2014 directs the amount of water to be released through the Moses-Saunders Dam based on either mechanistic rules or the Board's discretionary decisions, within the criteria laid out in the Supplementary Order of Approval. The Board, working with the U.S. Army Corps of Engineers and Environment and Climate Change Canada, sets weekly outflows using an algorithm based on short- and long-term water supply forecasts in conjunction with information on historic water supplies. Plan 2014 also includes a variety of water level limits and trigger points that require specific release actions. For example, outflow is constrained within certain limits to prevent river flows from falling too low, facilitate stable river ice formation, provide acceptable navigation conditions, provide safe operating conditions for dam control structures, and ensure controlled week-to-week changes in flows. In addition, based

[15]International Joint Commission, *International Lake Ontario-St. Lawrence River Board Directive* (Dec. 8, 2016).

[16]International Joint Commission, *Directive to the International Lake Ontario–St. Lawrence River Board on Operational Adjustments, Deviations and Extreme Conditions* (Dec. 8, 2016).

on IJC's Directive to the Board regarding operational adjustments, deviations, and extreme conditions, in certain situations the Board can deviate from the outflows prescribed by Plan 2014. Specifically, the Board can make operational adjustments in order to account for inaccurate forecasts, make certain minor deviations to respond to short-term needs (such as to allow for maintenance of the hydropower plant), and change flows in emergency situations.

In addition, the directive to the Board addresses major deviations—significant departures from Plan 2014 made in response to extreme high or low water levels on Lake Ontario in accordance with a criterion in the Supplementary Order of Approval. Specifically, this criterion provides that when water levels on Lake Ontario reach or exceed a specified high level, the dam is to be operated to provide all possible relief to shoreline owners upstream and downstream.[17] Conversely, when Lake Ontario water levels reach or fall below a specified low level, the criterion calls for the dam to be operated to provide all possible relief to municipal water intakes, navigation, and power purposes upstream and downstream. Under this criterion, the Board is authorized to use its discretion to set flows and deviate from Plan 2014 in accordance with the 1909 treaty; we refer to this as the Board's deviation authority. At the time IJC drafted Plan 2014, statistics based on the historical record indicated that water levels would not reach the high or low trigger points very often. However, since the Board began implementing the Plan in January 2017, Lake Ontario has experienced record high water levels and exceeded the high water trigger point in both 2017 and 2019. As a result, the Board had deviation authority from late April 2017 through the end of August 2017 and again starting in May 2019 when water levels reached or exceeded the high trigger point. In November 2019, in light of continuing high water levels, IJC gave the Board authority to continue to deviate from Plan 2014 until June 2020 when Lake Ontario was forecast to reach its seasonal peak, even if Lake Ontario water levels fell below the high trigger point.

Adaptive Management

The IJC Directive establishing the Board says that the Board will use an adaptive management process to verify that Plan 2014 has the effects IJC anticipated; react to the influence of changing conditions, such as climate change; and suggest opportunities to adapt or improve the Plan. IJC defines adaptive management as an ongoing planning process that can improve actions through long-term monitoring, modeling, and

[17]According to a Board directive accompanying the Order, the Board is authorized to use its discretion to set flows in such conditions and deviate from the approved plan to provide balanced relief to the degree possible, upstream and downstream.

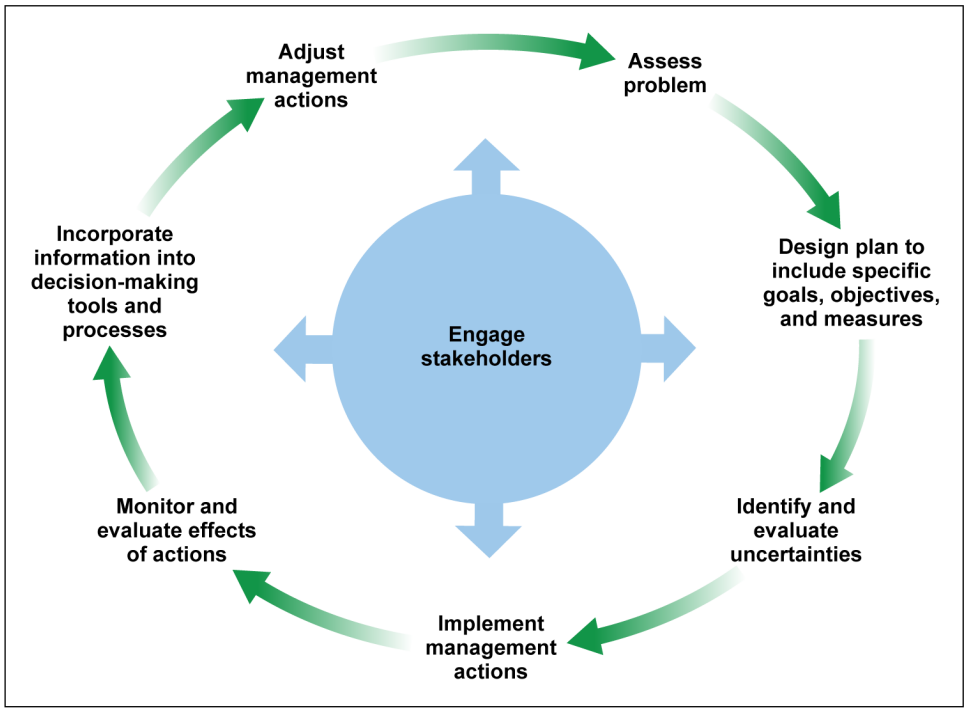
assessment. According to IJC, the adaptive management process is a learn-by-doing approach that will assess the extent to which the results predicted based on the research and models used to develop the Plan occur as expected and evaluate any new information or changes in conditions. The Supplementary Order of Approval requires that IJC conduct a review of the results of the Plan no later than 15 years after its effective date. If warranted, this review would provide the basis for possible changes to the Plan's rules for regulating water levels and flows. In January 2015, IJC established GLAM to implement an adaptive management process for Plan 2014 and two other Great Lakes boards of control.

There is no universal definition for adaptive management or fixed set of steps that constitute an adaptive management process, but in our past work we identified eight key elements of this iterative process based on a review of guidance from several federal agencies that describe best practices for an adaptive management process.[18] The key elements are summarized in figure 5. In addition to the eight key elements, our prior work also identified two overarching, essential characteristics of adaptive management: (1) describing linkages among the key elements and (2) collaborating with agency partners.[19] The agency guidance on which the key elements are based provide further detailed information and advice on applying the key elements and characteristics.

[18]GAO-13-797. These guidance documents were developed by federal agencies, but the key elements and essential characteristics that we identified in these documents can serve as best practices for any entity undertaking adaptive management.

[19]GAO-08-291. Our past work identified "engage stakeholders" as both an essential characteristic and key element. We discuss it here as one of the key elements.

Figure 5: Key Elements of the Adaptive Management Process



Sources: GAO analysis of guidance from the Department of the Interior,[a] U.S. Geological Survey,[b] U.S. Army Corps of Engineers,[c] Forest Service,[d] and Environmental Protection Agency.[e] | GAO-20-529

[a]B. K. Williams and E. D. Brown, *Adaptive Management: The U.S. Department of the Interior Applications Guide,* Adaptive Management Working Group, U.S. Department of the Interior (Washington, D.C.: 2012). B. K. Williams, R. C. Szaro, and C. D. Shapiro, *Adaptive Management: The U.S. Department of the Interior Technical Guide*, Adaptive Management Working Group, U.S. Department of the Interior (Washington, D.C.: 2009).

[b]A. J. Atkinson, P. C. Trenham, R. N. Fisher, S. A. Hathaway, B. S. Johnson, S. G. Torres, and Y. C. Moore, *Designing Monitoring Programs In an Adaptive Management Context For Regional Multiple Species Conservation Plans*, U.S. Geological Survey Technical Report (Sacramento, Calif.: U.S. Geological Survey Western Ecological Research Center, 2004).

[c]RECOVER 2010, *Comprehensive Everglades Restoration Plan Adaptive Management Integration Guide, Restoration Coordination and Verification* (Jacksonville, Fla. and West Palm Beach, Fla.: U.S. Army Corps of Engineers, Jacksonville District and South Florida Water Management District, 2010).

[d]G. H. Stankey, R. N. Clark, and B. T. Bormann, *Adaptive Management of Natural Resources: Theory, Concepts, and Management Institutions*, Gen. Tech. Rep. PNW-GTR-654 (Portland, Ore.: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 2005).

[e]Environmental Protection Agency, *Watershed Analysis and Management, Guide for States and Communities: EPA Watershed Analysis and Management Project* (Washington, D.C.: 2003), and Environmental Protection Agency, *Handbook for Developing Watershed Plans to Restore and Protect Our Waters*, EPA 841-B-08-002 (Washington, D.C.: 2008).

IJC's Process for Developing and Selecting Plan 2014 Was Generally Consistent with Relevant Essential Elements of Risk-Informed Decision-making

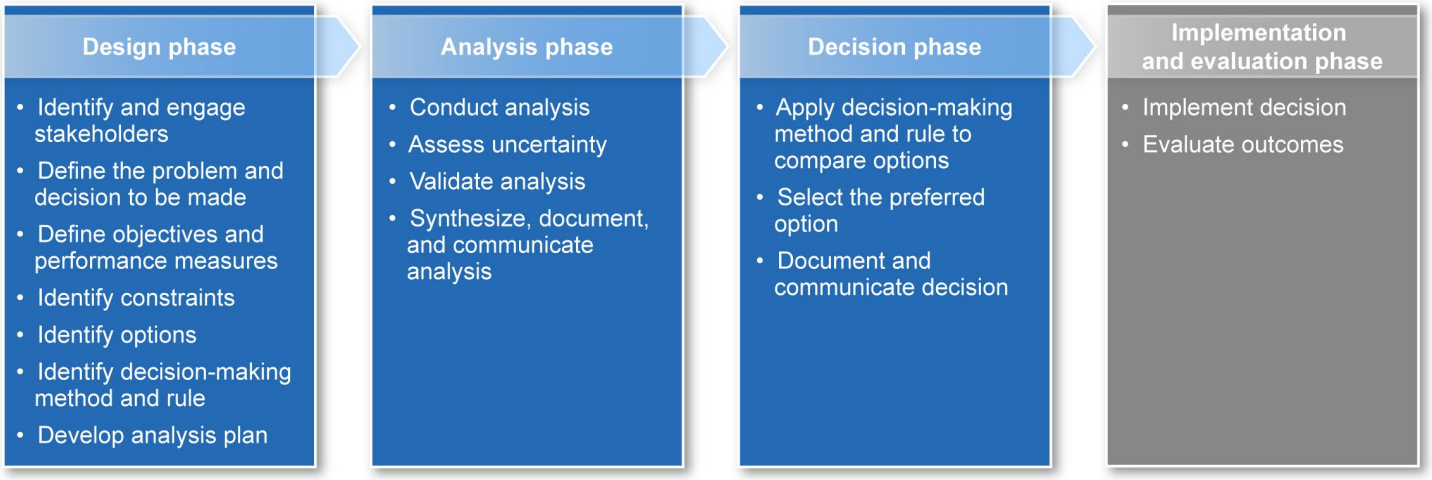
IJC's process for developing and selecting Plan 2014, along with the related revisions to the 1956 Order of Approval and two 2016 directives to the Board,[20] was generally consistent with relevant essential elements of risk-informed decision-making, based on our comparison of IJC's overall process to develop and select Plan 2014 with essential elements of GAO's risk-informed decision-making framework (see fig. 6).[21] The essential elements of the risk-informed decision framework consists of 16 steps across four phases. Specifically, we found that IJC's process was generally consistent with the 14 of 16 steps that are relevant to the design, analysis, and decision phases of the framework. We did not evaluate the two steps in the implementation and evaluation phase of the framework because this phase falls outside of IJC's process for developing and selecting Plan 2014.[22]

[20]When we refer to the development and selection of Plan 2014 in the following section, we are referring to both the development and selection of a regulatory plan as well as the related proposed revisions to the 1956 Order of Approval and two 2016 directives to the Board.

[21]GAO-19-339. To assist agencies in identifying and implementing essential elements of risk-informed decision-making, the report synthesized key concepts from relevant literature and input from experts who participated in a May 2018 meeting convened by the National Academies of Sciences, Engineering, and Medicine. The framework was developed in the context of environmental cleanup at Department of Energy sites but can be applied to other types of decisions.

[22]We assessed whether IJC took actions consistent with each step in each relevant phase. However, because it is outside the scope of this review, we did not evaluate the quality of IJC's actions regarding each step.

Figure 6: Essential Elements of a Risk-Informed Decision-Making Framework



Source: GAO. | GAO-20-529

Note: The essential elements of the risk-informed decision-making framework consists of 16 steps across four phases. GAO compared the International Joint Commission's (IJC) process for developing and selecting the Lake Ontario-St. Lawrence River Plan 2014 (Plan 2014), revisions to the 1956 Order of Approval, and 2016 directives to the Board, for consistency with the 14 steps of the design, analysis, and decision phases of GAO's framework. GAO did not evaluate the two steps in the implementation and evaluation phase of the framework because this phase falls outside of IJC's process for developing and selecting Plan 2014.

A description of the design, analysis, and decision phases and steps of the risk-based decision-making framework, along with examples of how IJC's process was generally consistent with steps in these relevant phases, are described in the following sections. For further details of IJC actions that we found demonstrate consistency with each step in the framework, see appendix II.

Design phase. The purpose of the design phase of risk-informed decision-making is to lay the groundwork for choosing between various options. There are seven steps in the design phase: (1) identifying and engaging stakeholders, (2) defining the problem and decision to be made, (3) defining objectives and performance measures, (4) identifying constraints, (5) identifying options, (6) identifying decision-making method and rule, and (7) developing an analysis plan. According to our review of IJC documents and interviews with officials from IJC and federal and state agencies, and with academic experts involved in developing and selecting the plan, we found that IJC's process was generally consistent with each of the seven steps of risk-informed decision-making for the design phase. During this phase, IJC published a plan of study in 1999

Impacts of Water Regulation on Lake Ontario and St. Lawrence River Wetlands

About 64,000 acres of coastal wetlands around Lake Ontario and the St. Lawrence River provide habitats for a wide range of plant, fish, and wildlife communities, including muskrat, northern pike, and black terns. The wetlands provide ecological services and economic value by improving water quality; providing recreation, such as hunting, fishing, and bird watching; and stabilizing the shoreline.

From 1956 through 2016, the 1956 Order of Approval governing the flow of water from the lake through the Moses-Saunders Dam to the river did not include criteria to account for environmental impacts. The Order, issued by the International Joint Commission (IJC) with concurrence by the United States and Canada, included a criterion to keep the water level of the lake within a 4-foot range. However, changes in water levels are the driving force that determines the diversity and health of wetland plant communities and habitats, according to IJC. By reducing the variability of water levels, the Order reduced the diversity of plant life along the shore and negatively affected wildlife dependent on those plants. For example, diverse wetland habitats in the Lake Ontario coastal ecosystem have converted to vast stands of cattails as a direct response to water-level regulation, according to IJC.

When IJC began developing new water release regulations starting in 1999, IJC supported studies of the responses of coastal ecosystems to various plan proposals. IJC's revised Order and regulation plan went into effect in January 2017. The rules allow more frequent fluctuations of water levels, which are expected to result in benefits to wetlands, according to IJC. IJC is monitoring wetlands to assess whether expected improvements in wetland heath occur under the new regulations.

Sources: IJC (data); Douglas Wilcox (image). | GAO-20-529

that served as the foundation for a 5-year study of the effects of water level and flow regulation.

The plan of study and 5-year study process addressed all seven of the steps in the design phase. For example, the plan identified an initial list of stakeholders to participate in the study process and defined the problem and decision to be made as identifying what, if any, changes should be made to existing water release rules to better meet user interest needs, among other things. In addition, IJC released a final report at the conclusion of this 5-year study in 2006. The 5-year study developed performance indicators and identified guidelines used to help prioritize three options for consideration. The same performance indicators and guidelines, with some minor improvements, were applied in later stages to evaluate subsequent options, including Plan 2014.

Analysis phase. The purpose of the analysis phase of risk-informed decision-making is to determine how the plan options perform with respect to the objectives identified in the previous phase and to provide a factual, analytical basis for making a decision. There are four steps in the analysis phase: (1) conducting analysis; (2) assessing uncertainty; (3) validating analysis; and (4) synthesizing, documenting, and communicating analysis. According to our review of IJC documents and interviews, we found that IJC's process was generally consistent with each of the four steps of the analysis phase of risk-informed decision-making. During this phase, IJC completed analyses evaluating effects of water level and flow regulation for an initial set of plan options as part of its 5-year study completed in 2006 and further analyses on additional plan options that were presented for public comment in 2008, 2012, and 2013. As part of its 5-year study, the Study Board conducted analyses using advanced models to evaluate environmental and economic impacts (e.g., ecosystem response, flooding, and erosion) of various plan options. Among other things, to validate the Study Board's analysis, IJC had the National Research Council and the Royal Society of Canada provide an independent scientific review of studies, report, and models used to develop plan options. These same models, with some revisions, were used in later analyses to evaluate other plan options, including Plan 2014.

Decision phase. The goal of the decision phase of risk-informed decision-making is to choose an option (or set of options) that meets constraints and achieves an acceptable balance of performance across the objectives. There are three steps in the decision phase: (1) applying a decision-making method and rule to compare options, (2) selecting the preferred option, and (3) documenting and communicating the decision.

Based on our review of IJC documents and interviews, we found that IJC's process was generally consistent with each of the three steps of the decision phase of risk-informed decision-making. During the decision phase, IJC applied the decision-making method developed during the design phase. For example, IJC evaluated economic and environmental benefits of each plan option it considered using measures, including impacts across the six user interests, and in 2014, selected Plan 2014 as the optimal plan option. According to IJC's June 2014 report on Plan 2014, IJC selected Plan 2014 because it provided the best possible balance between multiple—and sometimes conflicting—user interests. IJC communicated and documented its decision on Plan 2014 at various points in the process. For example, IJC communicated its decision to select Plan 2014 as the optimal plan in a press release and outlined its reasoning in a detailed document released in June 2014. On its website, IJC also provided a detailed written response to the issues raised during the public comment period on Plan 2014. Upon receiving concurrence from both countries in December 2016, IJC announced in a press release on its website the final decision to implement the plan and Supplementary Order of Approval beginning in January 2017.

IJC Has Used Various Ways to Communicate, but Stakeholders Have Expressed Concerns

IJC's Board—the entity responsible for implementing Plan 2014—has used various ways to communicate with stakeholders about implementing the Plan. It has two mechanisms in place—a communications committee and a strategic communication plan—and has used various communication methods—such as its website, social media, and in-person meetings with stakeholders—to support its communication with stakeholders about implementing Plan 2014.[23] Nevertheless, most of the selected stakeholders we interviewed expressed concerns about the Board's communication with stakeholders since Plan 2014 was implemented in January 2017. We found that the Board's strategic communication plan—developed in 2015 and updated in 2017—and its annual communication action lists for 2019 and 2020 partially address relevant best practices.

[23]For the purposes of this report, stakeholder communication refers to both the Board's outward communication to stakeholders about management of the Lake Ontario-St. Lawrence River system as well as collecting and responding to stakeholder feedback.

IJC Has Two Mechanisms in Place and Has Used Various Methods to Communicate with Stakeholders about Its Implementation of Plan 2014

The Board uses a communication committee—established in 1996—as one mechanism to help guide its communication with stakeholders. The committee is tasked with ensuring that the Board is proactive in acquiring knowledge about stakeholder needs and perspectives and providing those stakeholders with regular information about Board decisions. According to Board officials, the committee includes two members and two secretaries from the Board, two IJC communications advisors, and two IJC engineering advisors. Board officials also told us that the communications committee meets at least monthly and reports formally to the Board during Board meetings.

In 2015, the Board developed a strategic communication plan as another mechanism to help address communication challenges it faces in carrying out its mission.[24] The plan includes strategic communication goals and specific actions to address these challenges. The strategic communication goals are designed to address key communication challenges, including (1) informing stakeholders about the role of the Board, (2) educating them about the complexities of the system, and (3) managing their expectations with regard to water level regulation. According to Board officials, the board has largely implemented the 2015 communication plan and the committee and board regularly monitor and review the status of efforts to achieve the goals in the communication plan.

According to IJC documents and interviews with Board officials and stakeholders, the Board has also used a variety of methods to communicate with and gather feedback from stakeholders about Plan 2014 and the Board's water release decisions since the Plan's implementation in 2017. The Board used the following methods to communicate with stakeholders:

- **Sharing information on the Board's website.** According to Board officials, the Board has provided extensive, up-to-date information on its website. Its website includes information about the Plan and the watershed; a library of documents and reports that include data on regulatory actions, current and expected water level conditions, and water outflow amounts; press releases; meeting minutes; and responses to frequently asked questions.

[24]International Joint Commission, International St. Lawrence River Board of Control, *Strategic Communication Plan* (Aug. 31, 2015).

- **Distributing news releases and weekly emails.** Through IJC, the Board has distributed news releases and newsletters to a media contact list and a list of over 500 U.S. and Canadian federal, state, provincial, and local elected officials, according to Board officials. In addition, IJC sent weekly emails to about 400 subscribers, according to IJC officials.
- **Publishing educational materials.** The Board has also published educational materials for stakeholders on various aspects related to its management of the lake and river system. For example, the Board published a summary report and video specifically about the flooding in 2017 and a report and document of frequently asked questions about the flooding in 2019 that provided overviews of the reasons for the flooding, Plan 2014's effects on water levels, and actions being taken to reduce flooding in the future.[25]
- **Using social media.** The Board has posted information such as water release decisions on its Facebook pages in French and English. It has also gathered and posted responses to feedback on its implementation of Plan 2014 and any concerns from stakeholders on Facebook.
- **Conducting public meetings and annual teleconference webinars.** The Board has held public meetings and webinars. For example, from February 2017 through January 2020, the Board held more than 50 in-person meetings and presentations with stakeholders. According to Board officials, Board members have found that these in-person meetings can be useful for hearing and responding to the concerns of stakeholders, especially during or immediately after flooding events.
- **Conducting surveys of stakeholders.** IJC's GLAM surveyed residents following the flooding in 2017 and 2019 to gather information about how the water levels affected property and protective infrastructure and surveyed municipal water systems to learn how the flooding affected their operations.

In addition to using these mechanisms and methods, the Board took steps to evaluate its stakeholder communication activities. For example, following the flooding in 2017, the Board hired a contractor to conduct a review of the Board's communication efforts during the flooding. In

[25]International Joint Commission, International Lake Ontario-St. Lawrence River Board, *Observed Conditions and Regulated Outflows in 2017* (May 25, 2018), and *Lake Ontario-St. Lawrence River 2019 High Water Levels Questions and Answers* (Jan. 20, 2020), accessed on March 11, 2020, https://ijc.org/en/loslrb/watershed/2017-and-2019-high-water-events.

September 2018, the contractor made recommendations to the Board in its final report, including expanding regular communications with politicians and their staff, preparing a crisis communication plan, refreshing the Board's strategic communication plan, and maintaining regular ongoing contact with stakeholders to provide updates and maintain relationships.[26] According to Board officials, as of February 2020, the Board took actions in response to recommendations with assistance from the communications committee. For example, the communications committee worked with the Board to develop an expedited review and approval process for media releases. The committee also refreshed its stakeholder outreach process by launching a quarterly newsletter with information on current conditions and key issues affecting regulation of Lake Ontario outflows.[27]

Since fall 2019, IJC officials told us that they have taken a number of additional steps and have future plans to improve stakeholder communication. For example, the U.S. Army Corps of Engineers hired a public affairs officer in 2019 to assist the Board in its public communication efforts. In addition, in order to help ensure that perspectives of residents along the lake and river are given a voice in board deliberations and decisions, in September 2019, IJC created two new positions on the Board—one from each country—from municipalities on the shores of Lake Ontario and the St. Lawrence River. The Board also posted several new communication products on its website, such as a new video summarizing findings from a 2019 project on water levels and fish communities of the lake-river system initiated to address stakeholder concerns about the effects of water levels on recreational fisheries. In addition to these activities, the U.S. IJC commissioners told us that they have plans to improve stakeholder engagement in the future through such activities as hosting public information sessions, building relationships with elected officials, and developing materials to better explain the science of Plan 2014 to stakeholders.

[26]ECOStrategy, *Lake Ontario – St. Lawrence River Communications Assessment of 2017 High Water Event Communication Recommendations & Media Analysis* (September 2018).

[27]International Joint Commission, International Lake Ontario-St. Lawrence River Board, *Quarterly Newsletter: Fall 2019* and *Quarterly Newsletter: Winter 2019*, accessed on March 11, 2020, https://ijc.org/en/loslrb/newsletters.

Most Stakeholders We Interviewed Expressed Concerns about How IJC's Board Communicated about Implementing Plan 2014

Most selected stakeholders we interviewed expressed concerns about how IJC's Board has communicated with stakeholders about the implementation of Plan 2014. Specifically, 12 of the 14 stakeholders we interviewed had concerns about one or more of the following: information that the Board communicated to stakeholders, how the Board responded to stakeholder concerns, and methods that the Board used to communicate information.[28]

Regarding information that the Board disseminated about the implementation of Plan 2014, 10 of the 14 stakeholders we interviewed said that the Board did not share enough information. For example, four of these 10 stakeholders told us that the Board did not communicate the reasoning behind its water release decisions.[29] In addition, three stakeholders said that the Board did not communicate about the impact of its decisions on user interests.

Regarding how the Board responded to concerns, five of the 14 stakeholders we interviewed said that the Board either did not listen to their concerns or was not responsive to their concerns. For example, two of these stakeholders said that IJC did not respond to any of the letters they sent to IJC expressing their concerns about Plan 2014, and one stakeholder told us they only received boiler-plate responses from the Board. Another stakeholder told us that the Board appeared to lack empathy when residents told them about the impacts they were experiencing from high water levels on the lake and river that they believed were caused in part by Plan 2014.

Stakeholders also expressed concerns about the methods the Board used to communicate with them. When asked whether they were satisfied with the methods IJC used to communicate with the public about water level decisions that the Board made using Plan 2014, six of 14

[28]We selected a nonprobability sample of 14 stakeholders for interviews to represent a mix of stakeholder types and user interests from a list of 94 that submitted written and oral comments to IJC in 2013 about proposed Plan 2014. Because we used a nonprobability sample, their views are not generalizable to other Lake Ontario and St. Lawrence River stakeholders. We did not verify the accuracy of stakeholder statements regarding IJC communications.

[29]The Board includes a paragraph on its website that explains the rationale for the last outflow change above the outflow changes table, International Lake Ontario-St. Lawrence River Board, *Lake Ontario Outflow Changes*, accessed on April 20, 2020, https://ijc.org/en/loslrb/watershed/outflow-changes.

stakeholders said they were dissatisfied.[30] For example, one of these stakeholders said that although the Board has technical expertise, it does not have the skills or resources needed to communicate effectively with stakeholders, resulting in stakeholder questions and inaccurate expectations about the Plan and its limitations. In response to this same question and other questions, four of 14 stakeholders we interviewed told us that it was difficult to access information related to Plan 2014 and its implementation. Two of these stakeholders told us that the Board website could be more user friendly, for example. In addition, five of the 14 stakeholders we interviewed told us that they did not receive any direct communications from the Board. One of these stakeholders, for example, said that he relied on information passed around his community to learn about the Plan.

At the same time, some selected stakeholders we interviewed told us that they were satisfied with the methods that the Board has used to communicate since the implementation of Plan 2014. In response to our question about their satisfaction with the methods that IJC uses to communicate, six of 14 stakeholders said they were satisfied with the Board's methods. For example, one stakeholder told us that the Board has a great public communication strategy and specifically pointed to the Board's informative videos and training modules about Plan 2014. Another stakeholder said that members of the Board provided information to their group about the Plan and frequently shared information about changes in outflows. One stakeholder also said that the Board posted professional and fact-based answers to questions from the public on its Facebook page.

IJC Board's Strategic Communication Plan Partially Aligns with Relevant Best Practices

The Board's strategic communication plan states that the communication committee will review and update the plan every 2 years, and we found that the Board last updated its original 2015 plan in 2017. Since then, according to Board officials, the communications committee meets for an annual workshop to assess its efforts over the past year, discuss current communications priorities, and plan its activities for the coming year, resulting in a list of action items. However, the committee does not update

[30]When asked whether they were satisfied with methods IJC used to communicate with the public about water level decisions the Board made using Plan 2014, out of 14 selected stakeholders we interviewed, six stakeholders told us they were satisfied, six stakeholders said they were dissatisfied, and two provided comments but did not state whether they were satisfied or not.

the communication plan with this information. According to Board officials, the plan would be updated if the Board found it to be necessary.

We reviewed the Board's 2017 strategic communication plan and communication action lists generated from the Board's annual reviews in 2019 and 2020 against best practices of a successful public relations strategy we identified in our prior work.[31] These best practices consist of key elements listed below that are based on approaches used in the private sector. According to our prior work, a detailed communication plan incorporates core messages and themes, segmented target audiences, detailed strategies and tactics, and in-depth research and evaluation of results. In addition, these best practices suggest that a detailed communication plan serves to pull together the complex data and analysis required for a feasible plan of action that can be monitored and improved as needed based on performance feedback.

We found that the Board's 2017 strategic communication plan and its annual action lists for 2019 and 2020 collectively address some of the key elements of a successful public relations strategy we identified in our prior work and partially incorporate others. Specifically, we found that the Board's 2017 strategic communication plan and related communication actions lists do the following:

- *Incorporates core messages and themes based on program objectives.* In our review, we found that the Board's 2017 strategic communication plan includes five strategic communication goals that inform key messages incorporated in its annual action plans.[32] For example, the communication plan contains strategic communication goals, among others, for educating stakeholders on how natural factors and regulation affect water levels and flows and increasing stakeholders understanding of the need to expect and prepare for fluctuations in levels and flows. The 2019 and 2020 action lists included corresponding key messages such as "the amount of precipitation and where it falls, will determine if flooding will occur on

[31]See GAO-03-951 and GAO-06-535.

[32]The communication plan contains the following five strategic communication goals: (1) increase general public awareness of IJC and the Board; (2) communicate accurately and in a timely fashion about the actions of the Board and the reason for those actions; (3) explain how natural factors and regulation affect water levels and flows; (4) increase understanding of the need to expect and prepare for fluctuations in levels and flows; and (5) consistently seek out, consider, and respond to the views and concerns of all stakeholders.

Lake Ontario this year" and "the events of 2017 and 2019 were record setting, and everyone should plan and prepare for the next time these events occur" consistent with these strategic communication goals. Moreover, key messages in both of the 2019 and 2020 actions lists were timely and included specific messages related to flooding events in 2017 and 2019.

- *Partially defines target audiences.* In our past work, we reported that private sector best practices suggest that analyzing target markets in depth and segmenting these markets are critical to developing effective information campaigns.[33] In our review, we found that neither the Board's communication plan nor its action lists identify target audiences in depth as recommended in our past work. For instance, in its communication plan, the Board identifies nine broad target audiences, such as "stakeholders" and "media" for various communication activities. The 2019 and 2020 action lists specified some target audiences for outreach for each year but do not include comprehensive lists of target audiences. For example, the action lists included specific outreach steps to engage some targeted audiences, such a recreational boaters, industry groups, and Canadian and U.S. elected officials. However, other stakeholders are not identified, such as commercial and coastal development user interests and various stakeholder types within each of those stakeholder interest groups. Plan 2014 identifies a variety of stakeholders in the United States and Canada, such as the six user interests that include diverse types of stakeholders, such as nonprofit organizations, individual businesses, municipalities, and various industry groups.
- *Incorporates detailed strategies and tactics to reach target audiences with intended messages and themes.* In our past work, we reported that the private sector uses sophisticated strategies to integrate complex communication efforts involving multiple players.[34] In our review, we found that the 2019 and 2020 annual action lists incorporated strategies and tactics based on a range of communication activities identified in the communication plan to reach certain target audiences with messages and themes identified for that year. Specifically, the Board's 2017 communication plan described more than 10 communication activities and products, such as its website, learning modules, in-person presentations, and public webinars, as well as activities to support media relations. The annual action lists identified certain strategies and tactics for the year drawn

[33]GAO-06-535, p. 21.

[34]GAO-06-535, p. 23.

from the communication activities described in the communication plan. These strategies and tactics were directed to both specific target audiences and some general audiences with key messages, as appropriate. For example, the 2019 and 2020 action lists specified plans to conduct a webinar for elected officials' staff on Plan 2014 involving Board secretaries and IJC. In addition, the action lists specified increasing communications with recreational boaters associations in the United States and Canada, such as through Board member participation in meetings with these group.

- *Partially incorporates mechanisms for monitoring progress and adjusting strategies and tactics as needed.* In our past, work we found that private sector best practices highlight the value of a research-driven approach to designing, implementing, evaluating, and fine-tuning strategic communications efforts as needed.[35] The Board's strategic communication plan discusses dedicating staff time or hiring a contractor to evaluate and report on website analytics and user behavior to inform improvements to the website overall and to website tools (such as learning modules and interactive graphs) as needed. However, the communications plan does not describe any plans for evaluating the usefulness of other communication activities or products, such as the Board's Facebook page, newsletter articles, or presentations to broad-based membership organizations. Moreover, neither the 2019 nor 2020 action lists we reviewed discussed steps for monitoring progress for any of the identified communication strategies and tactics.

In addition to our best practices of a successful public relations strategy, a 2007 memorandum from the Office of Management and Budget and Office of Science and Technology Policy outlined two generally accepted principles for communicating risk information to the public that may help maximize public understanding.[36] The 2007 memorandum is instructive in this case because implementation of Plan 2014 involves ongoing

[35]GAO-06-535, p. 24.

[36]Generally accepted principles for assessing, managing, and communicating risk information are reflected in a 2007 memorandum. Office of Management and Budget and Office of Science and Technology Policy, *Updated Principles for Risk Analysis*. The 2007 memorandum reinforced and added guidance to a set of principles that the Office of Management and Budget and the Office of Science and Technology Policy developed in 1995 based on newer information from the scientific community, including the National Academy of Sciences; Congress; and the executive branch. These principles were developed to help policymakers with assessing, managing, and communicating policies to address broad variety of environmental, health, and safety risks. The memorandum focuses on those risk analyses related to environmental, health, and safety risks, but the memorandum recognizes that the principles it presents may be relevant to other fields.

communication of risk-related decisions made based on an analysis of trade-offs using scientific information that may change over time with scientific advances. One of the generally accepted principles specifies that risk communication should involve the open, two-way exchange of information between professionals, including both policymakers and "experts" in relevant disciplines, and the public. The other principle states that agencies should communicate accurately and objectively about risk management by explaining significant assumptions and models used in assessments or decisions, describing any uncertainties and providing timely, public access to relevant supporting documents, among other things. According to the 2007 memorandum on these principles, a high degree of transparency with respect to data, assumptions, and methods will increase the credibility of the risk analysis used to inform decisions and will allow interested individuals, internal and external to the agency, to understand better the technical basis of the corresponding analysis and decisions. Similarly, experts that we spoke with in our previous work said that although stakeholder consensus on risk-informed decisions is often not possible, by providing transparent, understandable information about the science and rationale behind decisions, the process may be accepted as transparent and legitimate.[37]

We found that some strategies in the Board's communication plan and its annual action lists relate to communication with stakeholders on risk-related information, but the plan does not fully integrate aspects of generally accepted principles for communicating risk information. The Board's 2017 communication plan includes a strategic communication goal for two-way consultation in which the Board seeks out, considers, and responds to the views and concerns of stakeholders. It also includes a goal for the Board to communicate accurately and timely about its actions and the reasons for these actions. However, although the communication plan identifies Board staff, Board members, and communications committee representatives to participate in various consultation and outreach communications, neither the 2017 plan nor the annual actions lists include details on relevant experts who should be involved in various communication strategies. In addition, neither the communication plan nor the annual actions lists we reviewed identify the steps the Board would take for evaluating the content of information that is communicated to stakeholders, such as significant assumptions, data,

[37]GAO-19-339, pp. 19-20.

models, or uncertainties, to help ensure that decisions are communicated accurately and objectively.

Although the Board has made efforts to improve its communication with stakeholders since its implementation of Plan 2014 beginning in 2017, the stakeholders we interviewed continued to have concerns about IJC's and the Board's communication with stakeholders, as described above. Overall, we found that the Board's strategic communication plan could benefit from additional detail to guide implementation of communication efforts. For example, adding defined target audiences, mechanisms for monitoring and informing adjustments to strategies, identification of experts for involvement in outreach as appropriate, and steps for evaluating content of information shared with stakeholders could help improve planning and communication efforts. IJC officials emphasized that their annual review of the communication plan and development of a specific list of actions for each year help to meet its communication goals. However, IJC officials acknowledged that the Board did not include these areas in its most recent update of its communication plan in 2017.

Experts we spoke with in our previous work noted that obtaining stakeholders' acceptance of the process and decisions may require extensive outreach over a long period of time and that acceptance among all stakeholders may not be feasible.[38] Experts further noted that it is often not possible that stakeholders will all concur on decisions. Nonetheless, by taking steps to improve communications with stakeholders, such as providing transparent, understandable information about the science and rationale behind decisions, the process may be accepted as transparent and legitimate. By updating its communication plan to incorporate best practices of a public relations strategy, in particular defining target audiences and monitoring progress to inform adjustments to the communication plan as needed, and incorporating generally accepted principles for communicating about risk into that updated plan, IJC could help maximize understanding among stakeholders about Plan 2014 and IJC's and the Board's decision-making, to help ensure improved stakeholder communication overall.

[38]GAO-19-339.

Stakeholders Expressed Concerns about Plan 2014, and IJC Has Taken Initial Steps to Develop a Process for Assessing and Adjusting the Plan

Stakeholders we interviewed expressed concerns about rules and criteria in Plan 2014 and how IJC's Board has implemented the Plan,[39] and IJC is undertaking an adaptive management process that will assess and adjust the Plan if warranted. To determine if IJC could make improvements to Plan 2014, GLAM has made short-term plans (1–5 years) for implementing the adaptive management process and has taken initial actions to carry out these plans. However, in some cases, GLAM has not been able to obtain the data it needs to conduct an effective evaluation of the Plan. IJC approved a long-term (12 years) adaptive management strategy in March 2020, but the Strategy does not fully incorporate the essential elements or characteristics of an adaptive management plan that we identified in previous work.

Stakeholders Expressed Concerns about Plan 2014 and How IJC's Board Has Implemented the Plan

The majority of the stakeholders we interviewed (nine out of 14) expressed concerns about the rules and criteria of Plan 2014, including the following:

- *Not proactive.* Seven stakeholders said that the Plan does not allow IJC to act proactively by, for example, taking action in anticipation of future conditions. One of these stakeholders, for example, said that the Plan does not allow the Board to plan for the amount of water currently in Lake Superior that will eventually effect water levels on Lake Ontario.
- *Models and data.* Five stakeholders had concerns about the models or data used to help determine the rules and criteria in Plan 2014 by identifying the outcomes of various water release scenarios. For example, one stakeholder said that the data used in the models to calculate costs to shoreline residents are out of date and underestimate the current value of housing.
- *Water system.* Four stakeholders told us that Plan 2014 does not account for the entire water system. For instance, two stakeholders told us that the Plan does not take the Ottawa River into consideration.
- *Trigger levels.* Three stakeholders expressed concerns about the trigger levels set in Plan 2014. For example, one of these

[39]We interviewed our 14 stakeholder groups regarding their concerns about Plan 2014 and its implementation in order to provide illustrative examples of a variety of stakeholder perspectives on the Plan. In IJC's view, in some cases these stakeholder statements did not reflect the content of Plan 2014 or the Board's implementation of the Plan. We did not verify the accuracy of either stakeholder or IJC statements about the concerns expressed by stakeholders because that is outside the scope of our report.

New York State and Plan 2014

The New York State Department of Environmental Conservation provided technical advice to the International Joint Commission (IJC) on developing the Lake Ontario-St. Lawrence River Plan 2014 (Plan 2014). According to Department officials, although IJC's process for involving stakeholders in developing Plan 2014 was positive, IJC did not adequately listen to and resolve concerns from the state, the public, or New York municipalities once the Plan was presented to the public.

Department officials told us that Plan 2014 did not adequately balance environmental restoration goals with the needs of property owners. Moreover, the officials said that Plan 2014 also did not include federal resources to support implementation and adaptation to any new regulation plan, such as resources for erosion mitigation projects. According to IJC, New York State officials did not voice these concerns during the development of Plan 2014 or during the official comment process once Plan 2014 was released to the public.

In October 2019, New York State filed a lawsuit in state court against IJC seeking compensation for the costs the state had already incurred and would incur because of, among other things, IJC's alleged negligence in failing to adhere to its own mandated protocol for managing Lake Ontario water levels during the flooding events in 2017 and 2019. The state subsequently amended its lawsuit. IJC disputes the allegations in the lawsuit and told us that it remains committed to a full and fair implementation of the Boundary Waters Treaty of 1909. IJC removed the case to federal court but, as of July 6, 2020, the state is seeking to have the case returned to state court.

Source: GAO. | GAO-20-529

stakeholders told us that the high water trigger points for the Board's discretionary authority should be lowered so that the Board can take control over water releases sooner.

- *Discretionary authority.* Three stakeholders said that the Plan gives the Board too much discretionary authority.

In addition to concerns about rules and criteria in Plan 2014, 10 stakeholders expressed concerns about how the Board has implemented the Plan. Six of the 10 stakeholders had concerns about the water release decisions the Board made when operating with discretionary authority. One of these stakeholders, for instance, said that the Board did not follow certain criterion in the Supplementary Order of Approval. In addition, five of the 10 stakeholders told us that some user interests were experiencing more negative impacts from water releases than others. For example, three of the five stakeholders said that coastal property owners were disproportionately affected by water release decisions during high water, and another said that hydropower and navigation users benefited over other user interests during these periods.

Most of the stakeholders that we interviewed (eight out of 14) told us that the use of Plan 2014 increased the flooding in 2017 or 2019. One of these stakeholders told us that the region had experienced high levels of precipitation in the past and did not have the same level of flooding before implementation of the Plan, and another said that more than half of the flooding in 2019 was due to Plan 2014.

Some of the concerns expressed by stakeholders reflect differences in understanding between IJC and stakeholders about Plan 2014. These differences may indicate that IJC's efforts to communicate have not always been effective. For example, as noted above, one stakeholder expressed concerns that Plan 2014 does not allow the Board to take into account the levels of Lake Superior when making water release decisions. However, according to IJC, the Board does consider inflow from upstream in the Plan calculations. Five stakeholders that we interviewed told us that they believe IJC was not balancing the negative impacts of water releases on the user interests. However, according to IJC officials, the Board is not required to balance impacts on users and is required by the 1909 treaty to give precedence to water uses for domestic and sanitary purposes, followed by uses for navigation, and then uses for power and irrigation. In addition, while the majority of the stakeholders that we interviewed believe that Plan 2014 played a role in the flooding in 2017 or 2019, according to the Board and a GLAM study, Plan 2014 did

not cause or meaningfully exacerbate the flooding and associated damages that occurred in 2017.

In addition, not all the stakeholders we interviewed shared the concerns outlined above. For example, one stakeholder told us that the entity appreciated the highly technical, data-supported process behind the Board's implementation decisions and told us that the limits and triggers in Plan 2014 permit the Board to act proactively. In addition, one stakeholder said that 2 years was too short a period of time to pass judgment on the Plan.

IJC's GLAM Made Plans for an Adaptive Management Process in the Short Term and Has Taken Actions to Implement These Plans, Although It Has Faced Challenges in Obtaining Some Data

Since the Board began implementing Plan 2014, GLAM has developed short-term plans for an adaptive management process, such as annual work plans and the 2017 3-to-5-year adaptive management strategy, and has taken actions to implement these plans. The adaptive management process is designed to evaluate Plan 2014 and Supplementary Order of Approval, including areas of stakeholder concern about rules and criteria in the Plan and Board water release decisions described above. In some cases, GLAM has faced challenges in obtaining from other sources the data it needs to monitor and evaluate the plan. Most recently, IJC has undertaken an expedited review of the impacts of the Board's water release decisions during periods of high water.

Since 2017, GLAM has developed short-term plans for carrying out the adaptive management process. GLAM incorporated an initial 3-to-5-year midterm strategy for adaptive management into its 2017 Triennial Progress Report.[40] According to that strategy, GLAM's goal was to move the adaptive management process from its start-up, conceptual phase to its implementation by organizing GLAM's work into a comprehensive, well-defined, and structured adaptive management process. The document outlined initial plans to review water levels and flows and the effects these had on the various user interests; investigate specific aspects of regulation plans and improve performance indicators, models, tools, and processes; and use the gathered information to make recommendations to the Board on whether changes to regulation plans are warranted. The strategy provided a general framework for adaptive management and stated that priorities for action would be set annually

[40]International Joint Commission, Great Lakes-St. Lawrence River Adaptive Management Committee, *Triennial Progress Report* (Apr. 12, 2017); also see, for example, Great Lakes Adaptive Management Committee, *Annual Work Plan Fiscal Year 2020* (Jan. 28, 2020).

Marinas

Lake Ontario and the St. Lawrence River support a large recreational boating and sport fishing industry, according to the International Joint Commission (IJC). In 2017, during extreme high water levels, IJC's Great Lakes-St. Lawrence River Adaptive Management Committee (GLAM) found that recreational boating opportunities were reduced across the waterways. Many marinas experienced negative impacts such as the inundation of nonfloating docks and damage to electrical hookups, according to IJC. Similar levels of flooding were experienced again in 2019.

Two marina owners that we spoke with reported property damage and decreased revenue because of customers' inability to access or dock their boats. The owner of Arney's Marina in Sodus Point, New York, estimated $90,000 in damages from flooding in 2017 and $25,000 to $50,000 in damages and hundreds of thousands in lost revenue in 2019. The owner of Sandy Creek Marina in Sandy Creek, New York, told us that he experienced foreclosure proceedings because of damages from flooding in 2017, including a ruined electrical system and saturated docks, and eventually lost the business.

Following the flooding in 2017, GLAM surveyed marina and yacht club owners to better understand the impacts of the high water levels on recreational boating. According to GLAM, the information from the surveys will be used as part of its long-term efforts to better understand high water impacts and improve existing models used to predict such impacts. GLAM conducted a similar survey of shoreline business owners after flooding in 2019.

Source: GAO. | GAO-20-529

depending on resources available within each fiscal year. Each year, GLAM has also issued work plans that outline its proposed products and tasks for implementing adaptive management activities for the fiscal year. The plans describe each task, who will be responsible for the work, proposed products each task will produce, expected available resources, and an estimated delivery date.

GLAM has taken steps to implement these plans, including monitoring the impacts of Plan 2014 and improving its models and performance indicators for evaluating the effects of various water release scenarios, according to GLAM documents and officials. For example, in 2017 GLAM established three working groups to focus on (1) gaining a better understanding of the dynamics of the hydroclimate system (the influence of the climate on water), (2) ensuring that the effects of outflow decisions on user interests are measurable and assessable, and (3) assessing and updating models and tools used to evaluate Plan performance. According to GLAM documents and a committee official, GLAM has collaborated with a variety of partners, including scientists who collect and assess data, and held meetings with experts on coasts, wetlands, and remote sensing, for example.[41] The committee has an ongoing effort to monitor the extent and health of wetlands in order to validate models and update performance indicators, according to GLAM officials. GLAM also evaluated water levels and flows during and after the 2017 flooding and assessed the impacts of high water levels on user interests, according to

[41]For example, GLAM partnered with the Canadian Wildlife Service to monitor coastal wetland habitat and with Clarkson University to assess ice conditions on Lake St. Lawrence.

a report on GLAM's findings.[42] GLAM also analyzed how water levels and flows in 2017 would have been affected under a variety of different regulation scenarios such as modified rules and triggers, no regulation plan, or alternative deviation decisions. GLAM is undertaking targeted projects to improve existing impact assessment tools such as a detailed review of existing performance indicators based on what was learned from the record high water levels in 2017 and 2019, according to GLAM's 2020 annual work plan. GLAM reports on its progress in implementing the adaptive management process in semiannual and triennial reports.[43]

According to GLAM's analysis of the 2017 flooding, Plan 2014 did not cause or meaningfully exacerbate the flooding and associated damages that occurred in 2017.[44] GLAM found that the outflows released in 2017 under Plan 2014 were similar to those that would have been released had the Board been operating under the old regulation plan. GLAM reported that Plan 2014 helped to reduce, but could not eliminate coastal damages and flooding while also attempting to balance and minimize impacts on other interests. In addition, GLAM also found that modifications to Plan 2014, such as to limits or triggers, would not have significantly reduced high water levels and changes in extreme water supply years, such as 2017. In addition, GLAM reported that its analysis showed that changes that would reduce high water levels and related damages to one interest or at one location tend to result in offsetting increases in levels and damages elsewhere or to other interests.

[42]International Joint Commission, Great Lakes-St. Lawrence River Adaptive Management Committee, *Summary of 2017 Great Lakes Basin Conditions and Water Level Impacts to Support Ongoing Regulation Plan Evaluation* (Nov. 13, 2018).

[43]See, for example, International Joint Commission, Great Lakes-St. Lawrence River Adaptive Management Committee, *Triennial Progress Report* (Apr. 12, 2017), and *5th Semi-Annual Progress Report to the Great Lakes Boards and the International Joint Commission* (Oct. 9, 2018).

[44]According to GLAM, the report is not intended to represent a full economic or environmental analysis of high water impacts in 2017. The evaluation is based in part on simulations using the models developed by the Study Board. GLAM acknowledges that there are limitations and sources of uncertainty in its evaluation. For example, in some cases GLAM was unable to obtain the data it needed to fully assess effects of flooding, and the simulations required simplifications and assumptions regarding short-term decision making and actual conditions. However, according to GLAM, the evaluation provides an immediate retrospective review of how Plan 2014 performed in 2017 as a first step for better understanding the hydrological system and regulation plan operation as well as highlighting areas for further investigation of plan impacts and model improvements.

For a variety of reasons, in some cases GLAM officials had difficulty obtaining information that it needs to evaluate Plan 2014 effectively. For example, when assessing the effects of the 2017 flooding, GLAM officials were unable to obtain information on the coastal impacts of flooding from the Federal Emergency Management Agency because of a miscommunication between the two entities, according to officials at both organizations. In addition, GLAM officials also said that they were unable to obtain information regarding the impacts of flooding on commercial navigation from industry representatives because shipping companies were unwilling to share proprietary information.[45] Hydropower entities and the New York State Department of Environmental Conservation did not provide requested information because they considered the data proprietary or privileged for security reasons, according to GLAM. When conducting its analysis of the flooding in 2017, GLAM found that governments at various levels did not collect standard survey information following damaging events, which GLAM needs to validate its models. GLAM told us that for some interest areas this inability to obtain information makes it more difficult to complete its review and evaluation of Plan 2014 and in some cases makes it nearly impossible. For example, without good data on the effects of high water on shoreline protection structures, GLAM cannot use real-world conditions to verify the models it uses to understand the effects of various plan modifications.

During prior work, we have found that entities can strengthen their commitment to working collaboratively by articulating their agreements in formal documents, such as a memorandum of understanding.[46] GLAM officials told us that it is essential that potential partners understand GLAM's goals and that GLAM emphasize the mutual benefits of information sharing and professional collaboration. In addition, GLAM officials said that it needs to provide assurances to agencies and groups

[45]Since GLAM's review of the 2017 flooding, IJC and the Saint Lawrence Seaway Corporations signed a formal memorandum of understanding that the corporations would contract for an analysis of the economic, environmental, and societal impacts of disruptions to commercial navigation in the St. Lawrence Seaway.

[46]Although these key collaboration practices refer to federal agency collaboration, these practices can be instructive for nonfederal entities as well. GAO, *Managing for Results: Key Considerations for Implementing Interagency Collaborative Mechanisms*, GAO-12-1022 (Washington, D.C.: Sept. 27, 2012). See also GAO, *Natural Resource Management: Opportunities Exist to Enhance Federal Participation in Collaborative Efforts to Reduce Conflicts and Improve Natural Resource Conditions*, GAO-08-262 (Washington, D.C.: Feb. 12, 2008), and *Individual Retirement Accounts: Formalizing Labor's and IRS's Collaborative Efforts Could Strengthen Oversight of Prohibited Transactions*, GAO-19-495 (Washington, D.C.: June 7, 2019).

that have resisted sharing information that any sensitive information would not be leaked or compromised. One expert we spoke with when conducting our previous work told us that the action of two entities articulating a common outcome and roles and responsibilities into a written document was a powerful tool in collaboration. By developing memorandums of understanding with partners on information sharing, GLAM would have an opportunity to clarify its goals and expectations and offer assurances to partners, better ensuring that it can obtain the information it needs to assess Plan 2014 effectively.

In February 2020, IJC requested that GLAM undertake an 18-to-24-month expedited review of Plan 2014. Through the review, GLAM will seek to determine if any changes to water releases under the Board's discretionary authority could reduce risks from high water levels, according to IJC and GLAM officials. The results of the analysis will help the Board with future decisions, particularly related to the balancing of upstream and downstream flooding and the balancing of shoreline effects with those on commercial navigation, according to GLAM. Moreover, one of the most important benefits of the expedited review may be better documentation and communication of the factors the Board considers in making decisions and the impacts of those decisions, according to a GLAM official. The Senate Appropriations Committee directed $1.5 million of IJC's fiscal year 2020 appropriation to GLAM to support this evaluation, matching $1.5 million contributed by Canada.[47]

GLAM has taken actions to implement its plans for the review. For example, GLAM engaged the U.S. Army Corps of Engineers' Institute for Water Resources to provide an independent economic analysis of the effects of selected water regulation strategies on commercial navigation. In addition, IJC is recruiting members for a public advisory group that will assist GLAM with the review and has hired a contractor to support the stakeholder engagement process.

[47]S. Rep. No. 116-126 at 40 (2019).

IJC approved GLAM's Long-Term Adaptive Management Strategy, but It Does Not Fully Incorporate the Key Elements or Essential Characteristics of an Adaptive Management Process

In March 2020, IJC approved GLAM's Great Lakes-St. Lawrence River Adaptive Management Short-term and Long-term Strategy For Evaluating and Improving the Rules for Managing Releases from Lakes Ontario and Superior (Strategy).[48] The Strategy describes GLAM's plans for assessing Plan 2014 and the Board's water releases under its deviation authority through 2031.

- Phase 1 includes the 18-to-24-month review described above.
- In phase 2, to be completed over the next 3 to 5 years, GLAM plans to expand its review to the assumptions, rules, limits, criteria, and deviations of Plan 2014 under a variety of possible high and low water level extremes and how any potential changes to the water release rules would affect user interests.
- As part of its ongoing review, to be completed by the end of December 2031 as required by the Supplementary Order of Approval, GLAM plans to analyze a full range of conditions, changes, and potential outcomes. According to GLAM, less extreme conditions are more common than those with high or low water and require a full assessment of economic and environmental plan performance over the longer term.

The Strategy identifies six components of analysis that GLAM will focus on: (1) understanding and assessing future hydrologic conditions; (2) calculating water levels and flows; (3) assessing impacts and improving predictive models; (4) formulating and evaluating potential Plan rules; (5) supporting decision-making; and (6) additional cross-cutting items, such as project management and support. The Strategy includes a list of tasks related to each of the six components, such as establishing scientific and stakeholder advisory groups, developing and updating performance indicators and models, and working with the Board to refine decision criteria. The Strategy notes that it is meant to be an evolving document that will be updated as further details are clarified and prioritized.

In our review of GLAM's Strategy, we found that GLAM did not fully incorporate two of the eight key elements and the two essential

[48]International Joint Commission, Great Lakes-St. Lawrence River Adaptive Management Committee, *Short-Term and Long-Term Strategy For Evaluating and Improving the Rules for Managing Releases from Lakes Ontario and Superior* (Mar. 6, 2020). The Strategy includes plans for applying an adaptive management process to both Plan 2014 and the regulation plan for Lake Superior outflows. We focused our analysis on aspects of the Strategy that would apply to Plan 2014.

characteristics of an adaptive management process that we identified in our past work.[49] Prior to GLAM's development of the Strategy, IJC and the Study Board completed three of the eight key elements and planning for these elements is not included in the Strategy—(1) assess problem; (2) design plan to include specific goals, objectives, and measures; and (3) identify and evaluate uncertainties.[50] The Board began to implement the fourth element—(4) implement management actions—on January 7, 2017, when it began releasing water through the dam based on the rules in Plan 2014 and the Supplementary Order of Approval. Of the remaining elements and characteristics, GLAM incorporated two of the elements: (5) monitor and evaluate effects of actions and (6) incorporate information into decision-making tools. However, it did not fully incorporate plans for the remaining two key elements in the Strategy—(7) adjust management actions and (8) engage stakeholders—or the two essential characteristics—(1) linkages among the key elements and (2) collaborating with partners.[51] We have identified other IJC and GLAM documents that include aspects of planning for these key elements, but these documents or plans are not discussed in the Strategy.

GLAM incorporated plans for two key elements in the Strategy:

- *Monitoring and evaluating the effects of actions in the Strategy*. In this case, the actions are the water releases made based on the rules in Plan 2014, the Supplementary Order of Approval, and Directives to the Board. In an appendix to the Strategy, GLAM listed specific tasks related to monitoring and evaluating the effects of these releases. For example, GLAM plans to monitor the ecosystem performance indicators for fish, birds, and muskrats; conduct field surveys to update baseline information on property values and elevations; assess damage to tourism and recreational boating in 2017 and 2019;

[49]GAO-13-797 and GAO-08-291.

[50]IJC evaluated problems with the performance of regulation plans for water levels and outflows from the Moses-Saunders dam. Specifically, in 1993, IJC reported on its assessment of the impacts of regulation measures on a variety of user interests in the region and, between 2000 and 2005, the Study Board further evaluated the impacts of the existing regulations on users and interests of the Lake Ontario and the St. Lawrence River system. The Study Board also developed goals, objectives, and measures as part of its work to develop a new regulation plan, such as identifying performance indicators that it used to model potential impacts of different plan options on each of the user interests. In addition, the Study Board identified and assessed uncertainties as part of its analysis, reporting on these uncertainties in its final report.

[51]GAO-08-291. Our past work identified "engage stakeholders" as both an essential characteristic and key element. We discuss it here as one of the key elements.

and evaluate the cost to commercial navigation of delays in opening the St. Lawrence Seaway.

- *Incorporating information into decision-making tools and processes.* The Strategy describes plans for developing and updating performance indicators, models, and criteria. For example, GLAM plans to improve models that relate observed water levels and flows to socioeconomic and environmental impacts by updating performance indicators for the six user interests. GLAM listed planned tasks for developing new performance indicators for critical hydropower thresholds and recreational boating, updating and testing a model with new performance indicator algorithms, exploring the potential impacts of lowering trigger levels, and testing plan evaluation tools.

GLAM did not fully incorporate the remaining two key elements and the two essential characteristics:

- *Adjusting management actions.* The Strategy does not explain how the Board or IJC will determine whether a change in the rules and criteria for water releases is necessary or outline the process IJC will use to decide to recommend changes to Plan 2014 or the Supplementary Order of Approval. For example, the Strategy states that one goal of the adaptive management process is to improve the rules governing releases from Lake Ontario. However, it does not identify how IJC or the Board will determine what is an improvement of the rules or outline plans to develop a decision framework to do so. Moreover, the Strategy does not describe how the Plan or Order will be adjusted, if IJC determines that changes are warranted. According to IJC, it will use its standard procedures of reviews, consultations, and hearings before making any recommendations to the governments for adjustments to Plan 2014. However, the Strategy does not describe any of these procedures for changing the Plan, outline plans to further develop or articulate such procedures, or point to other documents that do so. According to committee officials, GLAM is not a decision-making body and does not have the authority to make changes to the rules and criteria. However, plans to adjust management actions would close the loop of the cyclical adaptive management process.
- *Engage stakeholders.* The Strategy lists tasks related to stakeholder involvement, such as establishing a stakeholder advisory group and developing communication products. However, the document does not describe a strategy for engaging stakeholders throughout the adaptive management process or a plan on how GLAM will develop

such a strategy. According to IJC, in 2013, stakeholders raised concerns during hearings on Plan 2014 that adaptive management could lead to changes in the regulation plan without stakeholder review. IJC and GLAM documents have stressed the importance of stakeholder engagement as part of the adaptive management process. GLAM has a separate communication plan that includes objectives, principles, procedures, key messages, and tactics for engaging with stakeholders around the adaptive management process. However, GLAM does not refer to this plan in the Strategy.

- *Linkages among the key elements.* The Strategy does not link the key elements. For example, according to our prior work on adaptive management in 2008, all components of the adaptive management process—from monitoring to adjusting actions—flow from clearly defined, measurable objectives.[52] However, GLAM does not link the six components or individual tasks listed in the Strategy to any specific objectives of Plan 2014. Without linking the Plan's goals and objectives to specific performance indicators, it is unclear how GLAM will be able to assess when changes to rules or criteria would be warranted. In addition, the Strategy does not link monitoring and evaluation tasks to any specific uncertainties the tasks are meant to reduce. GLAM does not refer to uncertainties identified in other documents, such as the final report of the Study Board or GLAM report on 2017 flooding, nor does it identify or prioritize uncertainties that the monitoring and evaluating tasks will seek to address. According to best practices described in guidance from the U.S. Army Corps of Engineers on adaptive management, an adaptive management plan should identify and prioritize uncertainties in order to focus planning and monitoring efforts on addressing the most important uncertainties.[53]
- *Collaborate with partners.* According to GLAM, the committee relies on direct and in-kind contributions from agencies that make up its current membership, along with the support of external partners, including other agencies, nongovernmental organizations, broader research communities, and stakeholders that help contribute to the adaptive management process. The Strategy lists plans to establish a scientific advisory group to support peer review and to develop standard operating procedures for engaging the scientific community in that process. However, the Strategy does not include plans for

[52]GAO-08-291.

[53]RECOVER, *Comprehensive Everglades Restoration Plan Adaptive Management Integration Guide* (March 2011).

identifying or collaborating with partners in other aspects of the adaptive management process, such as by gathering and analyzing data, although GLAM relies on partners to do so. The Strategy also does not mention three existing working groups established in 2017 to carry out the adaptive management process. In contrast, in its 2013 International Great Lakes-St Lawrence River Adaptive Management Plan, IJC outlines more detailed plans for collaborating with a variety of partners in order to carry out specific aspects of the adaptive management process and includes information on roles and responsibilities of an advisory group and networks of partners.[54] The Strategy does not refer to this document.

Aspects of the key elements and essential characteristics of an adaptive management process—such as objectives, plans for stakeholder engagement, and potential collaboration partners—are outlined in other GLAM and IJC documents, as noted above. For example, GLAM identified uncertainties and performance indicators in its report on the 2017 flooding, and GLAM's midterm strategy and IJC's summary of Plan 2014 include information on the process for adjusting the Plan. According to a GLAM official, the current Strategy builds on these previous documents and was not meant to be a comprehensive adaptive management plan. However, GLAM mentions the midterm strategy only in passing in the Strategy and does not refer to any of these other documents.

GLAM had planned to release an updated or more detailed long-term adaptive management plan but has not had the opportunity to do so. According to GLAM officials, the committee was planning to release a long-term adaptive management framework in 2017, but flooding that year prompted GLAM to pause its work to focus on gathering information about the flooding. Instead, according to GLAM and IJC officials, GLAM integrated an initial adaptive management framework—the midterm strategy—into the first triennial report released in 2017. Following the flooding events in 2017, GLAM planned to develop an updated and more long-term adaptive management strategy. However, following IJC's request for an expedited review, the committee was busy responding to

[54]International Joint Commission, International Great Lakes-St. Lawrence River Adaptive Management Task Team, *Building Collaboration Across the Great Lakes-St. Lawrence River System: An Adaptive Management Plan* (May 30, 2013). The International Great Lakes-St. Lawrence River Adaptive Management Task Team released an adaptive management plan in May 2013 in response to an IJC directive to develop a plan to address future extreme water levels in the Great Lakes-St. Lawrence River system.

the request, and the Board requested that GLAM create a brief strategy document instead, according to GLAM and IJC officials.

Without planning for all the key elements and essential characteristics of an adaptive management process, IJC may not be able to carry out the adaptive management process effectively. Moreover, IJC's adaptive management strategy for Plan 2014, as developed by GLAM, is fragmented across multiple documents and is not transparent to stakeholders and Congress. According to best practices in Forest Service guidance on adaptive management, it is important for an adaptive management process to have clear documentation describing details of the process, and lack of explicit plans can diminish the potential benefits of adaptive management.[55] In addition, GLAM's midterm strategy stressed that it is important that the information and processes of adaptive management be accessible, transparent, and trusted. By fully incorporating the key elements and essential characteristics of an adaptive management process into a comprehensive Strategy or explicitly tying key elements and characteristics outlined in existing materials to the plans outlined in the Strategy, IJC can better ensure its ability to assess Plan 2014 transparently and effectively and adjust its rules and criteria to better achieve plan objectives.

Conclusions

The Lake Ontario-St. Lawrence River waterway supports multiple users in the United States and Canada that live, visit, or conduct business in the region and that are affected by lake and water levels. While there is no perfect regulatory plan, it is critical that IJC have robust plans in place for communicating with stakeholders about Plan 2014 and for assessing and making changes to the Plan, if warranted. The IJC commissioners and the Board have put mechanisms in place to facilitate and improve stakeholder communication, but stakeholders continue to have concerns about IJC's communication. In our previous work, experts told us that it is not always feasible to obtain stakeholders' concurrence on all decisions but that by providing transparent, understandable information about the science and rationale behind decisions, the process may be accepted as transparent and legitimate. By updating its communication plan and incorporating best practices of a public relations strategy—in particular, defining target audiences and monitoring progress to inform adjustments to strategies—and generally accepted principles for communicating about

[55]G. H. Stankey, R. N. Clark, and B. T. Bormann, *Adaptive Management of Natural Resources: Theory, Concepts, and Management Institutions*, Gen. Tech. Rep. PNW-GTR-654 (Portland, Ore.: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, 2005).

risk into that updated plan, IJC could maximize understanding among stakeholders about Plan 2014 and IJC's and the Board's decision-making. Without additional steps to help ensure effective communication, IJC and the Board may continue to face stakeholder criticisms that they are not keeping stakeholders informed or responding to their concerns.

In addition, throughout the development of Plan 2014 and its implementation, IJC has stressed the importance of using an adaptive management process to assess and evaluate new information continually in order to improve the Plan iteratively. GLAM has made plans outlining how it will carry out this process in the short term and has undertaken multiple projects and partnerships to monitor and evaluate the effects of Plan 2014. However, GLAM has not always been able to obtain the information it needs from other sources to support the monitoring and evaluation activities integral to the adaptive management process effectively. By using formal agreements, such as a memorandum of understanding, GLAM could better ensure that it can obtain the information it needs. Moreover, GLAM's Strategy does not fully incorporate the key elements and essential characteristics of an adaptive management process, which may hinder its ability to both improve the Plan as needed and to promote transparency with stakeholders and Congress. By fully incorporating these elements and characteristics into a comprehensive plan, IJC could better ensure that it has the framework in place to assess and improve Plan 2014 transparently and effectively.

Recommendations for Executive Action

We are making the following three recommendations:

The U.S. commissioners of the International Joint Commission should work with the Canadian commissioners to update the Lake Ontario-St. Lawrence River Board communications plan and ensure that the plan incorporates best practices for public relations efforts, in particular defining target audiences and developing mechanisms to monitor and inform adjustments to strategies, and generally accepted principles for communicating risk-related information. (Recommendation 1)

The U.S. commissioners of the International Joint Commission should work with the Canadian commissioners to develop and enter into written agreements with entities that the Great Lakes-St. Lawrence River Adaptive Management Committee identifies as having information or resources that the committee needs to effectively monitor and evaluate the impacts of Plan 2014. (Recommendation 2)

The U.S. commissioners of the International Joint Commission should work with the Canadian commissioners to ensure that IJC fully incorporates the key elements and essential characteristics of the adaptive management process into a comprehensive adaptive management strategic plan for Plan 2014. (Recommendation 3)

Agency Comments

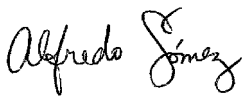
We provided a draft of this report to IJC for its review and comment. In its comments (see appendix III) and subsequent communications, IJC agreed with our recommendations and described steps that it is taking to respond to them. Specifically, IJC stated that it intends to develop an updated communications plan that incorporates best practices for public relations efforts by December 31, 2020. IJC is also compiling a list of entities with which it shares information to explore formal data and information sharing arrangements with them. In addition, IJC plans to produce a comprehensive adaptive management strategic plan that fully incorporates the key elements and essential characteristics of the adaptive management process by December 31, 2020.

We also provided a draft of this report to the Department of the Interior, Federal Emergency Management Agency, Department of Transportation, Department of State, and U.S. Army Corps of Engineers. We did not receive formal comments from any of these agencies. The U.S. Army Corps of Engineers stated that they concurred.

IJC, the Department of Transportation, and the Department of the Interior also provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the U.S. section of IJC and other interested parties. This report is available at no charge on the GAO website at https://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or gomezj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.



J. Alfredo Gómez
Director, Natural Resources and Environment

Appendix I: Objectives, Scope, and Methodology

This report examines (1) the extent to which the International Joint Commission's (IJC) process to develop and select the Lake Ontario-St. Lawrence River Plan 2014 (Plan 2014) was consistent with essential elements of risk-informed decision-making; (2) actions IJC has taken to communicate with stakeholders about its implementation of Plan 2014 and stakeholder concerns regarding IJC's communication, if any; and (3) stakeholder concerns about Plan 2014 and the extent to which IJC has developed a process to assess and adjust Plan 2014, if needed.

To examine the extent to which IJC's process to develop and select Plan 2014 was consistent with essential elements of risk-informed decision-making, we reviewed Plan 2014, the Supplementary Order of Approval, and the 2016 directives to the International Lake Ontario-St. Lawrence River Board (Board) as well as documentation from the 18-year development process, including IJC reports, such as *Plan of Study for Criteria Review in the Orders of Approval for Regulation of Lake Ontario-St. Lawrence River Levels and Flows and Options for Managing Lake Ontario and St. Lawrence River Water Levels and Flows*.[1] We also interviewed a former commissioner of the U.S. section of IJC and the current commissioners, who were confirmed in May 2019; other IJC officials; officials from federal and state agencies; and academic experts recommended by others we interviewed who contributed to developing the Plan. Through these document reviews and interviews, we obtained information and perspectives about the process IJC used to develop Plan 2014 through to its implementation, which occurred from 1999 to 2017.

We then compared this information on IJC's process with GAO's risk-informed decision-making framework, which identifies essential elements for decision-making when considering trade-offs among risk, cost, and other factors in the face of uncertainty and diverse stakeholder

[1]International Joint Commission, *Regulation Plan 2014 for the Lake Ontario and the St. Lawrence River: Compendium Document* (December 2016); International Joint Commission, *Plan of Study for Criteria Review in the Orders of Approval for Regulation of Lake Ontario-St. Lawrence River Levels and Flows*, prepared for the International Joint Commission by the St. Lawrence River-Lake Ontario Plan of Study Team (September 1999); and International Lake Ontario-St. Lawrence River Study Board, *Options for Managing Lake Ontario and St. Lawrence River Water Levels and Flows: Final Report to the International Joint Commission* (March 2006).

perspectives.[2] We found the framework useful for evaluating IJC's process for developing and selecting Plan 2014 to manage water releases. Consistent with the risk-informed decision-making framework, IJC's process to develop and select Plan 2014 to regulate outflows from Lake Ontario inherently involved examining trade-offs between potential risks to the different stakeholders affected by water release decisions. The essential elements of the framework consist of the steps across four phases. We focused our review on the design, analysis, and decision phases of the framework because these phases correspond to IJC's development and selection of Plan 2014. We assessed whether IJC took actions consistent with each step in each relevant phase. However, because it is outside the scope of this review, we did not evaluate the quality of IJC's actions regarding each element. For example, we assessed whether IJC identified objectives and performance measures as part of developing and selecting Plan 2014, but we did not assess whether these objectives or measures were appropriate or complete.

To identify actions IJC has taken to communicate with stakeholders about implementing Plan 2014, we reviewed relevant IJC documents, including the Board's Strategic Communication Plan, and IJC communication tools, such as the Board's website and educational materials. We also interviewed IJC officials, including a former chairwoman of the U.S. section of IJC and the current chairwoman and two commissioners, who were confirmed in May 2019, about IJC's actions to communicate with stakeholders. In addition, we reviewed IJC's communication plan for alignment with best practices for a typical public relations strategy that we identified in our prior work and with generally accepted principles for communicating risk information outlined in a 2007 memorandum from the

[2]GAO, *Environmental Liabilities: DOE Would Benefit from Incorporating Risk-Informed Decision-Making into Its Cleanup Policy*, GAO-19-339 (Washington, D.C.: Sept. 18, 2019). To assist agencies in identifying and implementing essential elements of risk-informed decision-making, we synthesized key concepts from relevant literature and input from experts who participated in a May 2018 meeting convened by the National Academies of Sciences, Engineering, and Medicine. The framework was developed in the context of environmental cleanup at Department of Energy sites, but the framework itself can be applied to other types of decisions.

Office of Management and Budget and the Office of Science and Technology Policy.[3]

To identify stakeholder concerns about IJC's communication with stakeholders, we interviewed officials and representatives from a nonprobability sample of 14 stakeholders in the summer and fall of 2019:

1. Alexandria Bay Fishing Guides Association;
2. Arney's Marina;
3. Business Council of the State of New York;
4. Lake Ontario Riparian Alliance;
5. Monroe County, New York;
6. Sandy Creek Marina;
7. Save Our Sodus;
8. Save the River;
9. St. Lawrence County Legislature;
10. St. Lawrence Seaway Management Corporation;
11. The Nature Conservancy;
12. Town of Greece;
13. Town of Ontario, and
14. Thousand Island Association.

As part of a site visit to the area in June 2019, we met with officials and representatives of four of these stakeholders in person: Monroe County, New York; the Town of Greece, New York; Save our Sodus; and Save the River. We also toured the Moses-Saunders Dam and interviewed officials with the New York Power Authority and Ontario Power Generation.

Because we used a nonprobability sample, the information obtained from these interviews is not generalizable to other Lake Ontario and St.

[3]GAO, *U.S. Public Diplomacy: State Department Expands Efforts but Faces Significant Challenges*, GAO-03-951 (Washington, D.C.: Sept. 4, 2003); GAO, *U.S. Public Diplomacy: State Department Efforts to Engage Muslim Audiences Lack Certain Communication Elements and Face Significant Challenges*, GAO-06-535 (Washington, D.C.: May 3, 2006); and Office of Management and Budget and Office of Science and Technology Policy, *Memorandum for the Heads of Executive Departments and Agencies: Updated Principles for Risk Analysis* (Washington, D.C.: Sept. 19, 2007).

Lawrence River stakeholders. In addition, we did not verify the factual accuracy of concerns identified by selected stakeholders. However, concerns identified in our interviews provide illustrative information about stakeholder perspectives.

To select this sample of stakeholders, we reviewed written and oral comments about the proposed Plan 2014 that individuals and groups submitted to IJC in 2013 through email, through the IJC website, by posted mail, and at public hearings. For each comment, we identified stakeholder type, user interest category, and whether the stakeholder supported or opposed Plan 2014. After eliminating some stakeholder types, such as comments from private citizens that would likely be represented by comments from local government representatives, we ultimately selected 14 stakeholders from a list of 95. Specifically, we selected stakeholders considering the following criteria:

- *Stakeholder type.* We selected stakeholders that represented a mix of the following four stakeholder types: government (such as county governments and town boards), environmental nonprofit, industry nonprofit, and commercial (businesses, such as marinas and stores). We selected four government stakeholders, five environment nonprofit stakeholders, two industry nonprofit stakeholders, and three commercial stakeholders.
- *User interest category.* We selected at least one stakeholder, to the extent possible, from each of six user interest categories from Plan 2014: ecosystems, coastal development, commercial navigation, hydropower, municipal and industrial water use, and recreational boating. For user interests, all but one user interest, hydropower, was represented by one or more stakeholders based on our review of stakeholder comments.[4] However, during our interviews we asked each stakeholder to identify one or more user interest categories representative of their respective organization. Stakeholders that reported identifying with multiple user interests typically included the user interest category that we had determined for that stakeholder.
- *Position on Plan 2014.* We selected a mix of stakeholders that both supported and opposed Plan 2014 based on their 2013 comments. In addition, during our interviews, six of 14 stakeholders told us that they

[4]Alcoa Massena Operations was the only U.S. stakeholder providing comments in 2013 that we determined identified with hydropower, and it did not respond to multiple requests for an interview.

supported Plan 2014 and eight of 14 stakeholders said that they did not.

We primarily selected stakeholders that operate at least in part in the United States. The St. Lawrence Seaway Management Corporation is the only stakeholder in our sample based exclusively in Canada. We included this Canadian industry nonprofit in our stakeholder sample because no U.S.-based stakeholders that submitted comments predominantly identified with the commercial navigation user interest category and because the St. Lawrence Seaway Management Corporation shares oversight of the St. Lawrence Seaway with its U.S. counterpart, the Saint Lawrence Seaway Development Corporation, a government corporation subject to the direction and supervision of the Secretary of Transportation.

In addition to the stakeholders we selected, we also spoke with one group and private citizens who reached out to us, and we reviewed documents they provided. We found that their views were similar to those expressed by our selected sample of stakeholders, so we did not incorporate the results of these interviews and document reviews in our selected sample results and report.

To identify stakeholder concerns about Plan 2014 and its implementation, we asked the 14 stakeholders about Plan 2014 and IJC's implementation of the Plan. In IJC's view, in some cases stakeholder statements did not reflect the content of Plan 2014 or the Board's implementation of the Plan. We did not verify the accuracy of either stakeholder or IJC statements about the concerns expressed by stakeholders because that is outside the scope of our report.

To determine the extent to which IJC has made plans to assess Plan 2014 and make adjustments to the Plan if needed, we reviewed IJC documents, including IJC's summary of Plan 2014, the 2013 Great Lakes and St. Lawrence River adaptive management plan, the Great Lakes-St. Lawrence River Adaptive Management Committee (GLAM) 2017 mid-term strategy in GLAM's triennial report, GLAM's report on the 2017 flooding, GLAM's *2020 Short-term and Long-term Strategy For Evaluating and Improving the Rules for Managing Releases from Lakes Ontario and*

Superior, and GLAM's annual work plans.[5] We also interviewed IJC and GLAM officials about their process to asses and adjust Plan 2014. In addition, we compared GLAM's long-term adaptive management strategy, approved by IJC in March 2020, to GAO's key elements and essential characteristics of an adaptive management process to determine whether GLAM incorporated these elements and characteristics.[6]

We conducted this performance audit from January 2019 to July 2020 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[5]International Joint Commission, *Lake Ontario-St. Lawrence River Plan 2014* (June 2014); International Joint Commission, International Great Lakes-St. Lawrence River Adaptive Management Team, *Building Collaboration Across the Great Lakes-St. Lawrence River System: An Adaptive Management Plan* (May 30, 2013); Great Lakes-St. Lawrence River Adaptive Management Committee, *Triennial Progress Report* (Apr. 12, 2017); Great Lakes-St. Lawrence River Adaptive Management Committee, *Summary of 2017 Great Lakes Basin Conditions and Water Level Impacts to Support Ongoing Regulation Plan Evaluation* (Nov. 13, 2018); and Great Lakes-St. Lawrence River Adaptive Management Committee, *Short-term and Long-term Strategy For Evaluating and Improving the Rules for Managing Releases from Lake Ontario and Superior* (Mar. 6, 2020). For an example of an annual report, see Great Lakes-St. Lawrence River Adaptive Management Committee, *Annual Work Plan Fiscal Year 2018* (Oct. 11, 20017).

[6]GAO, *Yellowstone Bison: Interagency Plan and Agencies' Management Need Improvement to Better Address Bison-Cattle Brucellosis Controversy*, GAO-08-291 Washington, D.C.: Mar. 7, 2008), and *Great Lakes Restoration Initiative: Further Actions Would Result in More Useful Assessments and Help Address Factors That Limit Progress*, GAO-13-797 Washington, D.C.: Sept. 27, 2013).

Appendix II: Review of IJC's Process for Developing and Selecting Plan 2014

Water releases from Lake Ontario into the St. Lawrence River are determined by a set of regulatory rules called the *Lake Ontario-St. Lawrence River Plan 2014* (Plan 2014)—issued pursuant to the Supplementary Order of Approval and the Boundary Waters Treaty of 1909.[1] The International Joint Commission (IJC)—a binational commission—developed and issued the Plan and Order with the concurrence of the United States and Canada. In 1999, IJC began reassessing existing water release rules based on dissatisfaction of shoreline property owners and boaters, the potential effects of climate change on lake levels, and growing concerns about degradation of coastal wetlands from constrained water level variability. The process to develop, approve, and implement Plan 2014, including issuance of the Supplemental Order of Approval, took more than 18 years.

We reviewed IJC's process for developing and selecting Plan 2014, including the Supplementary Order of Approval and two 2016 directives to the International Lake Ontario-St. Lawrence River Board,[2] for general consistency with relevant essential elements of GAO's risk-informed decision-making framework. The essential elements of the risk-informed decision framework consists of 16 steps across four phases.[3] Specifically, we found that IJC's process was generally consistent with the 14 of 16 steps of the design, analysis, and decision phases of the framework. We did not evaluate the two steps in the implementation and evaluation phase of the framework because this phase falls outside of IJC's process to develop and select Plan 2014.

[1]International Joint Commission, *Lake Ontario-St. Lawrence River Plan 2014: Protecting Against Extreme Water Levels, Restoring Wetlands and Preparing for Climate Change* (Washington, D.C.: June 2014); *Treaty Between the United States and Great Britain Related to the Boundary Waters* (Jan. 11, 1909); and *International Joint Commission in the Matter of the Regulation of Lake Ontario Outflows and Levels: Supplementary Order of Approval* (Dec. 8, 2016).

[2]When we refer to the development and selection of Plan 2014 in the following section, we are referring to both the development and selection of a regulatory plan as well as the related proposed revisions to the 1956 Order of Approval and two 2016 directives to the Board.

[3]GAO, *Environmental Liabilities: DOE Would Benefit from Incorporating Risk-Informed Decision-Making into Its Cleanup Policy*, GAO-19-339 (Washington, D.C.: Sept. 18, 2019). To assist agencies in identifying and implementing essential elements of risk-informed decision-making, the report synthesized key concepts from relevant literature and input from experts who participated in a May 2018 meeting convened by the National Academies of Sciences, Engineering, and Medicine. The framework was developed in the context of environmental cleanup at Department of Energy sites, but the framework itself can be applied to other types of decisions.

Descriptions of the design, analysis, and decision phases of the risk-based decision-making framework, along with examples of how IJC's process was generally consistent with each step in these relevant phases, follow.

Design phase. The purpose of the design phase is to lay the groundwork for choosing between various options. There are seven steps in the design phase: (1) identifying and engaging stakeholders, (2) defining the problem and decision to be made, (3) defining objectives and performance measures, (4) identifying constraints, (5) identifying options, (6) identifying decision-making method and rule, and (7) developing an analysis plan.

During this phase, IJC published a plan of study in 1999 that served as the foundation for a 5-year study of the effects of water level and flow regulation. IJC established the Study Board in 2000 to direct the study. The Study Board comprised of seven U.S. members and seven Canadian members that IJC appointed. IJC released a final report at the conclusion of this 5-year study in 2006.

According to our review of IJC documents and interviews with officials from IJC and federal and state agencies and with academic experts involved in the plan development and selection process, we found that IJC's process was generally consistent with each of the seven steps of risk-informed decision-making for the design phase.

- *Identifying and engaging stakeholders*. The plan of study identified an initial list of stakeholders to participate in the study process, and IJC engaged stakeholders throughout the design phase. For example, the Study Board engaged stakeholders as members of a public interest advisory group that interacted with technical working groups to help formulate and comment on plan options.
- *Defining the problem and decision to be made.* The plan of study defined the problem and decision to be made as identifying what, if any, changes should be made to existing water release rules to better address needs of various user interests.
- *Defining objectives and performance measures*. The plan of study described the objective to update the existing water release rules if appropriate and identified preliminary measures the new plan would need to meet.
- *Identifying constraints.* The plan of study identified constraints in the preliminary analysis plan, including the rules in the Boundary Waters

Treaty of 1909 and use of the existing conditions of the1956 Order of Approval as a starting point. As part of the 5-year study, a list of constraints and assumptions—including maximum outflow limits based on physical or structural constraints, such as ice conditions or capacity of the river channel—were identified and used to evaluate various plan options so that results would be comparable.

- *Identifying options.* IJC identified various options for regulating outflows from Lake Ontario developed as part of the initial study completed in 2006 and further developed options in later stages of the process. For instance, in 2006 the Study Board produced a final report that included three options for adjusting the water release rules and related revisions to the 1956 Order of Approval. According to that final report, the Study Board selected these three options in an attempt to achieve the greatest benefits for as many user interests as possible while minimizing losses to any one sector. The final report also described how the Study Board developed numerous approaches and evaluated hundreds of plan variations to help identify the three options. In addition, IJC directed development of subsequent options presented for public comment in 2008, 2012, and 2013.
- *Identifying decision-making method and rule.* As part of its decision-making method, the Study Board developed guidelines for prioritizing plan options during the study process completed in 2006. IJC applied these same guidelines to the selection of Plan 2014, with some minor improvements according to IJC's June 2014 report on the Plan.[4] These evaluation guidelines included measurement of a plan's impact on ecological integrity, evaluation of net benefits that considers both economic and environmental benefits, and qualitative determination of disproportionate loss to any user interests.
- *Developing an analysis plan.* A plan for analyzing the impacts of changes to water release rules on the region using new and existing data was developed and described in the plan of study issued in 1999. The evaluation of subsequent options, including Plan 2014, was based on the same models and performance indicators developed in the 1999 plan of study.

Analysis phase. The purpose of the analysis phase is to determine how the plan options perform with respect to the objectives identified in the previous phase and to provide a factual, analytical basis for making a decision. There are four steps in the analysis phase: (1) conducting

[4]International Joint Commission, *Lake Ontario-St. Lawrence River Plan 2014: Protecting Against Extreme Water Levels, Restoring Wetlands and Preparing for Climate Change* (June 2014).

analysis; (2) assessing uncertainty; (3) validating analysis; and (4) synthesizing, documenting, and communicating analysis.
During this phase, IJC completed analyses evaluating effects of water level and flow regulation for an initial set of plan options as part of its 5-year study completed in 2006 and further analyses on additional plan options that were presented for public comment in 2008, 2012, and 2013.

According to our review of IJC documents and interviews, we found that IJC's process was generally consistent with each of the four steps of the analysis phase of risk-informed decision-making:

- *Conducting the analysis.* As part of its 5-year study, the Study Board conducted analyses using advanced models to evaluate environmental and economic impacts (e.g., ecosystem response, flooding, and erosion) of various plan options.
- *Assessing uncertainty*. In addition, as part of the study, the Study Board identified and assessed a range of uncertainties, including climate change and economic variables. As part of developing Plan 2014, IJC recognized uncertainties in water supplies used to test the rules and differences in actual impacts of water levels and flows from modeled impacts. Consequently, IJC included an adaptive management process as part of Plan 2014 to support ongoing evaluation and improvements to the Plan, as needed.
- *Validating the analysis.* Early in the 5-year study process, the Study Board retained a panel of four economic experts under a series of contracts to review the economic analyses to be used to select plan options. Moreover, toward the end of the study period, to validate the Study Board's analysis IJC had the National Research Council and the Royal Society of Canada provide an independent scientific review of studies, reports, and models that were used to develop plan options.[5]
- *Synthesizing, documenting, and communicating the analysis*. The Study Board and IJC synthesized the results of the board's analyses and documented and communicated its results for plan options developed. For example, the Study Board documented the analyses of the three proposed plan options in the final 2006 Study Board report and on its website. In later stages, IJC issued a guide that described Plan 2007 and corresponding analyses prior to holding public hearings and obtaining written comments it collected in 2008. It

[5]National Research Council, *Review of the Lake Ontario-St. Lawrence River Studie*s (Washington, D.C.: The National Academies Press, 2006).

also distributed a four-page fact sheet on Plan 2014 with key economic and other analyses results at public hearings and in newspapers during a public comment period held in summer 2013.

Decision phase. The goal of the decision phase is to choose an option (or set of options) that meets constraints and achieves an acceptable balance of performance across the objectives. There are three steps in the decision phase: (1) applying a decision-making method and rule to compare options, (2) selecting the preferred option, and (3) documenting and communicating the decision.

During the decision phase, IJC reviewed relevant information and, in 2014, selected Plan 2014 as the optimal plan option. IJC subsequently submitted Plan 2014 and related revisions to the 1956 Order of Approval to the United States and Canada for their concurrence. Upon receiving concurrence from both countries in 2016, IJC announced the final decision to implement the Plan and Supplementary Order of Approval beginning in January 2017.

Based on our review of IJC documents and interviews, we found that IJC's process was generally consistent with each of the three steps of the decision phase of risk-informed decision-making:

- *Applying a decision-making method and rule to compare options.* IJC applied the decision-making method developed during the design phase. For example, IJC evaluated and compared economic and environmental benefits of each plan option it considered, including impacts across the six user interests.
- *Selecting the preferred option.* In June 2014, IJC selected Plan 2014 as its preferred option for regulating the water levels and flows of Lake Ontario and the St. Lawrence River.
- *Documenting and communicating the decision.* IJC announced its decision in a press release and outlined its reasoning for selecting Plan 2014 in a detailed document released in June 2014. On its website, IJC also provided a detailed written response to the issues raised during the public comment period on Plan 2014. In addition, in December 2016, it announced in a press release on its website that the commissioners signed Plan 2014 upon receiving concurrence from the U.S. and Canadian governments. IJC also summarized the benefits and impacts of the plan across user interests in a fact sheet linked with the press release.

Appendix III: Comments from the International Joint Commission

International Joint Commission
Canada and United States

Commission mixte internationale
Canada et États-Unis

June 26, 2020

Ms. Barbara Patterson
Assistant Director
Natural Resources and Environment
Government Accountability Office
441 G St., NW
Washington, DC 20548

Dear Ms. Patterson:

Thank you for the opportunity to provide an initial response to the draft Government Accountability Office (GAO) report entitled *Lake Ontario-St. Lawrence River Plan: Improved Communication and Adaptive Management Strategy Could Help Address Stakeholder Concerns* (GAO-20-529). The International Joint Commission (IJC) appreciates the GAO's work in undertaking this report.

We appreciate the GAO recognizes that the International Joint Commission (IJC) is a binational organization and that decisions of the Commission require agreement by a majority of Canadian and US Commissioners. Under the Boundary Waters Treaty, the Commission acts as a unitary body, taking the interests of stakeholders in both countries into consideration and seeking solutions that are in the best interest of both countries.

In addition, we are pleased that the GAO found that the IJC's process for developing and selecting Plan 2014, the current plan used for regulating Lake Ontario outflows, was generally consistent with each of the 14 steps for risk-informed decision making that the GAO evaluated. These included the direct involvement of stakeholder representatives in defining performance indicators, developing models to assess environmental and economic impacts, and evaluating a wide range of alternative regulation plans. The IJC also conducted extensive public consultations in 2008, 2012 and 2013 before recommending Plan 2014 to the Governments of Canada and the United States.

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Recommendation One

The US Commissioners of the International Joint Commission should work with the Canadian Commissioners to update the Lake Ontario-St. Lawrence River Board Communications Plan and ensure that the plan incorporates best practices for public relations efforts, in particular defining target audiences and developing mechanisms to monitor and inform adjustments to strategies, and generally accepted principles for communicating risk-related information.

Progress to date

When we received the GAO's draft report, the IJC consulted with a communications expert for advice on specific actions that could be taken to incorporate best practices for public relations efforts into an updated Board communications plan. The consultant's tasks include recommending: (1) overall desired outcomes for the communications plan; (2) how target audiences should be segmented and prioritized; (3) best public relations practices, along with the human and financial resources needed to carry them out; and (4) methods for assessing the effectiveness of the communications effort to meet the desired outcomes. Preliminary advice from the consultant suggests that the IJC could use polling more extensively to conduct research, provide user-testing of information and messages, and gather quantitative data on changes over time in awareness of and satisfaction with IJC decision making within stakeholder groups. The IJC intends to develop an updated communications plan that incorporates best practices for public relations efforts by December 31, 2020.

We are pleased that the GAO recognized the extraordinary effort made by our International Lake Ontario-St. Lawrence River Board (Board) to communicate with stakeholders regarding the record-high water levels that occurred in 2017 and 2019. Additional steps to respond to concerns identified in the draft GAO report include engaging a consultant to augment the Board's technical expertise with the skills and resources needed to communicate more effectively. Among other things, the consultant has helped the Board craft consistent messages, provided plain language editing of communication products, led a weekly communications coordination meeting, and provided expert advice in other areas. In response to recommendations by the Ontario Government's Special Advisor on Flooding, the Board also created a section on its website to make information about the 2017 and 2019 floods more accessible, including the causes of the floods and how Lake Ontario outflows were managed. The Board has developed a quarterly newsletter for local officials, property owners, recreational boaters and other target audiences in shoreline communities with similar information needs. The newsletter provides information about the issues that are anticipated to affect water levels during the coming season.

Steps taken by the IJC include a series of public webinars to address issues of immediate interest to shoreline residents, including factors that determine Lake Ontario and St. Lawrence River water levels, balancing high-water conditions upstream and downstream of the Moses-Saunders Dam, how commercial navigation affects Lake Ontario outflows, and other topics raised by stakeholders. Policy makers (IJC co-chairs) and technical experts were available to respond to questions during the webinars. Recent IJC public webinars have included more than 1,000 participants and more than 90 percent of respondents to polling questions indicated that they found the webinars to be useful. In addition, the IJC's Great Lakes-St. Lawrence River Adaptive

Management (GLAM) Committee has sought input on high water impacts via a questionnaire for shoreline property and business owners, and in meetings with municipal leaders in shoreline communities.

Challenges

The IJC appreciates that the GAO recognized stakeholder consensus on risk-informed decisions is often not possible. The major challenge facing the IJC in this regard is to restore the trust of property and business owners who have been harmed by high water. In situations where perceptions of unfairness have been deeply held for decades, measures such as best practices for targeting information may have little effect until what may be referred to as community outrage factors have been addressed. Therefore, the IJC has concluded that its best practices for public relations must also demonstrate that it takes stakeholder concerns seriously.

As part of the adaptive management process, the IJC has established a public advisory group to involve leaders from stakeholder organizations in the review of Plan 2014. Our intention is to work with these leaders to identify potential improvements to the criteria that guide Lake Ontario outflow decisions. The IJC has engaged an outside, neutral facilitator to lead stakeholder engagement, and possibly mediate issues that arise during the review. Our hope is that the process will lead to a common understanding of the facts and refinement of the decision criteria. However, establishing and sustaining trust more broadly within shoreline communities is a much larger, ongoing challenge. When inflows are as high as they were in 2017 and 2019, flooding of communities cannot be avoided, and outflow decisions will need to balance the impacts among affected stakeholders. Maintaining the public's trust in how outflows are governed is also a shared responsibility. Historically, leaders of stakeholder organizations and elected officials have blamed the IJC for any flooding that occurs.

Recommendation Two

The US Commissioners of the International Joint Commission should work with the Canadian Commissioners to enter into written agreements with entities that the Great Lakes-St. Lawrence River Adaptive Management Committee identifies as having information or resources that the committee needs to effectively monitor and evaluate the impacts of Plan 2014

Progress to date

Earlier this year, the IJC agreed to a written protocol with the St. Lawrence Seaway entities to share information regarding the economic impacts of extreme water levels and flows on their interest. The IJC is compiling a list of additional entities and will explore formal data and information sharing arrangements with them. Negotiating such agreements can be a lengthy process, but we intend to make further progress by December 31, 2020.

Recommendation Three

The US Commissioners of the International Joint Commission should work with the Canadian Commissioners to ensure that the IJC fully incorporates the key elements and essential

characteristics of the adaptive management process into a comprehensive adaptive management strategic plan for Plan 2014.

Progress to date

The GLAM Committee has begun to revise its adaptive management strategic plan to incorporate key elements and essential characteristics of the adaptive management process as identified by the GAO. In particular, the strategic plan will reference the GLAM communication plan. It will also recognize the establishment of the Public Advisory Group and its role in assisting the GLAM Committee with seeking improvements to regulation by contributing knowledge about water level impacts and input on the assessment methods used in the review. Public Advisory Group members are also expected to help foster a two-way dialogue between the GLAM Committee and their constituencies and provide advice on incorporating long-term stakeholder engagement into the adaptive management strategic plan. The strategic plan will also note the importance of collaboration with partner agencies and organizations.

The GLAM Committee is also working with the IJC and a communications consultant to better articulate the linkages between the GLAM Committee activities and the objectives of the regulation plan and deviations from plan flows. The strategic plan will be revised to help clarify these linkages and to explain how the adaptive management process is identifying and evaluating uncertainties. Reducing uncertainty is a primary goal of validating the performance indicators and models. The GLAM Committee will produce a comprehensive adaptive management strategic plan that fully incorporates the key elements and essential characteristics of the adaptive management process by December 31, 2020. The adaptive management strategic plan will be updated in October 2021 to incorporate advice provided by the Public Advisory Group on long-term stakeholder engagement.

Challenges

The GAO's draft report notes that the GLAM Committee's strategic plan does not explain how the Board or IJC will determine whether a change in the rules or criteria for water releases is necessary. In cases where the GLAM Committee can identify how adjusting the rules or criteria would benefit one or more interests without impacting other interests, the need for change can be considered on an empirical basis. However, changes in the hydroclimate, economic uses or social values may also generate concerns about the performance of the regulation plan. In such cases, we cannot identify the specific considerations that may determine the need for change in the future. The GLAM strategy relies on the ongoing collection of data, and refinement of evaluation tools to support the collective judgment on when potential changes may be warranted.

It is important to note that the continued collection and analysis of data needed to fulfill the adaptive management requirements in the 2016 supplementary order of approval is also contingent on the availability of funding. The GLAM Committee was not able to fully proceed with the first phase of the review of Plan 2014 until funding was provided in the U.S. Section's FY 2020 appropriation in December 2019. Funding for subsequent work on the review, or the GLAM strategy in general, is still uncertain.

Conclusion

In closing, we again thank the GAO for its evaluation of the IJC's communications and adaptive management plans regarding the regulation of Lake Ontario outflows. The IJC is working to respond to the GAO's recommendations and expects to have a more thorough response by the end of this calendar year.

Sincerely,

Jane Corwin
Chair
US Section

Pierre Béland
Chair
Canadian Section

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the contact named above, Barbara Patterson (Assistant Director), Michelle Treistman and Krista Mantsch (Analysts-in-Charge), Mark Braza, Maggie Devlin, David Dornisch, Rich Johnson, Gwen Kirby, Dan Royer, Jeanette Soares, Vasiliki Theodoropoulos, Swati Thomas, and Kellen Wartnow made key contributions to this report.

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