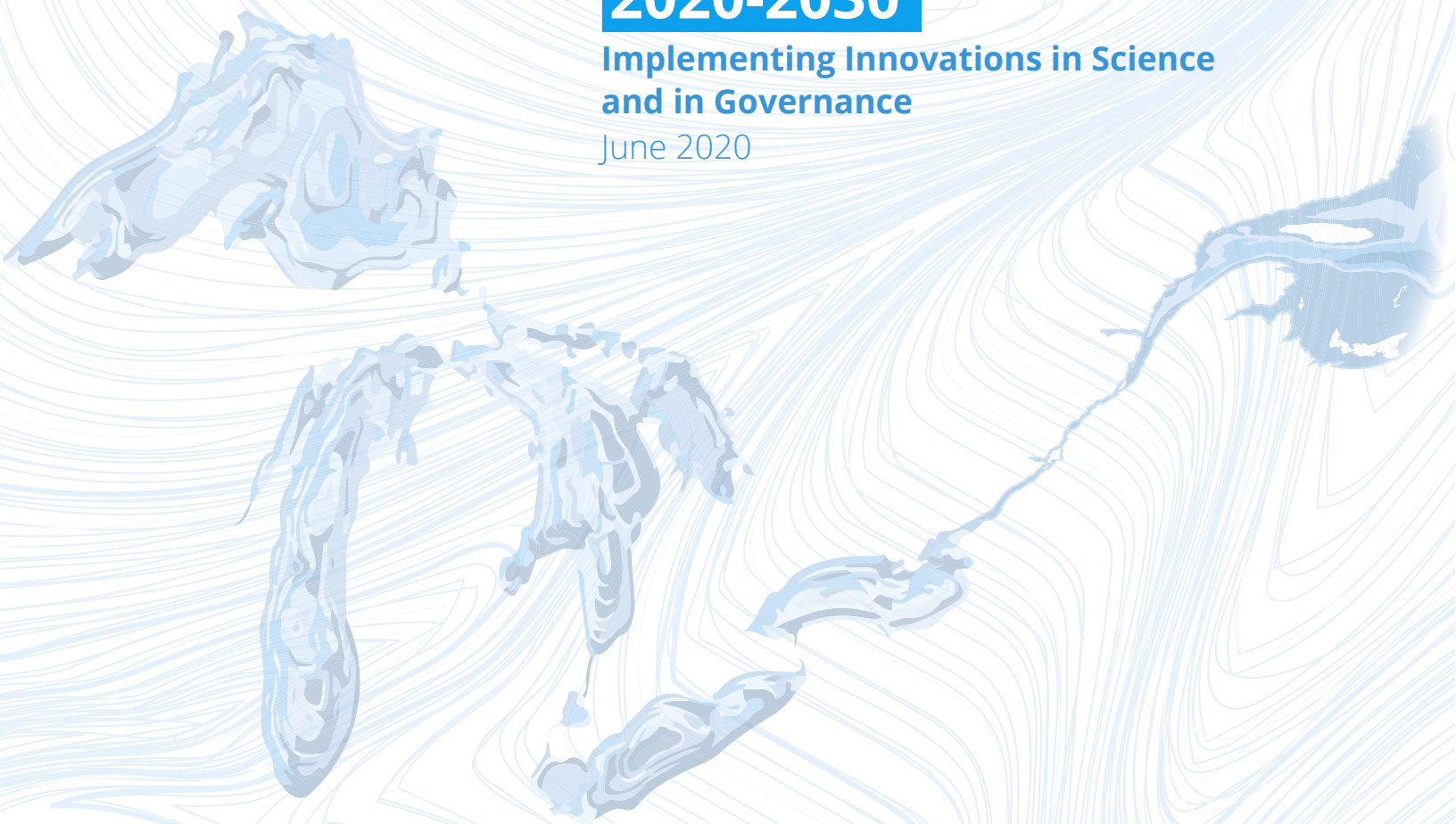
ACTION PLAN TO PROTECT THE GREAT LAKES AND ST. LAWRENCE 2020-2030

Implementing Innovations in Science and in Governance

June 2020



The Great Lakes and St. Lawrence Collaborative

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L'ALLIANCE DES VILLES DES GRANDS LACS ET DU SAINT-LAURENT
GREAT LAKES AND ST. LAWRENCE CITIES INITIATIVE

Prepared by:

Westbrook Public Affairs

ÉCOGESTION SOLUTIONS

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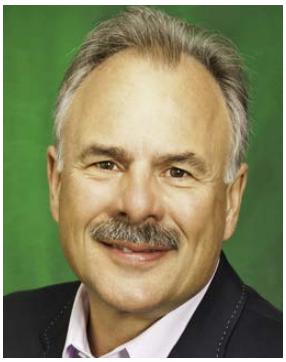

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ACKNOWLEDGEMENTS

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The Collaborative partners would like to express their heartfelt appreciation to the Expert Panel, co-chaired by Mr. Jean Cinq-Mars and Mr. Gord Miller, whose leadership and guidance has resulted in the inspirational vision laid out in this report and the two foundational reports on the Great Lakes and St. Lawrence. In addition to the co-chairs, the Expert Panel members include Anishinabek Nation Deputy Grand Council Chief Edward Wawia, Denise Cloutier, Dr. Yves Comeau, Denis Lapointe, Hélène Lauzon, Theresa McClenaghan, Dr. Ariane Plourde, Mayor Walter Sendzik, and Sarah Zammit. Members during the Great Lakes phase also included Dr. Bob Slater and Karen Clarke-Whistler.

The recommendations were the product of extensive deliberations by the Great Lakes and St. Lawrence issue tables, ably led by issue table co-chairs who devoted many hours to provide content expertise and ensure the quality of the recommendations proposed to the Expert Panel.

In addition to these experts and stakeholders, the Collaborative benefitted from the feedback and advice of stakeholders who participated in a number of webinars and in two summits held in Toronto and Quebec respectively.

The Collaborative partners would also like to thank the many people behind the scenes who contributed to the Collaborative and who helped shape the Action Plans. The Collaborative is particularly grateful to the members of the Secretariat, Nicola Crawhall of Westbrook Public Affairs, Stephanie Allard, Rose Savard-Paquet and Ines Singhe of Ecogestion Solutions, Korice Moir of Korice Moir Consulting, and Sophie Afriat. The Secretariat received research support from members of the McMaster research team led by Dr. Gail Krantzberg, and Sonja Behmel of Watershed Monitoring.

Economic analysis was provided by Dave Thompson of PolicyLink, which informed the investment strategy and the preliminary cost-benefit analysis.

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EXECUTIVE SUMMARY

This is the final report of the Great Lakes St. Lawrence Collaborative. This report integrates the findings of the two foundational reports, the Great Lakes Action Plan 2030, and the Action Plan for the future of the Saint Lawrence 2020-2030.

Key Findings

The Great Lakes and St. Lawrence Action Plan 2030 provides a forward-looking roadmap over the next ten years, to tackle some of the greatest challenges facing our region. To ensure the successful implementation of the Action Plan over the next ten years, new approaches and institutional arrangements are needed.

The recommendations developed for the Great Lakes and St. Lawrence regions share much common ground, demonstrating the shared goals and aspirations of those working for their protection and restoration. Where there are significant differences in approach between the Great Lakes and the St. Lawrence, these reflect differences in geographic context, severity of impacts, or provincial legislative or regulatory regimes.

To address the complex challenges outlined in the Great Lakes St. Lawrence Action Plan 2020-2030, the Expert Panel recommends a new approach, based on the following principles:

1. Alignment and integration of actions and investments from the federal level, right through to those living, working and visiting the shorelines of the Great Lakes and St. Lawrence, to overcome the fractured nature of activities across this enormous geography.
2. Risk-based prioritization and risk management to devote investment and effort where it is needed most, and to minimize risk to avoid impacts and costs in the future.
3. Purpose-oriented research and innovation to inform locally relevant technical assistance.
4. Formal monitoring and evaluation, to measure progress and to provide the public with an independent evaluation of the governments' performance.

To bring about the changes needed to adopt the above principled approach, a new institutional arrangements model, an investment strategy, and roll-out plan are proposed.

The proposed institutional arrangements are inspired by two similarly complex, multijurisdictional water system management programs, the Great Lakes Restoration Initiative and the Chesapeake Bay Program. The new institutional arrangements propose six elements:

i. A federal cross departmental taskforce, that is responsible for federal financing and alignment of departmental effort with regard to Great Lakes St. Lawrence protection.

ii. A Great Lakes St. Lawrence Commission with indigenous, business, NGO, academic and municipal representation that guides and coordinates implementation;.

iii. An Indigenous Great Lakes St. Lawrence organisation, with representation of indigenous organisations and communities in the region.

iv. Implementation teams on the four main challenges

v. Centres of research and innovation and technical assistance teams.

vi. Additionally, oversight by the Federal Commissioner of Environment and Sustainable Development is recommended.

The investment strategy involves a federal commitment of at least $2 billion over ten years to implement Action Plan 2020-2030. A large portion of this investment is focused on shoreline resiliency along the Saint Lawrence and in the Great Lakes that have experienced acute and repeated flooding and erosion. Another significant area of investment is in upgrading wastewater treatment plants, particularly those that are already required to upgrade from primary to secondary treatment to come into compliance with the federal wastewater effluent regulation, that could attain a higher level of treatment to remove new and emerging harmful substances with additional investment.

Faced with one of the most serious economic downturns in the modern era as a consequence of the COVID-19 global pandemic, it is anticipated that the Federal, Quebec and Ontario governments will adopt major economic stimulus and job creation programs. In addition to improving the

quality of the Great Lakes and St. Lawrence, the actions outlined in the Action Plan 2020-2030 and its investment strategy offer an effective means to stimulate the economy and create jobs. For example, based on Statistics Canada estimates, $500 million in shoreline restoration investments would be expected to create upwards of 3,500 person-years employment.

This is why the proposed Action Plan 2020-2030 roll-out plan recommends immediate activity and investments in shoreline resiliency and flood mitigation, to provide much needed relief to those flood-prone areas, and in the process, create jobs and stimulate the regional and national economy. Design work on upgrades to wastewater treatment in key municipalities should also be prioritized, proceeding as quickly as possible to approvals and tenders for work.

The Action Plan 2020-2030 Implementation Plan will result in a revitalized and well-resourced commitment on the part of governments, indigenous communities, watershed organisations, businesses, and property owners that will deliver more effective protection and greater climate resiliency for the Great Lakes and St. Lawrence region over the coming decade and beyond.

Recommendations

In addition to the 27 recommendations contained in the two Action Plans, this report proposes three final recommendations.

1. **It is recommended that** the Government of Canada, in collaboration with the Governments of Quebec and Ontario, establish the institutional arrangements outlined in this report. The institutional arrangements will be free standing, but may be integrated into the Canada Water Agency once it is established.

   It is further recommended that the Government of Canada request that the federal Commissioner of Environment and Sustainable Development undertake a performance audit of Action Plan 2020-2030 every 2-3 years and report its findings to Parliament.

2. **It is recommended that** the Government of Canada commit at least $2.2 billion in investments over ten years to implement the Great Lakes St. Lawrence Action Plan 2020-2030, guided by the implementation roll-out and investment strategy in this report, and seek shared funding arrangements where appropriate from the Governments of Quebec and Ontario and municipalities.

3. **It is recommended that** the Great Lakes St. Lawrence Collaborative Commission regularly review progress towards desired outcomes, consider adapting recommended actions to changing circumstances, and recommend new issues to add to the Action Plan, including biodiversity, nuclear operations and waste, and road salts.

1. WHAT IS ACTION PLAN 2020-2030?

1.1 An Action Plan Developed by and for those it affects

The Action Plan to Protect the Great Lakes and St. Lawrence 2020-2030 (Action Plan 2020-2030) is a $2 billion, 10-year, forward looking strategy to protect the Great Lakes and St. Lawrence and those who live by them. The Action Plan is the product of an unprecedented stakeholder-led engagement process to re-envision and re-invigorate Great Lakes St. Lawrence protection over the next decade. It has been developed ***by and for*** those it affects the most- the communities, stakeholders and on the ground organisations in the Great Lakes and St. Lawrence region. In total, over 200 experts, stakeholders and indigenous representatives were consulted in the development of Action Plan 2020-2030, the largest stakeholder-led engagement effort in the Great Lakes and St. Lawrence region of its kind.

The development of the Action Plan 2020-2030 was initiated by the Great Lakes St. Lawrence Collaborative, a partnership of five leading Great Lakes St. Lawrence advocacy organisations, the Great Lakes Fishery Commission, the Great Lakes St. Lawrence Cities Initiative, the Council of the Great Lakes Region, Freshwater Future Canada, and Stratégies Saint Laurent. With financing from Environment and Climate Change Canada, the Collaborative established an eighteen-month process to engage economic, NGO, and academic stakeholders and First Nations in an intensive period of reflection and consultation on ways in which current efforts and resources could be modernized using new and innovative approaches to more effectively protect the Great Lakes and St. Lawrence region.

The Collaborative was led by a Panel of Experts, co-chaired by two esteemed environmental experts, Gord Miller, former environment commissioner of Ontario, and Jean Cinq-Mars, former Commissioner of Sustainable Development for Quebec. The expert panel consisted of indigenous, private sector, academic, municipal and NGO representatives from the Great Lakes and St. Lawrence regions. The Expert Panel was directly advised by over 200 experts and stakeholders, in Ontario and Quebec, respectively. The Expert Panel and issue tables were supported by a Secretariat led by Westbrook Public Affairs in Toronto, and supported by Ecogestion Solutions during the St. Lawrence phase of the process.

The Collaborative acknowledges and thanks Environment and Climate Change Canada for providing financial support for the Collaborative process.

Expert Panel member Deputy Grand Chief Wawia at Great Lakes Summit, June 2019, Toronto. © Quinn Corkal

1.2 What will the Great Lakes St. Lawrence Action Plan 2030 achieve?

The Great Lakes and St. Lawrence Action Plan 2030 provides a forward-looking roadmap over the next ten years, to tackle some of the greatest challenges facing our region. It consists of strategic and specific actions to improve environmental protection in four areas outlined in this section. It also proposes new institutional arrangements to drive a new, integrated approach to Great Lakes St Lawrence protection, which are explained in greater detail in Sections 3 and 4.

When implemented, the Action Plan will:

- **Protect and build resiliency in Great Lakes and St. Lawrence shoreline communities** and ecosystems that are most vulnerable to high water levels and erosion, through new collaborative partnerships, direct financial and technical assistance, with a strong emphasis on naturalizing shorelines.

- **Reduce human and environmental exposure to toxics** and other harmful chemicals in the Great Lakes and St. Lawrence region through a proactive surveillance program that actively seeks out impacts on people and species and engages affected communities in the monitoring and response to exposure;
- **Reduce agricultural nutrient runoff** that causes harmful algal blooms, eutrophication and hypoxia by using new technologies and conservation measures, and harnessing big data to target areas and properties that contribute the most;
- **Introduce enforceable requirements to trace and address sources of bacteriological contamination at beaches** that pose a public health threat and reduce access to the Great Lakes and St. Lawrence shorelines and beaches.
- **Upgrade treatment and capacity of wastewater treatment plants** to effectively remove emerging contaminants, total nitrogen, and pathogens in select areas**.**

For Action Plan 2020-2030 to successfully combat complex problems facing the region, it will require a new approach that involves the injection of significant new investment, the application of cutting edge research and innovation, and institutional arrangements that drive the integration of effort and resources amongst senior governments, First Nations, and local organisations and communities in the region. This new approach will reinvigorate and modernize water resources protection in the Region.

Launch of St. Lawrence report, Salon des Teq, March 2020. L to R: Line Beauchamp, Jean Cinq-Mars, Michelle Morin-Doyle, Denise Cloutier, Dr. Yves Comeau

2. ACTION PLAN 2020-2030: A COMMON, INTEGRATED VISION

This report outlines an implementation plan for Action Plan 2020-2030. The details of the plan are found in two foundational documents, Great Lakes Action Plan 2030, released in June 2019, and Action Plan 2020-2030 for the future of the St Lawrence, released in March 2020. While the recommendations were developed separately, to reflect geographic and jurisdictional differences, the Expert Panel oversaw the entire process, and ensured a common vision and approach.

A primary motivation for establishing the Great Lakes and St. Lawrence Collaborative was to create an integrated vision for the two regions. Due to jurisdictional reasons, the two water systems are managed separately, this despite the fact that they are hydrologically one system. The similarity in the desired outcomes and recommended actions that experts and stakeholders arrived at in the two regions through the Collaborative process underlines the common ground between the two regions and their shared vision for the future. Where differences in recommended actions exist, they reflect unique circumstances in the regional environmental conditions, in the scale of impacts, and in legislative or regulatory requirements in Ontario and Quebec respectively. Notwithstanding these differences, the core prescriptions remain essentially the same.

This section explores common ground and key differences in approaches in the two parts of the region. The Expert Panel felt that a number of differences were justified and should remain differentiated in each region. Other recommendations were transferable to both regions.

A complete list of recommendations can be found in Section 4. To fully understand and appreciate the rationale for these recommended actions, readers are encouraged to return to the original Action Plans for important contextual detail.

2.1 Building climate change resiliency in shoreline communities

Context in each region

Shoreline communities in both the Great Lakes and St. Lawrence regions have experienced severe flooding in 2017 and 2019, erosion, and intensified wind and wave energy due to the effects of climate change.

Within the Great Lakes basin, the impacts have been felt in discrete areas, along the north shore of Lake Erie in Chatham Kent and further west, along the Lake Huron shoreline between Amberley and Grand Bend, along the Lake Ontario shoreline from the City of Toronto through to Prince Edward County, along the soft shoreline at Fort William First Nation and Thunder Bay on Lake Superior, and to a lesser extent in the south-east corner of Georgian Bay, around Tiny Township and Penetanguishene.

Flooding in the Saint Lawrence region has affected communities along hundreds of kilometres of shoreline, particularly from south of Montreal to north of Quebec City. Erosion is also a significant threat to the St. Lawrence estuary and its islands, and is expected to accelerate in the Côte-Nord, Bas-Saint-Laurent, and Gaspésie–Îles-de-la-Madeleine regions.

Common Ground

For both the Great Lakes and St. Lawrence affected shorelines, the Action Plan calls for four key actions. First, there is a need for coordinated support from senior governments for technical and financial assistance for communities, including First Nations. Secondly, there is a need for coordinated support from senior governments to work with communities and First Nations to assess impacts and develop and implement shoreline resiliency plans to respond to these impacts. In undertaking this work, there should be a strong emphasis on the deployment of natural infrastructure along shorelines as opposed to the hardening of shorelines. All of this will require access to climate data to inform resiliency plans.

Key Differences due to context

The key difference in recommendations in each region is one of scale. Given the more localized nature of flooding and climate impacts along Great Lakes shorelines, the Great Lakes actions prioritize 5 shoreline resiliency zones for coordinated assistance and funding: i) between Chatham-Kent and Leamington on Lake Erie; ii) between Amberley to Grand Bend on Lake Huron; iii) between the City of Toronto to Prince Edward County, on Lake Ontario; iv) between Fort William First Nation and Thunder Bay on Lake Superior; and v) between Penetanguishene and Tiny Township on Georgian Bay.

Coordination of effort and resources on the ground is an imperative. In the US, a National Coastal Zone management program has provided such coordination since 1972. There are eight regional coastal zone management programs in the US Great Lakes Region. These could serve as a model for the priority zones.

Given the more pervasive climate impacts along the Saint Lawrence shoreline, the Saint Lawrence actions call for a province-wide adaptation and resiliency strategy and action plan, as well as an annual reporting system on progress.

Recommended actions that may be adopted in both regions

The St. Lawrence actions call for the establishment of a federal-provincial climate resiliency centre as well as an ecological services payment system for landowners. These could be extended to and benefit the Great Lakes region. The Great Lakes actions call for a Great Lakes regional subportal to be created within the Canadian Centre for Climate Services portal. This could be extended to the Saint Lawrence region. The Centre mentioned above could advise on the creation of this subportal.

2.2 Improve beaches quality by cleaning up untreated sewage and other sources of bacteriological contamination

Context in each region

There are many more beaches on Great Lakes shorelines than on the St. Lawrence. The regulatory regime to ensure beaches quality has been in place for years in Ontario, whereas Quebec lacks a regulatory framework for beaches management and quality. The problem identified in the Great Lakes region was the number of beaches that experience chronic bacteriological contamination. Up to 20% of all beaches post a public health advisory repeatedly during the swimming season as a result of contamination, including untreated wastewater following heavy rainfall. Another significant concern was the outdated approach to testing and notifying the public of beaches quality. For St. Lawrence stakeholders, establishing a robust regulatory framework to encourage the opening and proper maintenance of beaches is a main objective. This would facilitate greater access to St. Lawrence shorelines.

Common Ground

Both the Great Lakes and St. Lawrence actions include a reorientation of beach quality management towards a risk-based approach, whereby beaches would be monitored, and categorized. Those beaches with chronic bacteriological contamination over several swimming seasons would be declared 'impaired' and their owners or operators would be required to track the sources of the contamination and take actions to mitigate them.

Key Differences due to context

Key differences are due to differences in the current regulatory regime in Quebec compared with Ontario, as well as the limited access points in the St. Lawrence basin.

Given the current absence of regulatory authority, the St. Lawrence actions call for a whole new regime to ensure beaches quality, including a new risk-based regulation, a new water quality data and monitoring protocol, a best practices guide, and public awareness campaign.

Reflecting the large percentage of wastewater that receives only primary treatment in Quebec, St. Lawrence actions call on the Quebec Government to provide financial assistance to municipalities for upgrades to wastewater treatment plants identified as sources of bacteriological contamination at nearby beaches. This could be combined with recommendations on upgrading treatment to remove toxics in Quebec, to take advantage of a generational opportunity as municipalities upgrade their systems to comply with the federal wastewater effluent regulation.

Recommended actions that may be adopted in both regions

The Great Lakes actions provide greater specificity with regard to requirements under the risk-based system, including frequency of testing and contamination source-tracking required based on beach quality. Those beaches deemed 'impaired', that have chronic contamination issues, would be required to track the source of contamination and take action to eliminate the source of contamination.

The Great Lakes actions also call for the modernization of testing methods to reduce the lag in testing and public notification to hours rather than days.

These recommended actions would be of benefit to the Saint Lawrence and could be integrated into the new regulatory regime for beaches quality proposed under the Saint Lawrence actions.

2.3 Eliminate harmful algal blooms by reducing phosphorus in agricultural and urban runoff entering waterways

Context in each region

The western end of Lake Erie has experienced repeated algal blooms that have impacted aquatic ecosystems and drinking water sources. Canada's contribution to phosphorus entering western Lake Erie comes primarily from the Thames River and the Leamington tributaries. The St. Lawrence river has experienced hypoxia zones that impact the aquatic ecosystem and fishing. The Collaborative has identified 11 priority zones within the St. Lawrence watershed. In addition to phosphorus, excess nitrogen is also a concern, as it has a greater impact in creating hypoxia zones in the marine or salt water section of the St. Lawrence basin. The need to combine efforts to reduce phosphorus and pesticide loss was considered a priority in the St. Lawrence region.

Common Ground

Both the Great Lakes and St. Lawrence actions include the establishment of research centres to bring together expertise and information on agricultural conservation to support best practices. Such research and expertise would provide consistent, well researched information to agricultural extension teams that would be established, with expertise in best practices and technologies to reduce phosphorus loss from agricultural lands and/or remove phosphorus from runoff before it enters waterways.

Key Differences due to context

Notably, the St. Lawrence recommended actions address phosphorus, nitrogen and pesticides, whereas the Great Lakes actions are focused exclusively on phosphorus reduction. The St. Lawrence actions also do not identify urban runoff as a significant enough source of phosphorus to warrant specific actions. In contrast, the Great Lakes actions call on municipalities that are identified as significant sources of phosphorus to adopt a stormwater plan to reduce phosphorus runoff.

Recommended actions that may be adopted in both regions

The Great Lakes actions call for a data management strategy that would facilitate the use of data sets in GIS based platforms to precisely identify which properties are likely to contribute the most phosphorus, and direct financing and technical support to these properties. A strategy that ensured the availability of data and the use of innovative data platforms would also be of great use in the St. Lawrence region.

The Saint Lawrence actions call for changes to current agricultural income support and technical programs to incorporate payment for ecosystem services, green infrastructure and other measures to support water quality and reduce phosphorus and pesticides in run off. Although programs differ in Ontario for the Great Lakes, financial support for these types of activities would also be welcome, either directly through Ontario income support and technical programs, or through the Canadian Agricultural Partnership (CAP) or equivalent federal-provincial funding mechanisms.

2.4 Reduce our exposure to toxics and other harmful pollutants

Context in each region

Both the Great Lakes and St. Lawrence regions have concerns with toxics and other harmful pollutants in waterways, coming from industrial and municipal sources, as well as from products. Given that over half of wastewater effluent is only subject to primary treatment, there was greater concern with toxics in treated wastewater effluent in the St. Lawrence region. As a result, there was greater emphasis on upgrading municipal wastewater treatment in the St. Lawrence region, whereas there was more emphasis placed on preventing toxics from entering the wastewater stream in the Great Lakes region.

Common Ground

Both the Great Lakes and St. Lawrence actions call for the Federal Government to establish a targeted environmental and human health effects biomonitoring and surveillance program to provide early detection of effects. They also both call for greater support for the development, use and promotion of toxics substitution in products as a means to prevent toxics and harmful pollutants from entering waterways through products like personal care products, cleaning products, and pharmaceuticals, among others.

Key Differences due to context

The St. Lawrence actions put a greater emphasis on wastewater treatment as a means to remove toxics entering waterways, calling on federal and provincial treatment standards to be strengthened, including the addition of total nitrogen discharge limit, and funding for testing innovative treatment technologies

The St. Lawrence actions call on the Government of Canada to broaden the scope of the Canadian Environmental Protection Act (CEPA) to eliminate toxics, by reviewing the evaluation and approvals process for new substances. During Great Lakes discussions, it was felt that recommended actions could be achieved within the existing legislative framework.

Recommended actions that may be adopted in both regions

The Great Lakes actions call for guidelines on the generation and communication of surveillance data to affected communities, with particular emphasis on those indigenous communities affected by historical or industrial pollution. Guidelines for the co-development of data generation and communication with communities should also be considered in Quebec.

The Great Lakes actions call for the establishment of a Centre for Chemical Substitution and a chemical substitution recognition program, modelled on similar initiatives in the U.S. The St. Lawrence actions also prioritized chemical substitution. The St. Lawrence region would benefit from the expertise and guidance from such a Centre as well as a recognition program.

In addition to the recommendations in the two Action Plans, the Expert Panel also identified further research and action on the impacts of road salts on aquatic organisms as a priority under the Toxics and Harmful Pollutants issue area.

3. NEW INSTITUTIONAL ARRANGEMENTS AND APPROACHES NEEDED TO DELIVER ACTION PLAN 2020-2030

The Great Lakes and St. Lawrence is a vast and complex ecological region whose waters alone cover 1.6 million km^2, roughly equivalent to the surface area of France, Germany, Italy, the UK and Spain combined. Across this enormous canvas, a patchwork of government investments, policies and actions across Federal and Provincial departments and local activities in First Nations communities, at the watershed level, by municipalities and many stakeholders, make up a fractured approach to environmental protection. Efforts to put in place institutional arrangements to link federal and provincial commitments through to those on the ground have been chronically under-resources, including the Zones d'intervention Prioritaires (ZIPs) in the Saint Lawrence region, and the Remedian Action Plans in each Area of Concern in the Great Lakes region.

The limited ability of this existing fractured and under-resourced approach to address the complexity of problems facing the region is exacerbated by the impacts of climate change, that are hammering shoreline communities, bringing intense rainfall and snowmelts that cause combined overflows and increased agricultural and urban runoff, and generally worsen the impact of diffuse pollution sources.

Tackling the complexity of this vast ecoregion in the era of climate change with existing institutional arrangements and management will only enshrine the weaknesses of the current approach. Delivering Action Plan 2020-2030 necessitates a purpose-driven approach like the one that enabled the Collaborative to be successful in securing the voluntary participation of hundreds of experts from different organizations in the preparation of the Great Lakes Saint-Lawrence Action Plan 2020 – 2030. It also needs to be principle-led to guide decisions and actions. Finally, it needs to be performance-based with direct accountability to ensure that investments are made wisely and that they are managed to bring their intended benefits. Only with such a new management 'playbook' can we ensure that the Collaborative's ambitious results are achieved.

This section outlines elements of a new approach that is needed to deliver Action Plan 2020-2030. This new approach is based on:

i. New institutional arrangements to drive alignment across government departments and across governments, First Nations, and ultimately with those who are impacted at the local level.

ii. A risk-based approach that prioritizes actions and resource allocation across the Region's enormous geography while using risk management to avoid impacts in the future.

iii. Research-intensive innovation using emerging technologies, digital applications, and best practices (AI, big data, genetics, precision conservation, etc.) that is made relevant to those impacted and communicated locally through technical assistance.

iv. Monitoring and evaluation to measure and report publicly on progress.

3.1 Institutional Arrangements to drive alignment

As noted in the report 'Water Security for Canadians', water management in Canada is fractured, with First Nations, shoreline communities and conservation organisations trying to cope with overwhelming water management problems at the local level that at times originated many kilometres away, and for which they lack the authority, capacity, knowledge or resources to address them.

The continuing exposure of residents to toxic pollution in Aamjiwnaang First Nation near Sarnia that is documented in Great Lakes Action Plan 2030, painfully illustrates the fractured approach to human health and environmental protection in First Nation communities, and the failure of governments to align their efforts to decisively address the problem.

The UN Special rapporteur on Human Rights and Toxics, Mr. Baskut Tuncak, who investigated environmental contamination in Aamjiwnaang First Nation in 2019, concluded that Canada showed a 'blatant disregard for Indigenous rights' in its handling of toxic chemicals and industrial discharges, and called on the federal government to improve the speed with which it responds to situations where indigenous peoples are disproportionately exposed to pollutants.

The Action Plan makes specific recommendations that call for intergovernmental protocols to more effectively address exposure to pollution that would require federal and provincial authorities to commit to timely action to address the sources of pollution, clarify their respective roles and responsibilities, and involve and communicate with affected communities, throughout the process.

Alignment is needed with respect to actions ***and*** budgets to achieve shared desired outcomes. Alignment will create coherence in the work across federal departments, in the coordination of effort between federal, indigenous, and provincial governments, and in meeting the needs of those impacted at the local level.

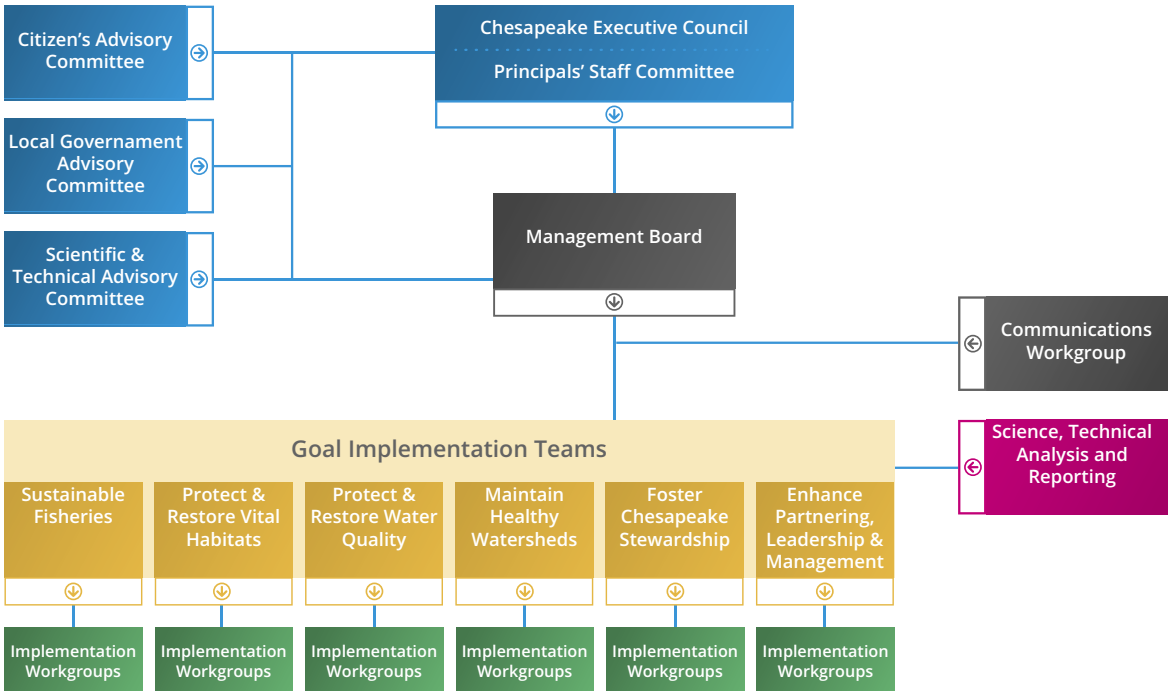
To be clear, the alignment contemplated here does not mean that the Federal Government takes over water management in the Great Lakes St. Lawrence region. Rather, it requires that the resources and expertise available through the Government of Canada are deployed in a more coordinated and integrated way and reflect the needs of indigenous and other communities on the ground. Quebec and Ontario must remain the leads in water management except for those areas of exclusive federal or Indigenous jurisdiction (e.g. toxics assessment and regulation) and for those policies and targets that are associated with binational or international agreements that are negotiated by the Federal Government.

To provide the support needed to address these challenges, alignment is needed at four levels:

a. Across the 20 federal departments and agencies with shared responsibility for water management

b. Across all orders of government, federal, provincial and municipal

Figure 1. Organizational Structure of the Chesapeake Bay Program



c. At the local level, with municipalities, the Zones d'Intervention Prioritaires (ZIPs),watershed and conservation organisations and other community-based organisations, and impacted residents and businesses.

d. With indigenous councils, communities and organisations

To conceive of a governance structure that could create this alignment, the Collaborative drew inspiration from five large scale regional water management programs in Canada and the U.S., the Great Lakes Restoration Initiative (GLRI) Chesapeake Bay program Partnership, Puget Sound Partnership, the Fraser Basin Council, and Everglades Restoration Working Group. In recognition of the fractured nature of management over a large and complex geography, each of these governance structures integrates the work of multiple parties across jurisdictions, and directly connects the national or regional administration to local government and key constituencies on the ground.

In the case of the GLRI, the most analogous program, all Great Lakes federal funding is coordinated across federal departments through an interagency taskforce. This authority and alignment over Great Lakes protection was achieved through a Presidential order, that brought 11 federal departments together to deliver the Great Lakes Restoration Initiative program. Executive Order 13340, '***Establishment of Great Lakes Interagency Task Force and Promotion of a Regional Collaboration of National Significance for the Great Lakes'*** signed by President George W. Bush in 2004 created the Great Lakes Interagency Task Force (IATF). With representation from all eleven federal departments, the US Environmental Protection Agency (EPA) was charged with chairing the IATF. Congress passed a law putting EPA in charge of coordinating implementation and funding.

The Chesapeake Bay program's governance structure is particularly instructive in the way that it coordinates and integrates activities across the federal government, 3 states (Maryland Virginia, Pennsylvania) and the District of Columbia. The partnership also brings together academic and local watershed organizations to build and adopt policies that support Chesapeake Bay restoration. It also connects the federal and state level action with actions on the ground through implementation teams.

The question of the authority invested in any new institutional arrangement is one that requires careful consideration, in a way that is sensitive to the existing rights of indigenous peoples, the leading role of provinces in water management, and existing intergovernmental arrangements for water management under the Great Lakes Water Quality Agreement, the St. Lawrence Action Plan and the Canada-Ontario Agreement respecting Great Lakes.

Some Great Lakes specific governance structures can offer some solutions in this regard. Two treaty-based organisations, the International Joint Commission and the Great Lakes Fishery Commission, were created to establish working arrangements across jurisdictions to manage specific water-related issues. In the case of the International Joint Commission, in addition to its responsibilities in preventing and resolving transboundary water disputes, it has specific authority with respect to regulating the water levels and the flow of water through dams at Sault Ste Marie and Cornwall. The Great Lakes Fishery Commission is responsible for establishing working arrangements amongst a number of agencies to control the proliferation of sea lamprey and other invasive species in the Great Lakes. These Commissions, with limited authority on issues assigned to them by governments, could serve as models for the limited authority bestowed to institutions set up to deliver the Great Lakes St. Lawrence Action Plan.

Learning from these models, new institutional arrangements to ensure integration, alignment and limited authority are proposed in Section 4.

3.2 Evidence driven risk-based prioritization and risk management

In a world with diffuse sources of pollution, from agricultural and urban runoff, long range air pollution, pharmaceuticals and other products, combined with limited resources to address them, we must focus our efforts where evidence shows that there is greatest risk.

Regulators need to adopt a risk-based prioritization or a risk-based targeting approach to address sources of pollution and climate impacts. This approach to prioritizing action must be steeped in evidence and risk assessment that identifies and manages sources of pollution that cause the greatest environmental degradation or have the most negative impacts to human health, preferably on a geographically specific basis.

The digital revolution has made prioritization based on evidence and risk increasingly precise and publicly accessible, with the development of more sophisticated modelling, real-time remote sensing, and GIS based platforms that can synthesize massive amounts of data to pinpoint specific sources of pollution. In the case of reducing phosphorus loss from agricultural lands, this approach goes beyond priority watersheds (where programs are currently focused) to the micro scale of individual properties using GIS based data platforms.

A parallel aspect to the risk-based approach is the importance of risk management to reduce risk. By using evidence-based risk management methodologies, we can prevent impacts and avoid costs in the future.

Creating this type of data-dependent risk-based prioritization and risk management framework to guide water protection interventions requires the modernization of data systems, greater access to data, including some of which that are currently considered proprietary, and a new data management strategy. Data and information gathering must also include the involvement of those impacted, and timely communication of information to the interested public. This will require significant investments in data gathering (modelling, testing, monitoring), data management systems and data sharing and access protocols.

Information Strategy to Support Risk Based Prioritization

NUTRIENTS	BEACHES
GIS based agricultural conservation platforms to identify high phosphorus loss properties to prioritize technical assistance and resources	Centralised portal with beaches testing results to identify chronically impaired beaches that require action
TOXICS EXPOSURE	**CLIMATE RESILIENCY**
Aquatic surveillance program to locate priority areas with evidence of effects of human and ecosystem toxics exposure	LIDAR, floodplain mapping, modelling to identify priority zones, communicate risk to shoreline communities

By prioritizing interventions where and when the evidence shows that there is greatest risk, we can deliver results and save money that is otherwise inefficiently deployed through broad but unfocused interventions.

3.3 Purpose-Oriented Research and innovation to inform locally relevant technical assistance

There is tremendous knowledge and expertise available through academic institutions, research centres and amongst outreach and extension professionals that must be harnessed and directed to benefit local efforts to address the challenges identified in Action Plan 2020-2030.

Unfortunately, there is a lack of coordination with respect to innovation and technical assistance that is accessible to local communities, agricultural enterprises and small businesses.

The need for centres of knowledge directly linked to technical assistance teams was identified in three of the four Action Plan areas.

These centres would provide invaluable information and advice at the local level that would:

- Provide impartial advice independent of commercial interests;
- Harness expertise of academic research and translating it into practical hands on advice;
- Ensure consistency of advice across decentralised sectors, including thousands of farms, hundreds of municipalities, and hundreds of manufacturers; and
- Relay information through existing Great Lakes, St. Lawrence and watershed organisations, including ZIP committees, agro-advisory groups, etc.

There are three important aspects to this vital function that must work hand-in-glove

i. Purpose-oriented research and innovation,

ii. Training of researchers and technical outreach professionals, and

iii. Locally relevant technical advice and outreach.

The purpose-oriented research and innovation program would address specific challenges identified in the Great Lakes and St. Lawrence Action Plans, including removal of nutrients from agricultural and urban runoff, agricultural best practices to retain nutrients on the field, proactive surveillance of exposure to toxics and other harmful pollutants, substitution of toxics in products, climate adaptation and building resiliency along shorelines, and advanced treatment of wastewater and stormwater.

This work would be undertaken by the centres recommended in the Action Plan. The second component is to connect this research and knowledge to locally-relevant technical assistance on the ground. This type of extension work requires the recruitment and training of extension experts who can foster trusting relationships with their client base on the ground. This could include existing organisations with established relationships on the ground, such as ZIPs or conservation authorities.

Training and education to support both the research and innovation side and technical outreach side of the equation is essential. This would require dedicated programs at key academic institutions and training for technical assistance teams to ensure the generation and transmission of up-to-date and consistent advice as well as succession planning over time.

Purpose Oriented Research and Innovation and Locally Relevant Technical Assistance

CLIMATE RESILIENCY	TOXICS EXPOSURE	NUTRIENTS AND ALGAL BLOOMS
A joint climate adaptation and resiliency centre as well as shoreline priority shoreline zone management teams to help shoreline communities with professional services and expertise.	A Toxics Substitution Centre to undertake research and with the capacity to work directly with companies on substituting harmful substances in products	A Centre for water quality and nutrient management with trained technical assistance teams to work with farmers

Funding purpose-oriented research and innovation and making it available at the local level through direct extension support would have a transformative effect on the ability of indigenous communities, municipalities, conservation and watershed organisations, agricultural operations, and other small businesses to contribute to building climate resiliency and protecting water resources.

3.4 Monitoring and evaluation

The implementation of Action Plan 2020-2030 must strive for continuous improvement. This requires an investment in monitoring and evaluation, and in the public reporting of results.

Having clear objectives, principles and indicators that measure progress is essential in the context of a collaborative approach that involves numerous government and non-government organizations in the implementation of recommendations. Objectives, principles and indicators provide directions and guide decision-making.

In order to evaluate progress, each recommended action in Action Plan 2020-2030 will need:

- Targets or anticipated outcomes for tri-annual environment results for 2023, 2026, 2029;
- Environment baseline indicators to track progress.

The results from this monitoring and evaluation activity should be communicated publicly through

- Annual reports that are submitted to the Great Lakes and St. Lawrence Collaborative Commission by the implementation teams;
- An annual report submitted by the Great Lakes and St. Lawrence Collaborative Commission to the federal government;
- A bi-annual meeting of stakeholders, various government organizations and First Nations organised by the Great Lakes and St. Lawrence Collaborative Commission to present results, share experiences and further a community approach in the management of a shared ecosystem, with meetings alternating between Ontario and Québec;
- Develop and populate a dashboard to communicate results on outcomes and outputs (live).

Furthermore, to establish accountability to the public, it is proposed that Action Plan 2020-2030 be periodically (every 2-3 years) audited by

- The Commissioner for Environment and Sustainable Development (federal) for the overall plan;
- The Auditor-General (Ontario) for the Great Lakes region;
- Commissioner for Sustainable Development (Québec) for the Saint Lawrence region.

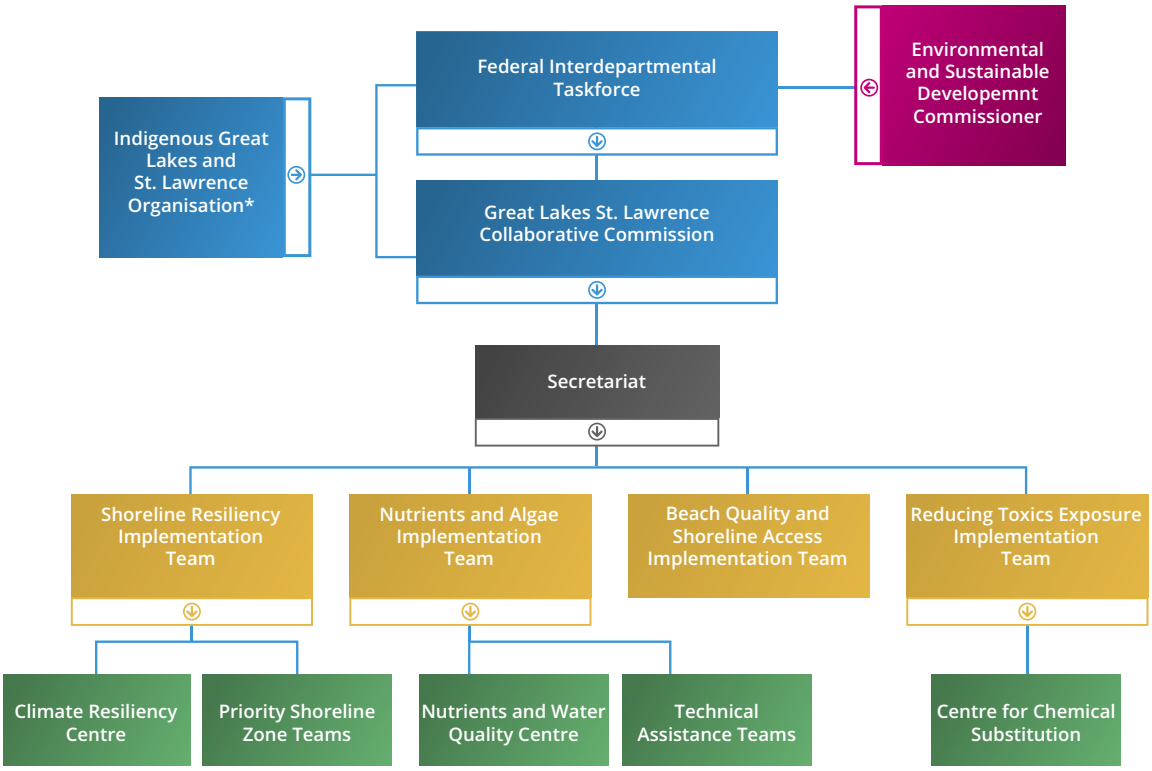
4. IMPLEMENTING ACTION PLAN 2020-2030

To implement Action Plan 2020-2030, the following institutional arrangements, roll-out plan and investment strategy is proposed.

4.1 Great Lakes St. Lawrence Action Plan 2020-2030 Institutional Arrangements

As explained in Section 3, new institutional arrangements are needed to overcome the current fragmented approach, to integrate Great Lakes St. Lawrence protection, align federal actions and funding across departments, and connect federal and provincial action to indigenous and other key constituencies to make it locally relevant.

Integrated Great Lakes St. Lawrence Institutional Arrangements to Deliver Action Plan 2020-2030



* Institutional arrangements involving indigenous groups will be determined following further consultations with Great Lakes and St. Lawerence indigenous groups

Great Lakes St. Lawrence Collaborative Commission

There is currently no cross-cutting forum or institutional structure within which to coordinate Great Lakes-St. Lawrence issues together. The Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health (COA) and the Saint Lawrence Action Plan (SLAP) are planned and implemented entirely separately, despite the ecological connection and shared economic significance of the waterways. This lack of cross-cutting coordination and knowledge sharing was one of the primary motivations to undertake the Great Lakes St. Lawrence Collaborative. Any institutional structures that are established or built upon to deliver the Great Lakes St. Lawrence Action Plan must undertake this work with an approach that promotes regional integration.

To coordinate and align actions across the Great Lakes and St. Lawrence regions, it is proposed that a Great Lakes St. Lawrence Collaborative Commission be created. This Commission would be an eight person Commission, half from the Great Lakes and half from the St. Lawrence regions respectively. Commissioners would be chosen from key constituencies in the Region, including indigenous, business (e.g. maritime, agriculture),

conservation and climate resiliency, science/engineering/academia, municipal and NGO/civil society. Federal, Quebec and Ontario Government officials would be invited to attend as observers. A representative from the US Federal Interagency Taskforce would also be invited as an observer to consider synergies with the US GLRI program.

The mandate of the Great Lakes St. Lawrence Collaborative Commission would be to:

- Oversee the implementation of the Great Lakes St. Lawrence Action Plan,
- Work with the Federal Taskforce to secure funding to implement the Action Plan,
- Facilitate working arrangements among responsible agencies to deliver the Action Plan,
- Recommend to the Federal Government new issues to add to the Action Plan on a periodic basis,
- When a new issue is assigned to it by the Federal Government, convene and oversee a new issue table to develop recommended actions to address the new issue,
- Review progress towards desired outcomes, consider adapting recommended actions to changing circumstances.

The Commission would be co-chaired by two representatives from the Great Lakes and St. Lawrence regions respectively. They would be appointed to 5 year terms by the Minister of Environment and Climate Change. The Commission would meet quarterly, and would be supported by a secretariat.

Federal Great Lakes St. Lawrence Taskforce

At the federal level, alignment of budgets and actions is needed across 20 departments and agencies with responsibility for water management. The primary departments that should be involved in a Federal Great Lakes St. Lawrence Taskforce include Environment and Climate Change Canada, Health Canada, Natural Resources Canada, Agriculture and Agrifood Canada, Infrastructure Canada, Public Safety Canada, Global Affairs Canada, Indigenous and Northern Affairs, Transport Canada, Fisheries and Oceans Canada, Heritage Canada and Treasury Board.

It is proposed that the GLRI Interagency Taskforce serve as a model for the Canadian federal government to drive interdepartmental alignment on Great Lakes and St. Lawrence protection.

The federal Great Lakes St. Lawrence Taskforce's mandate would be:

1. To advance collaboration across federal government departments and with Great Lakes and St. Lawrence Collaborative Commission in support of the Great Lakes St. Lawrence Action Plan 2020-2030;
2. To coordinate the development of coherent Federal policies, strategies, projects, and priorities for addressing those issues identified in the Great Lakes and St. Lawrence Action Plan and assisting in the appropriate management of the Great Lakes and St. Lawrence system;
3. To allocate federal funding across departments and federal funding to specific projects of Action Plan 20202-2030 through Great Lakes and St. Lawrence Collaborative Commission.
4. To negotiate shared financing of aspects of the Action Plan with the Governments of Quebec and Ontario.
5. To consider recommendations of the Commission for new issues to add to the Great Lakes St. Lawrence Action Plan 2020-2030, and approve, deny or request further information of the Commission.

The Taskforce would be co-chaired by the Federal Minister of the Environment and the Federal Minister of Infrastructure. It would meet twice a year.

Indigenous Great Lakes St. Lawrence body

To coordinate and align actions with First Nations and Metis Councils, it is proposed that an Indigenous Great Lakes and St. Lawrence organisation be created. The structure must be mindful of the pre-eminence of the direct government to government relationship between indigenous peoples and the Federal Government, as well as the Crown's duty to consult. This suggests a number of options, whether it be a direct relationship with the Federal taskforce, an advisory role to the Great Lakes St. Lawrence Collaborative Commission, or another institutional arrangement. Rules, responsibilities and authority of this organisation will be explored through consultation with indigenous groups in the Great Lakes St. Lawrence basin, and ultimately agreed to through negotiations between indigenous representatives and the Federal Government.

Issue-specific Implementation Teams

To coordinate delivery of programs and funding on the ground, it is proposed that four issue-specific implementation teams be created in the four areas outlined in the Great Lakes and St. Lawrence Action Plans:

i. Shoreline climate resiliency

ii. Nutrients and algae

iii. Beaches quality and shoreline access

iv. Exposure to toxics

These implementation teams would include representation from the federal government, Quebec and Ontario government representatives, as well as representation from local and regional municipalities, and existing St. Lawrence, Great Lakes and local watershed organisations. Economic sectors associated or dependent on the regional water systems would also be represented on the implementation teams.

It should be noted that neither the Commission nor the implementation teams are meant to replace the work of existing government programs, but rather are meant to supplement and assist these programs in linking the programs with local needs by engaging local stakeholders, communities, and academic and technical expertise.

To that end, implementation teams should work through existing regional and local organisations and programs. It is vital that Governments maintain and increase financial support of those regional initiatives that have demonstrated their local efficiency such as Stratégies Saint-Laurent and the Zones d'Intervention Prioritaires (ZIP) Program under the St. Lawrence Plan.

Other important organisations with which the implementation teams should work include Organismes des Basins Versants, the tables de concertations established by the Quebec Government to promote integrated management of the St. Lawrence, and Conservation Authorities in Ontario. Other conservation groups and NGOs active on the ground may also be invited to work with the implementation teams. These may include Nature Conservancy Canada, field naturalist organisations, ALUS Canada, Ducks Unlimited, Forest Ontario, among others.

The mandate of the implementation teams would be to:

- Coordinate funding and programming to meet local needs
- Monitor and report on progress on outputs and outcomes
- Support and steer watershed initiatives
- Review and approve workplans to implement the action plan
- Communicate and consult with stakeholders
- Link local needs with academic and technical expertise

Three of the four implementation teams would be supported by research centres and technical assistance teams as outlined in the organisational chart above.

4.1.1 Assigning New Issues

The Great Lakes Action Plan 2020-2030 is focused on four important issues that have been identified as requiring alignment and new institutional arrangements to be addressed effectively.

The Great Lakes and St. Lawrence Collaborative Commission will have the authority to recommend new issues to the federal taskforce for its consideration. Three new issues already identified by the Expert Panel include i) the protection of biodiversity in the Great Lakes St. Lawrence region, ii) the operations of nuclear facilities and the storage of low level, intermediate and high level nuclear waste in the Great Lakes St. Lawrence basin, and iii) long term impacts of exposure to road salt on sensitive species such as crustaceans.

The protection of biodiversity has a number of important aspects that would need to be considered. The question of relative species abundance and the protection of endangered species across the Great Lakes St. Lawrence region is an acute concern. Habitat degradation, particularly the hardening and development of shorelines and the destruction of wetlands is devastating spawning areas. The introduction of invasive species, including Asian Carp, zebra and quagga mussels, among others, continue to threaten aquatic species and the health of the waters. Climate change impacts, including warming waters, more intense polluted runoff, among other impacts, is exacerbating all of these pressures. The economic, social and cultural significance and value of biodiversity must also be recognised.

The issue of activity of nuclear facilities within the Great Lakes St. Lawrence basin is also of great concern. This includes existing and newly proposed operations of nuclear facilities within the Great Lakes St. Lawrence watershed. The ongoing question of nuclear waste storage, both low and medium level waste and high level waste, remain unresolved, resulting in aboveground stockpiles. The potential impact of these activities requires an aligned and coordinated response.

A third issue, the concentration of chloride harming aquatic organisms in wetlands and tributaries to the Great Lakes and St. Lawrence from the application of road salt, was recently highlighted in the Ontario Auditor General's report. Chloride from road salt is transported more easily than sodium, and accumulates in wetlands and streams near roads. During periods of snowmelt, concentrations of chloride have been found to greatly exceed the Canadian water guidelines for chronic and acute exposure to chloride (120mg/litre and 640mg/litre respectively). The Ontario auditor general found that road salt studies in Ontario and across North America show the problem is widespread and getting worse. While this issue should be championed under the Toxics and Harmful pollutants recommended actions in terms of proactive surveillance, testing and reporting, there is also a need for a long term study of the impacts of road salts on aquatic organisms in various parts of the Great Lakes and St. Lawrence basin, particularly crustaceans and amphibians including salamanders and frogs. Chloride is known to be harmful to these organisms because it affects the way they can regulate the uptake of salt into their bodies.

It is recommended that the Government of Canada, in collaboration with the Governments of Quebec and Ontario, establish the institutional arrangements outlined in this report. The institutional arrangements will be free standing, but may be integrated into the Canada Water Agency once it is established.

> **It is further recommended that** the Government of Canada request the federal Commissioner of Environment and Sustainable Development to undertake a performance audit of Action Plan 2020-2030 every 2-3 years and report its findings to Parliament.

It is recommended that the Great Lakes St. Lawrence Collaborative Commission regularly review progress towards desired outcomes, consider adapting recommended actions to changing circumstances, and recommend new issues to add to the Action Plan, including biodiversity, nuclear operations and waste, and road salts.

4.2 Implementation Roll Out Plan and Investment Strategy

In order to ensure that the Action Plan 2020-2030 is implemented in a timely manner, the following Roll-out Plan and Investment Strategy is proposed, with dates assigned to each of the 30 recommended actions.

The needed investment indicated is new funding, unless otherwise indicated. Only the Federal share is included. No figures are provided where the responsible parties are provincial governments only. Cost sharing with provincial governments, First Nations and municipalities should be sought where indicated.

For those recommendations where First Nations and other shoreline communities are specifically identified, further consultation will be needed to ensure that the needs of each community is met.

Date	Action	Responsible Party	Federal Share only, over ten years
Commit to Implementation of Great Lakes St. Lawrence Action Plan 2020-2030			
2020	1. Commit to implementation of the Great Lakes St. Lawrence Action Plan 2020-2030 and a 10-year $2 billion investment strategy.	GOC	
2020	2. Establish institutional arrangements including a Federal Interdepartmental taskforce, a Great Lakes St. Lawrence Collaborative Commission, an indigenous body (to be determined following consultation) , implementation teams, and supporting research centres and technical assistance teams. Request to Environment and Sustainable Development Commissioner to report on progress every 2-3 years.	GOC	$50M
2021	3. Regularly review progress towards desired outcomes, consider adapting recommended actions to changing circumstances, and recommend new issues to add to the Action Plan, including biodiversity, nuclear operations and waste, and road salts.	GLSL Collaborative Commission	
Build Shoreline Climate Resiliency			
2020	4. Commit to establishing and funding five Shoreline Resiliency Priority zones and management teams to identify and address significant threats from climate change (high water levels, stronger wind/ wave energy, erosion, sudden spring thaws, ice jams) impacting natural and built infrastructure on Great Lakes shorelines, with an emphasis on naturalization and green infrastructure solutions, beginning with five shoreline priority zones 5. Offer ongoing guidance and funding (on a competitive basis) to all shoreline municipalities and Indigenous communities to support actions to make their shorelines more climate resilient	GOC, ON	$330M + existing funding program commitments (e.g Disaster Mitigate and Adaptation Fund). Seek cost sharing on 40% federal / 40% provincial / 20% municipal basis.

Date	Action	Responsible Party	Federal Share only, over ten years
2021-2024	6. Establish a joint Office of Shoreline Climate Change Adaptation and Resilience (2022), to a. Develop a regional shoreline adaptation and resiliency strategy and provincial action plans (2023) and coordinate their implementation b. Report annually on progress with respect to shoreline adaptation and resilience c. Provide professional services and expertise to regional and local governments and First Nations (2021)	GOC, QC, ON	$38.5M Seek 1/3 federal 1/3 QC 1/3 ON cost share
	7. Facilitate the development and implementation and track progress of local climate adaptation and resiliency plans in the St. Lawrence region (2023), while • financing professional services in priority zones and extension services during and following a catastrophic event, including 5 First Nations: Abénakis (Odanak, Wôlinak), Huron-wendat (Wendake), Innus (Essipit, Pessamit, Uashat, Ekuanitshit), Mi'gmaq (Gespeg and Gesgapegiag) and Mohawks (Akwesasne, Kahnawake, Kanesatake) • review and revise financial assistance programs to include education and awareness programs.		$500M Seek cost sharing on 40% federal / 40% provincial / 20% municipal or First Nation basis.
2021	8. Invest further in the development of Light Detection and Ranging (LIDAR), flood plain mapping, and monitoring/modelling data to benefit shoreline communities	ON, QC	
2021-2023	9. Create a climate data sub- portal for Great Lakes and St. Lawrence shoreline priority zones within the Canadian Centre for Climate Services portal (2021-2023) 10. Ensure **access to climate change data and information (2021)** for local communities and support the development of information based on current and futures needs of communities.	GOC, QC, ON	$0.3M Seek 1/3 federal 1/3 QC 1/3 ON cost share

Date	Action	Responsible Party	Federal Share only, over ten years
2022	11. Develop an **ecosystem services payment program (2022)** for land owners in exchange for the deployment of ecosystem service measures on their land, particularly to support flood risk mitigation. 12. Support natural and green infrastructure solutions in land use and infrastructure management, particularly in developing a plan for land acquisition in underdeveloped zones.	GOC, QC	$5.5M Seek 50% federal, 50% QC cost share
Reduce Bacteriological Contamination of Shorelines, Beaches			
2022	13. Introduce a new risk-based categorization system for Ontario beaches, and require actions of owners of 'impaired' beaches that have chronic bacteriological contamination issues	ON, QC	$160M Seek cost sharing on 40% federal / 40% provincial / 20% municipal or First Nation basis.
	14. Develop and put in place a risk-based approach for the opening and operation of beaches on the St. Lawrence (2022) a. Including implementation of beach management plan in 5 First Nation communities : Gespeg, Gesgapegiag, Akwesasne, Kahnawake, and Kanesatake.		$33M Seek cost sharing on 40% federal / 40% provincial / 20% municipal or First Nation basis.
2023	15. Create and maintain a central portal with beach quality information, including information on the 'status' of the beach	ON, QC	
2022-2030	16. Provide financial support for wastewater treatment facility upgrades and the installation of green infrastructure to reduce the number of sewer overflows in priority sectors, remove emerging contaminants and support other measures proposed by beach operators in their beach plans.	GOC, QC	$400M Seek cost sharing on 40% federal / 40% provincial / 20% municipal or First Nation basis.
2023	17. Amend the Public Health Ontario's Public Beach Water guidance on test methods for E. coli to allow for alternate testing methods other than membrane filtration as per Ontario Ministry of Environment, Conservation and Parks (MECP) guidance on drinking water testing methods	ON	

Date	Action	Responsible Party	Federal Share only, over ten years
Reduce nutrients entering waterways			
	18. Adopt a targeted geographically specific approach to reducing nutrients entering waterways, employing precision conservation and stormwater optimization.	GOC, ON, QC	
2023	19. Establish a research centre supported by a university consortium and an interministerial committee to develop measures and provide extension support to farmers in 11 priority zones in Quebec , using agricultural conservation and living lab models to support farmers in adopting best practices. 20. Together with partner universities, Indigenous communities, and relevant organizations, create a Centre for Water Quality and Nutrient Management to generate and coordinate information to support precision conservation and stormwater optimization approaches in the Great Lakes and St. Lawrence Basin.	GOC, QC, ON	$80M Seek 1/3 federal, 1/3 QC, 1/3 ON cost share
2023	21. Develop a data management strategy and tools to support the precision conservation approach and to facilitate the collection and use of datasets (e.g. elevation, soil type, property boundaries, land use) needed to prioritize properties, and best practices, and to coordinate monitoring and modelling data at a watershed level.	ON, QC, GOC	$0.15M Seek 1/3 federal 1/3 QC 1/3 ON cost share
2023	22. Review and adapt agricultural income support and technical programs to reduce water contamination as well as technical assistance outreach to farmers, especially incorporating green infrastructure, payment for ecosystem services for landowners, a. Including support for changes in agricultural practices in 3 First Nations communities: Akwesasne, Kahnawake, and Kanesatake. 23. Designate a dedicated network of extension workers that receive standardized training and provide consistent technical advice to farmers	GOC, QC, ON	$300M Seek 50% federal, 50% provincial cost share $20M Seek 50% federal, 50% provincial cost share

Date	Action	Responsible Party	Federal Share only, over ten years
2025	24. Where subwatershed modelling and monitoring identifies urban areas as significant contributors of phosphorus loading, require the relevant municipalities in consultation with conservation authorities to develop an urban stormwater optimization/prioritization plan with steps to achieve measurable phosphorus reductions	ON	
Prevent exposure to harmful chemicals			
2022	25. Review and strengthen the standards and upgrade the performance of existing wastewater treatment facilities for municipalities, businesses, and institutions. • carry out and finance small scale pilot projects to test innovative approaches, strategies and technologies • meet obligations under international conventions, particularly with respect to persistent organic pollutants. • amend wastewater treatment regulations to include a total nitrogen discharge standard.	GOC, QC	Included in investments under Rec. #16, above.
2024	26. Develop a targeted environmental and human health effects monitoring, human biomonitoring and surveillance program to provide early detection of unexpected effects in the Great Lakes basin that feeds directly into a regulatory and non-regulatory response plan to reduce exposure 27. Develop and implement a proactive program of targeted surveillance on human health and environmental effects and determine the priority zones where effects are most likely to be found, Including implementation of a human health and environmental surveillance program focused on 5 First Nations: Uashat Mak Mani-Utenam, Ekuanitshit, Nutashkuan and Unamen Shipu.	GOC	$120M $120M
2024	28. Broaden CEPA's scope to eliminate toxics, particularly with respect to authorizing the entry of new substances into the market	GOC	$0.25M

Date	Action	Responsible Party	Federal Share only, over ten years
2024	29. Develop guidelines to guide the generation and communication of data collected through the surveillance program and develop Guidance on the Appropriate Response to Exposure and Effects surveillance program data	GOC	$0.4M
2024	30. Introduce a Strategy to Promote Substitution of Harmful Chemicals in Products, including a Centre for Chemical Substitution, and a Chemical Substitution Recognition Program	GOC	$20.4M
TOTAL (Federal share over ten years)			**$2,178.50**

4.3 Investment Highlights and Economic Benefits

Based on a high-level assessment of investments needed to implement the Action Plan 2020-2030, it is estimated that the Federal share is in the order of $200 million per year for ten years. The investments would be unevenly distributed over the ten years, as per the proposed Roll Out plan and Investment Strategy, above.

Highlighting specific investments in two areas, shoreline resiliency and wastewater treatment and capacity upgrades serves to demonstrate the magnitude of the investments needed to implement the Action Plan 2020-2030. The investment strategy will require further refinement as the specific investments and projects are more clearly defined by the governments, First Nations, and communities involved. Further details may be found in the two foundation reports.

4.3.1 Shoreline Resiliency Investments

The first highlighted investment area is $840 million for shoreline resiliency work to mitigate climate change impacts in the St. Lawrence and Great Lakes basin. These could include flood and erosion protection measures along shorelines, appropriation of properties that are not able to be protected, and the transformation of these lands to a natural state, among other measures. The total cost of needed measures far exceeds the amount recommended in this investment strategy. The investment in Action Plan 2020-2030 is meant to accelerate ongoing work in a way that integrates the efforts of a number of authorities and the communities and residents involved. In doing so, the projects undertaken under the Action Plan will serve as templates for future shoreline work.

In the Great Lakes region, five priority zones are identified in the Action Plan. In three of the zones, the Lake Erie, Lake Huron, and Lake Ontario priority zones, adaptation and resiliency planning and projects are already underway. In the case of Fort William First Nation and Thunder Bay, there is a specific shoreline risk that needs addressing involving a contaminated sediment site and remaining remediation work that involves multiple federal and provincial agencies. In the case of the Georgian Bay zone, while there is no specific shoreline resiliency plan in place in Tiny or Penetanguishene, it would serve as an important case study to build resiliency before more severe impacts are experienced. The Action Plan recommends creating intergovernmental and interdisciplinary teams in each of the five zone to integrate financing and planning efforts, and to provide technical and financial assistance with planning and implementation of plans. Financial assistance would be provided to undertake the resiliency work identified in each zone's plans.

In the St. Lawrence region, the needs and the geographic scale of climate impacts are so great that the Action Plan recommends the development of a provincial strategy to guide resiliency planning and implementation, and creation of a centre to provide detailed climate information and technical advice. In terms of where to start this work, while the impacts are felt along hundreds of kilometres of shoreline from south of Montreal through to north of Quebec City, there are three zones that could be prioritized to demonstrate the benefits of an integrated approach due to the complexity of agencies and institutions involved, and the dire socio-economic impacts in failing to take action. These include the Montreal region (including consideration of the impact of the Outaouais river), the Quebec City region, and the region surrounding Lac St. Pierre.

First Nations communities along the St. Lawrence are particularly at risk, given the fractured response of governments and limited resources. Five First Nation zones have been identified in the St. Lawrence Action Plan 2020-2030, including the Abenakis of the Odanak and Wolinak, the Huron-Wendat of the Wendake, the Innus of the Essipit, Pessamit, Washat, and Ekuanitshit, the Mi'gmaq of Gespeg and Gesgapegiag, and the Mohawks of Akwesasne, Kahnawake and Kanesatake.

In terms of investments to mitigate the impact of erosion, the accelerating erosion in the St. Lawrence estuary and the Cote Nord region has been well documented. The Action Plan investments could be directed to one or two areas experiencing acute erosion in this region, such as Sainte Flavie north of Rimouski, and Pessamit, an Innu community north of Baie Comeau mentioned above.

In both the Great Lakes and the St. Lawrence region, it is anticipated that an aspect of integrated resiliency planning will include identifying specific areas where flooding or erosion are so severe that the only appropriate resiliency strategy is retreat and re-naturalisation. In these areas, the Federal and provincial governments will need to work with municipalities to appropriate properties while fairly compensating the municipalities and residents. These areas would then be naturalised, to allow for the free flow of water in expanded flood zones. These areas could be designated as federal or provincial parks and/or natural heritage areas to promote biodiversity and eco-tourism.

4.3.2 Wastewater Treatment and Capacity Investments

The need for investments in more effective wastewater treatment and expanded wastewater capacity was identified as a need in 3 of the 4 principal issue areas:

- to prevent bacteriological contamination from bypasses and combines sewer overflows during heavy rains that contaminate beaches and shorelines;
- to remove total nitrogen that contributes to areas of hypoxia in the Saint Lawrence;
- to more effectively remove emerging contaminants like pharmaceuticals.

Investments to install more effective treatment technology would benefit at least five treatment stations, in Montreal, Laval (2 stations), Longueuil, and Repentigny. These investments would be timely given that the municipal owners of these plants are currently considering designs to upgrade the plants to comply with the federal wastewater treatment regulation by the end of 2030. With additional funding, these plants could install treatment technology to go beyond compliance, to remove either total nitrogen and/or emerging pollutants such as pharmaceuticals, depending on the location. It is estimated that each treatment upgrade would require investments ranging from $100 million to $400 million, based on the size of the plant and the nature of the upgrade, for a total of about $1 billion in investment, which could be shared on a 40% federal, 40% provincial, 20% municipal basis. This would represent a $400 million investment commitment by the Federal Government.

Investments are also required to assist municipalities to eliminate bacteriological contamination caused by bypasses or combined sewer overflows that contribute to chronic contamination of beaches and shorelines. In Ontario, 15-20% of beaches have chronic contamination problems. Large cities like Toronto, Hamilton and Kingston are already investing multi millions of dollars to eliminate their combined sewer overflows (CSOs). For those smaller municipalities whose plants are found to be the source of bacteriological contamination of beaches, it is anticipated that they will need financial assistance to eliminate the source of contamination. It is proposed that $400 million be provided to accelerate work by big cities to eliminate CSOs, and to assist up to 15 smaller municipalities to increase their

sewage treatment and/or storage capacity at an estimated cost of $20 million each. With 40%/40%/20% cost share, that would represent an investment commitment of $160 million by the Federal Government.

It is recommended that the Government of Canada commit to $2.2 billion in new investments over ten years to implement the Great Lakes St. Lawrence Action Plan 2020-2030 and seek shared funding arrangements where required from the Governments of Quebec and Ontario and municipalities.

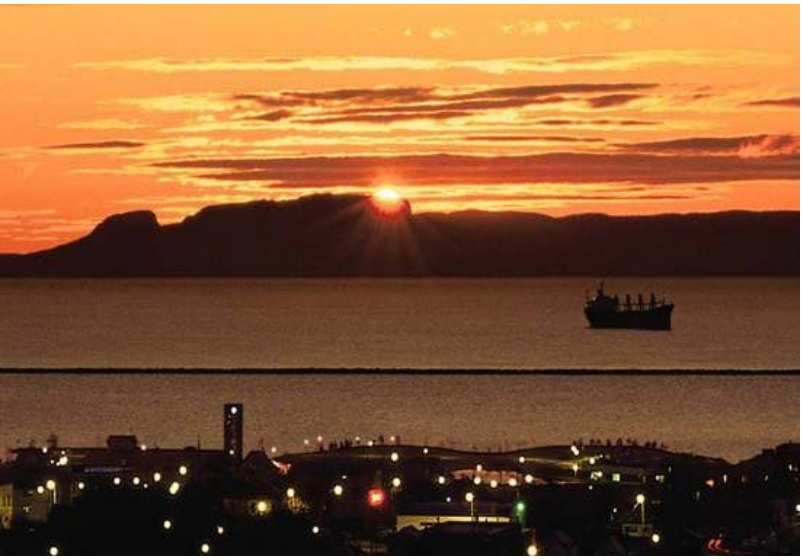
4.3.3 Benefits of Action Plan Investments

While it was beyond the scope of the Collaborative's work to conduct a comprehensive assessment of the multiplier effect of the proposed investments, a preliminary assessment revealed significant benefits, in terms of quality of life, revenue generation, avoided costs and employment generation.

These investments in Great Lakes St. Lawrence protection would reap considerable ecological, public health, economic, and lifestyle benefits. At a time when the region will be recovering from the economic impacts of the COVID-19 pandemic, employment generation effects would also be very attractive.

The economic benefits would largely be reaped based on increased employment due to construction and restoration activity and increased revenue from tourism and property values.

For example, based on Statistics Canada estimates, $500 million in shoreline construction costs would be expected to create upwards of 3,500 person-years employment, in the industries below and their supply chains, plus induced employment.



Person-years of employment (direct and indirect only) per $ million invested

Industry	PYE / $M
Engineering construction	6.82
Repair construction	11.47
Professional, scientific and technical services	9.53
Administrative and support, waste management and remediation services	13.96
Other federal government services	7.05
Other provincial and territorial government services	7.77

Source: Statistics Canada, "Provincial Input-Output Multipliers 2013", published 2017

As a comparator, a recent US study found similarly-scaled results. It noted a total of $1.4 billion in US federal spending on Great Lakes Restoration Initiative (GLRI) projects between 2010 and 2016 (matched by $360 million from state and local governments) and estimated that every dollar of federal spending will produce a total of $3.35 of additional economic output in the Great Lakes region through 2036, and that the GLRI created or supported an average of 5,180 jobs per year from 2010–2016.

Another US study with a larger focus on the overall economic impact of Great Lakes restoration estimated present-value economic benefits from implementing the Great Lakes Regional Collaboration Strategy at over $50 billion in long-term benefits; and between $30 and $50 billion in short term multiplier benefits.

The benefits of shoreline resiliency work include avoided costs, including preservation of residences, businesses, and public buildings, the value of which greatly exceeds the costs of protection (and the value of which increases due to the protection being added); prevention of potential

financial losses to property owners; and amenities to local residents and visitors, akin to that of existing conservation areas. A 2015 study by the climate change research consortium Ouranos suggested that anticipated costs of erosion in the Cote Nord and St. Lawrence estuary region alone could exceed $1 billion. A 2020 study by the World Resources Institute predicted that the costs of flood impacts in Canada could triple by 2030, from between US$2.4B – $6.6B.

Benefits of reducing human exposure to toxics and other harmful pollutants would include reduced toxics loading for humans and other species, lower costs of morbidity and mortality, lower health-care costs, and higher productivity (reduced productivity losses caused by illness). Recent studies show a reduction in productivity and a rise in health costs as a result of exposure to toxic substances. In the United States, health costs associated with toxics exposure have been estimated at US $340B per year, and US$217B per year for Europe, corresponding to 2.3% and 1.3% of gross domestic product respectively.

The primary benefits of reducing nutrient loss from agricultural land would include cleaner streams and shorelines, cost savings to agricultural operators due to more efficient phosphorus application, enhanced recreational and fishing uses of cleaner waterways, and the preservation of property values and tourism income for shoreline communities, among others.

Benefits of improved beach and shoreline quality would include avoidance of the costs of beach closures, which can be tens of thousands of dollars per day for a single beach, as well as avoidance of illnesses and associated costs, e.g. health care, loss of productivity. Based on a recent US study, in Ontario alone these avoided costs could be in the range of $96 million to $162 million per year. Other benefits would include resident convenience in using beaches, potential improvements in demand for businesses near beaches due to increased confidence in water quality.

These benefits suggest a significant return on investment from Action Plan 20202-2030, in terms of economic, ecological, human health, and quality of life improvements.

5. CONCLUSION

The Great Lakes and St. Lawrence Action Plan 2030, has been developed over the last eighteen months with the input of hundreds of experts, stakeholders, concerned citizens, and indigenous representatives. Together they have forged a common, integrated vision for Great Lakes and St. Lawrence protection over the next ten years.

To ensure the successful implementation of the Action Plan over the next ten years, new approaches and institutional arrangements are needed. This new approach must embrace alignment and integration of actions and investments, risk-based prioritization and risk management, intensive research and technical assistance, and monitoring and evaluation.

By adopting the implementation plan outlined in this report, including new institutional arrangements, the roll out plan, and the investment strategy, the Federal Government, with its indigenous, provincial and municipal partners, economic, watershed and local stakeholders, can embark on a new era of freshwater protection, one that will reap benefits in human and ecological health, nurture biodiversity, and contribute to the region's economic recovery.

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