PARKS+

A PROGRAM TO ACCELERATE AND SCALE UP NATURAL INFRASTRUCTURE IN CANADIAN URBAN CENTRES

Challenge Question: "How should Intact Financial Corporation actively engage the federal government in accelerating the conservation, protection and restoration of natural infrastructure in Canada?"

Max Bell School of Public Policy
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Please note that the opinions expressed in this report are those of the authors. They do not necessarily reflect the views of Intact Foundation, the Max Bell School of Public Policy, or the stakeholders consulted.

Executive Summary

As part of the Max Bell School of Public Policy's 2023 Policy Lab, Intact Financial Corporation presented the following policy challenge: ***How should Intact Financial Corporation actively engage the federal government in accelerating the conservation, protection and restoration of natural infrastructure in Canada?***

This is a timely question. In 2022 alone, floods, wildfires and storms caused $3.1 billion in insured damage alone, according to the Catastrophe Indices and Quantification Inc.[1] The evidence now indicates that the country will experience annual losses arising from extreme, climate-related weather events amounting to $25 billion (equal to 50% of Canada's projected GDP growth[2]) by the year 2025. Extreme weather events can cause catastrophic losses to households, communities, insurers, and governments at all levels. There is a need not only to mitigate climate change, but also to simultaneously adapt to the impacts of climate change which will be felt for years to come. Although the federal government has adopted a National Adaptation Strategy in 2022, efforts undertaken so far fall short of addressing the urgency of the crisis[3].

Natural infrastructure is considered a solution for both climate adaptation and mitigation to improve community and ecosystem resilience. According to the International Institute for Sustainable Development (IISD), *"Natural infrastructure is an area or system that is either naturally occurring or naturalized and then intentionally managed to provide multiple benefits for the environment and human well-being."*[4] It is low-cost, resilient, and provides multiple benefits to communities and ecosystems. Examples may include strategically managed forests, wetlands and or flood plains. As opposed to traditionally engineered grey infrastructure, like dykes and seawalls, studies show that natural infrastructure are cost-effective and achieve similar or better performance[5]. A 2018 joint report released by the Insurance Bureau of Canada (IBC), demonstrates the value of natural infrastructure in providing ecosystem services, value for money, and should be implemented by all levels of government[6].

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[1] Insurance Bureau of Canada, "Severe Weather in 2022 Caused $3.1 Billion in Insured Damage – Making It the 3rd Worst Year for Insured Damage in Canadian History," Insurance Bureau of Canada, accessed July 5, 2023, https://www.ibc.ca/news-insights/news/severe-weather-in-2022-caused-3-1-billion-in-insured-damage-making-it-the-3rd-worst-year-for-insured-damage-in-canadian-history.

[2] Environment and Climate Change Canada, "Canada's National Adaptation Strategy Will Protect Communities and Build a Strong Economy," news releases, 2022, https://www.canada.ca/en/environment-climate-change/news/2022/11/canadas-national-adaptation-strategy-will-protect-communities-and-build-a-strong-economy.html.

[3] Ryan Ness and Sarah Miller, "Closing Canada's Adaptation Gap: Key Elements of a National Adaptation Strategy" (Canadian Climate Institute, 2022), https://climateinstitute.ca/wp-content/uploads/2022/05/closing-canada-s-adaptation-gap.pdf.

[4] Dimple Roy, "The Multiple Benefits of Natural Infrastructure," International Institute for Sustainable Development, 2018, https://www.iisd.org/articles/insight/multiple-benefits-natural-infrastructure.

[5] Shalini Vajjhala and Dimple Roy, "Mobilizing Capital for Natural Infrastructure in Canada: A Guide for Project Champions and Funders" (International Institute for Sustainable Development, 2020), https://www.iisd.org/publications/guide/mobilizing-capital-natural-infrastructure-canada.

[6] N Moudrak et al., "Combating Canada's Rising Flood Costs: Natural Infrastructure Is an Underutilized Option" (Prepared for Insurance Bureau of Canada. Intact Centre on Climate Adaptation, University of Waterloo, 2018), http://assets.ibc.ca/Documents/Resources/IBC-Natural-Infrastructure-Report-2018.pdf.

As such, this policy brief recommends Intact Foundation advocate to the federal government for a national program that uses natural infrastructure as a powerful medium for climate action and community resilience. Building natural infrastructure implies restoration, conservation, enhancement and management of *natural ecosystem features and materials* to aid in climate mitigation and adaptation. Leveraging nature's inherent ability to protect against climate change impacts will result in healthy ecosystems that halt biodiversity loss and enable nature to facilitate adaptation for the overall well-being of humans and the larger environment[7] .

In order to reduce rising climate risks, and protect communities from preventable losses to life and livelihoods, this policy brief proposes Intact Foundation advocate to the federal government to adopt the program, *Parks+* (pronounced 'parks plus').

Parks+ is a collaborative demonstration program to accelerate and scale up natural infrastructure solutions in all provinces and territories across Canada. A cohort of **13 urban parks**, one in each province and territory would be identified to multisolve the cities' most pressing climate risks and community challenges. Urban parks were selected as they provide an ideal testing ground for collaborating with multiple stakeholders while simultaneously reaching a wider audience and population in urban settings. What makes *Parks+* distinct is that the primary goal of these urban parks is to tackle specific local climate risks, rather than only focusing on recreational use or aesthetics.

Given that *Parks+* is fundamentally a shift in how land is used and given Canada's history of colonization and dispossession of Indigenous peoples from their land, to ensure *Parks+* is equitably operationalized across Canada, the design and implementation must be done in ways that honour traditional knowledge, respect Indigenous leadership and advance federal commitments to reconciliation with Indigenous Peoples. Moreover, in order to design effective natural infrastructure interventions, the establishment of *Parks+* sites must be guided by principles of **Integrated Watershed Management (IWM)**. This ensures a more holistic valuation and management of both ecological and human factors. IWM principles applied to an urban setting can also build opportunities for collaboration and future up-scaling.

Parks+ is an ambitious program and opportunity for the government to expand upon its current plans by **scaling up** action on natural infrastructure. It provides an avenue for multiple sites for this infrastructure and builds capacity for future action. It also provides opportunities for cross-sectoral capacity building given the multidisciplinary nature of the initiative and the necessity of working collaboratively with partners across the insurance sector, civil society, Indigenous governments, and public post-secondary institutions.

Parks+ will **accelerate** natural infrastructure solutions because it will draw from private sector expertise, including those of the insurance sector, and actors like Intact. It hopes to create new institutional arrangements that will fast-track the establishment of natural infrastructure. *Parks+*

[7] Dr Blair Feltmate and Marina Moudrak, "Climate Change and the Preparedness Of 16 Major Canadian Cities To Limit Flood Risk," n.d.

is also a clear signal to the private sector, and Canadians at-large about the federal government's priorities in reducing climate risks, which in turn can attract innovative partnerships, investments, expertise and political support.

The *Parks+* program consists of five main pillars, necessary for this scaling up and acceleration of natural infrastructure, and includes:

1. **Institutional Arrangements**: It is recommended that a federal Steering Committee be established with representation across federal departments and leadership from Infrastructure Canada. This committee would be responsible for the commission of the study into the creation of *Parks+*. To ensure a diversity of voices at the table, consultations with Indigenous partners, provincial and territorial governments, and partners must be undertaken.

2. **Co-Governance**: It is recommended that a combination of top-down and bottom-up approach be applied to center Truth and Reconciliation, as well as principles of IWM, bringing together various partners and actors including Indigenous communities and governments. Each *Parks+* site should have a co-governance board or a variation that is appropriate to the local realities of the site.

3. **Criteria:** Although each *Parks+* site may be different depending on the local geographies and contexts, it is recommended that there should be some minimum standards in place. This proposal recommends that all *Parks+* must be within an urban setting; have a public engagement component with the general public; be designed with community climate risk reduction and resilience in mind; have an established minimum threshold for the size that is demonstrably impactful on a neighbourhood scale to ensure a good return on investment for climate risk reduction and other co-benefits; partner with public post-secondary institutions for creating training and learning opportunities related to natural infrastructure, as well as, leveraging academic expertise; and form co-governance partnerships with Indigenous communities.

   Additionally, this proposal recommends prioritizing sites that display a strategic case for accelerating natural infrastructure that might include 1) sites that aim to expand wetlands 2) sites that will reforest native plant species 3) and sites along, and that protects, critical freshwater resources. These are strategic given the evidence presented by studies from the Intact Centre for Climate Adaptation which has demonstrated that wetlands conservation and restoration is a cost-effective means to reduce flood risks to Canadians[8].

4. **Capacity-Building:** It is recommended partnerships be formed with post-secondary institutions in order to establish training opportunities or programs, and dedicated research funding to further expand the capacity in natural infrastructure. Capacity-building and

[8] Natalia Moudrak, Anne-Marie Hutter, and Blair Feltmate, "When the Big Storms Hit: The Role of Wetlands to Limit Urban and Rural Flood Damage" (Intact Centre on Climate Adaptation, University of Waterloo, July 2017), https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2017/07/When-the-Big-Storms-Hit.pdf.

professional development programs for partners that are involved in the establishment of each *Parks+* site may also be conducted independent of these partnerships as appropriate.

5. **Monitoring and Evaluation:** It is recommended that a centralized data hub be created that allows for decentralized but coordinated access and management of data across different sites. The federal government should work with each *Parks+* board to develop monitoring and evaluation metrics and performance indicators that can be reviewed and assessed over time.

What makes *Parks+* a worthwhile investment?

A report from the Canadian Climate Institute (CCI) finds that for every $1 spent on the adaptation measures, including natural infrastructure, there is an estimated $13-$15 in total benefits accrued. This also includes $5-$6 of benefits through avoided direct damages like premature infrastructure repair or replacement costs and $6-$10 through benefits that are circulated through the economy[9]. These savings can be invested elsewhere into the economy and communities.

There are also many intangible benefits. These benefits can be enjoyed in the immediate term, and most importantly, yield long-term benefits. Through achieving *Parks+*'s climate risk reduction goals, losses of life and livelihoods will be avoided. These are benefits that may not be fully valued in monetary terms but nonetheless are just as, if not more important. Programs like *Parks+* are not only a form of natural infrastructure, but also a form of social infrastructure, which are spaces that help to foster community connections. Access to green spaces and nature promotes physical and mental health, builds social connections, and is linked to positive health outcomes, which consequently can reduce costs on the healthcare system.

Investing in natural infrastructure can also support capacity-building and professional development because there's a greater demand for skills and knowledge. Finally, this also enhances political support for future natural infrastructure projects, with greater attention and recognition of these co-benefits. Indeed, one of the key co-benefits of this program is that if done well, these parks can be integrated into the everyday lives of Canadians. Think about well-loved urban parks, such as Mont Royal Park in Montreal, Stanley Park in Vancouver or Central Park in New York. These are parks that make up the "heart" of a place or community. Similarly, natural infrastructure can also contribute to placemaking. This is crucial to raising awareness of the role natural infrastructure can play in reducing climate risks. Its popularity and public support can help build political will to advance the creation of natural infrastructure.

Why is *Parks+* feasible?

To determine the potential costs for implementing *Parks+*, an analogous method of costing was adopted, which involves identifying case studies as a reference for estimating the cost of

[9] Dave Sawyer et al., "Damage Control: Reducing the Costs of Climate Impacts in Canada." (Canadian Climate Institute, September 2022), https://climateinstitute.ca/wp-content/uploads/2022/09/Damage-Control_-EN_0927.pdf.

individual urban parks. This information was then aggregated as subcomponents of the *Parks+* to arrive at a total cost for the entire project. Deriving from this approach, there are three potential scenarios. In the most likely **baseline scenario** (depending on the wide range of projects with different scopes), *Parks+* could cost around $1.7 billion dollars over a period of 10 years. In an **alternate high-cost scenario**, *Parks+* could cost as high as $3 billion dollars over a period of 10 years taking into account the highest initial development cost and annual maintenance costs. Similarly, under a **low-cost scenario**, *Parks+* could cost around $0.6 billion dollars over a period of 10 years. Prior to implementation, a subsequent sensitivity analysis could help determine the feasibility of the baseline scenario and examine the extent to which results are affected by changes in methods, models, values of unmeasured variables, or assumptions.

Next steps

Should this policy proposal be accepted, the following next steps are recommended:

Intact Foundation should:

- Engage with government partners on the federal, provincial and local levels to gauge support and validate the proposal.
- Engage with other insurance and private sector actors through the IBC or through other tables it is a part of to garner commitment to support the federal government in the rollout of *Parks+*. Intact can also play a leading role in spearheading a strategy that would streamline the actions of the insurance sector.

At a later phase of the program, the federal government should:

- Engage with Indigenous partners, provincial and territorial governments, and communities to establish effective co-governance.
- Study and establish a model for a federal-level Steering Committee to oversee the implementation of *Parks+* across the country, with the recognition that each *Parks+* site should have its own independent co-governance structure.
- Commission further studies to identify preliminary sites for consideration of *Parks+* within each province and territory. The results of this study could inform a more in-depth analysis of the costs and benefits associated with this proposal.

The types of infrastructure a society chooses to build indicates what it values. Choosing to make long-term investments in natural infrastructure such as in programs like *Parks+*, is to show that it is possible to tackle complex problems like climate change in ways that prioritize both sustainability and community resilience. Infrastructure projects can be daunting in scale and costs. But if Canada wants to fulfill its climate commitments including net-zero emissions by 2050, and protect communities from the devastating impacts of climate change for years to come, long-term investments in natural infrastructure programs must be made.

I. Research Methodology

This policy brief draws on extensive desktop research, literature reviews, scoping and ideation exercises, and stakeholder interviews.

Literature reviews and desktop research

This policy brief draws on a literature review of publications shared by the sponsor, alongside diverse academic publications, reports from government sources, civil society organizations, and reputable think tanks. For instance, sources from the Intact Centre for Climate Adaptation, the Insurance Bureau of Canada (IBC), the Canadian Climate Institute (CCI), the Natural Assets Initiative (NAI, previously MNAI for Municipal Natural Assets Initiative), and International Institute for Sustainable Development (IISD) were consulted. These sources were also identified through recommendations from interviewees and further desktop research, including grey literature from stakeholder organizations, and government sources such as policies and plans. This broad review helped develop a baseline understanding of the subject matter, scope down the challenge objectives, and identify potential gap areas.

Stakeholder interviews

This policy brief draws upon 31 conducted stakeholder interviews across 24 organizations in the area of climate adaptation and natural infrastructure (See **Appendix A**). These stakeholders represented various sectors, including the government, civil society, academics, think tanks, and the insurance sector. This phase of work culminated as the Summary of Key Insights including eight lessons that informed the development of this final brief.

Developing policy recommendations and integrating case study examples

After producing the Summary of Key Insights document, the team moved on to developing potential policy recommendations. The team conducted two ideation workshops and two meetings with the policy lab coach to work out creative, yet feasible, ideas to address the policy challenge. Case studies and initiatives from other jurisdictions of similar scope and governance were also studied as a part of this process to illustrate the potential benefits and outcomes of relevant natural infrastructure projects.

Limitations

There were some limitations to data and information, such as the team being unable to include certain groups in this process due to constraints related to time and logistics. These include government representatives from certain federal departments, some community-level organizations involved in natural infrastructure projects, as well as Indigenous governments and experienced knowledge keepers. Nevertheless, the team made substantial efforts to engage with a wide range of stakeholders from different backgrounds.

II. Introduction

Canada's climate has changed drastically over the last two decades. Floods, wildfires, droughts - the evidence has reached the doorsteps of ordinary Canadians and can no longer be ignored. As Canada's climate continues to change, the country will experience annual losses of $25 billion by 2025 from extreme climate-related weather events. This is equal to 50% of Canada's projected GDP growth in 2025[10]. Canada is already engaged in climate mitigation by reducing the intensity of its greenhouse gas (GHG) emissions, allowing the country to stay accountable to its environmental commitments - including targets around Canada's Nationally Determined Contributions (NDC) for 2030.

Climate adaptation is complementary to mitigation, helping minimize the intensity of climate change impacts. The unique aspect of natural infrastructure is that it can be used for both adaptation and mitigation. Natural infrastructure carries significant potential in reducing climate risks and minimizing losses if employed wisely in climate adaptation[11]. Leveraging nature's capacity to protect against climate change impacts support healthy ecosystems that halt biodiversity loss and enable nature to fully allow for adaptation. As such, this policy brief recommends Intact Foundation advocate to the federal government for a national program that accelerates and scales-up natural infrastructure solutions across Canada.

What is Natural Infrastructure?

*See **Appendix B** for a glossary of useful concepts and a list of acronyms.*

Natural infrastructure or Green infrastructure?

Terms such as natural infrastructure and green infrastructure are often used interchangeably in a global sense to discuss interventions that leverage the benefits of nature, either naturally occurring, through engineered solutions, or a combination of both, depending on the context. Natural infrastructure and green infrastructure are generally classified under the broad category of nature-based solutions, but natural infrastructure is *"differentiated from green infrastructure based on its composition of exclusively natural ecosystem features and materials*"[12].

Natural infrastructure vs. Grey infrastructure

Natural infrastructure is typically defined as *"an area or system that is either naturally occurring or naturalized and then intentionally managed to provide multiple benefits for the environment*

[10] Environment and Climate Change Canada, "Canada's National Adaptation Strategy Will Protect Communities and Build a Strong Economy."
[11] Feltmate and Moudrak, "Climate Change and the Preparedness of 16 Major Canadian Cities to Limit Flood Risk."
[12] Canadian Council of Ministers of the Environment. "Natural Infrastructure Framework: Key Concepts, Definitions and Terms," 2021. https://ccme.ca/en/res/niframework_en.pdf.

and human well-being"[13]. This framing allows for natural features and systems to be understood as a form of infrastructure in that it provides fundamental (and critical) services needed for the functioning of a community or society in the same way bridges, ports, housing, and telecommunications infrastructure do.

- **Examples of natural infrastructure**: naturally occurring ponds in a coastal town, restored and managed wetlands, coral reefs, urban forests, meadows.
- **Examples of grey infrastructure** (which are also "conventional" adaptation infrastructure)**:** dams, seawalls, dykes and drainage pipes.

Other infrastructure such as electric vehicle infrastructure and green roofs may also share some common objectives and yield common benefits with natural infrastructure, such as building climate resilience, but they are not considered natural infrastructure as they are not naturally occurring. Another differentiating fact about grey infrastructure is that it typically depreciates in value over time and has a limited functional lifetime, whereas natural infrastructure typically appreciates in value over time and can last significantly longer.

Why does natural infrastructure matter?

One reason why natural infrastructure is gaining attention from governments, environmental groups, researchers, and the insurance industry is due to its multiple co-benefits. **Co-benefits** refer to *"the additional positive outcomes that are delivered beyond their primary function, objectives and outcomes"*[14]. For example, a restored and managed wetland offers a wide array of co-benefits, such as enhanced water quality, flood protection, stormwater storage services, biodiversity preservation, and more. Quantifying these benefits can be difficult, thereby making it challenging to persuade decision-makers to invest in them and determine how to allocate resources effectively.

Why are watersheds important in natural infrastructure?

According to Agriculture Canada, a **watershed** is *"the area of land that drains into rivers and lakes, which, in turn, flow to a common outlet. Characteristics include, but are not limited to, the total area of the watershed, its shape, the arrangement of slopes and the overall relief or elevation change. Additional characteristics include the form of its drainage network, the types and arrangement of vegetation cover, the nature of the soils, the geology, and land-use patterns."*[15] Consideration of watersheds matter to natural infrastructure for a number of reasons. For one, it is the appropriate unit of analysis that considers both natural and human systems. In order to understand where natural infrastructure restoration is needed requires a holistic understanding of the watershed. For instance, the value assessment of a lake might not

[13] Vajjhala, Shalini, and Dimple Roy. "Mobilizing Capital for Natural Infrastructure in Canada." International Institute for Sustainable Development, 2020. https://www.iisd.org/publications/guide/mobilizing-capital-natural-infrastructure-canada.
[14]Bachra, S., A. Lovell, C. McLachlan, and A. M. Minas. "The Co-Benefits of Climate Action: Accelerating City-Level Ambition." CDP Worldwide: London, UK, 2020.
[15] Agriculture and Agri-Food Canada, "Understanding Watersheds," resource list, 2014, https://agriculture.canada.ca/en/environment/watershed-protection/understanding-watersheds.

be accurate without understanding its surrounding drainage networks above and underground, and the flora and fauna that inhabit in and around the lake. IWM then is the process of *"creating and implementing plans, programs and projects to sustain and enhance watershed functions that provide the goods, services and values within a watershed boundary."*[16] This approach involves *"socio-economic, human-institutional, and biophysical interrelationships among soil, water and land us and the connection between upland and downstream areas"*[17].

III. Current Policy Contexts and Challenges

Climate adaptation commitments in the federal context

The Government of Canada's growing interest in natural infrastructure and climate adaptation is indicative of the urgency and gravity of climate change effects. Although these conversations have been around for some time, the federal government has only recently made public funding and mandate commitments to natural infrastructure including:

- $2 billion over 10 years, starting in 2018, for the Disaster Mitigation and Adaptation Fund (DMAF), which supports infrastructure projects to help communities better prepare for natural disasters and climate change effects.[18]
- $200 million for the Natural Infrastructure Fund (NIF) [19], announced in Budget 2021.
- $4.7 billion over 10 years for the Nature Climate Solutions Fund announced in 2021.[20]

Most recently announced in Budget 2023, the federal government reaffirmed its commitment to implement its National Adaptation Strategy, which includes $1.6 billion in funding commitments and ongoing stakeholder consultations.[21,22] Budget 2023 extends on the recent federal environment and climate change mandate letter, for instance, committing to provide $85.1 million over five years to create a Canada Water Agency and legislation to establish it as a standalone entity by the end of this year."[23,24]

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[16] Guangyu Wang et al., "Integrated Watershed Management: Evolution, Development and Emerging Trends," *Journal of Forestry Research* 27, no. 5 (October 1, 2016): 967–94, https://doi.org/10.1007/s11676-016-0293-3.
[17] Wang et al.
[18] Infrastructure Canada, "Infrastructure Canada - Disaster Mitigation and Adaptation Fund: Overview," 2018, https://www.infrastructure.gc.ca/dmaf-faac/index-eng.html.
[19] Infrastructure Canada, "Infrastructure Canada - Natural Infrastructure Fund," 2022, https://www.infrastructure.gc.ca/nif-fin/index-eng.html.
[20] Environment and Climate Change Canada, "Nature Smart Climate Solutions Fund," grants and funding opportunities, 2021, https://www.canada.ca/en/environment-climate-change/services/environmental-funding/programs/nature-smart-climate-solutions-fund.html
[21] Environment and Climate Change Canada, "Canada's National Adaptation Strategy Will Protect Communities and Build a Strong Economy," news releases, 2022, https://www.canada.ca/en/environment-climate-change/news/2022/11/canadas-national-adaptation-strategy-will-protect-communities-and-build-a-strong-economy.html.
[22] Department of Finance Government of Canada, "Budget 2023," March 28, 2023, https://www.budget.canada.ca/2023/home-accueil-en.html.
[23] Minister of Environment and Climate Change Mandate Letter," Prime Minister of Canada, 2021, https://pm.gc.ca/en/mandate-letters/2021/12/16/minister-environment-and-climate-change-mandate-letter.
[24] Department of Finance Government of Canada, "Chapter 4: Advancing Reconciliation and Building a Canada That Works for Everyone | Budget 2023," 2023, https://www.budget.canada.ca/2023/report-rapport/chap4-en.html#m61.

Additionally, as part of the federal government's commitment to protect biodiversity and to conserve 25 percent of lands and waters by 2025, and 30 percent of each by 2030, Parks Canada, in collaboration with partners, hopes to realize the vision of establishing a network of national urban parks in many of Canada's major urban centers. The 2021 federal budget committed to funding the creation of a network of up to six national urban parks by 2025 designated under National Urban Parks Policy (NUPP)[25].

Several federal departments share priorities on natural infrastructure including Environment and Climate Change Canada (ECCC), Infrastructure Canada, Natural Resources Canada (NRCan), Public Safety Canada, among others. This adds another layer of complexity when it comes to accelerating the work on natural infrastructure in order to reduce climate risks. For example, on a wetland, there are sector-specific practices associated with agriculture (related to Agriculture and Agri-Food Canada) that can harm the inherent capacity of the wetlands to provide different ecosystem services (related to ECCC), but there are limited subsidies and incentives for the people to actually change their practice into something more sustainable (related to the Department of Finance Canada). Although efforts are underway, climate adaptation remains severely underfunded and underinvested. For example, globally, climate adaptation accounted for only 7 percent of climate finance flows in 2021, and dual-use (mitigation and adaptation) projects accounted for only 2 percent"[26].

As mentioned, the federal government has a number of programs and funding mechanisms to support natural infrastructure projects. However, current programs, policies, incentive structures, and benefits are not tailored to the scale of watersheds, and most legislation does not address the need for coordinated action. In fact, all interviewees underscored the need for watershed-scale management of natural infrastructure. This scale is important for a holistic and effective approach to protecting and conserving natural infrastructure. Poor management of a piece of infrastructure upstream will impact areas downstream. Efforts to understand the value and benefits of natural assets must also be considered on this scale given that their values are interconnected. For instance, the value of a lake might not be fully realized without understanding its surrounding drainage networks above and underground and the flora and fauna that inhabit in-and-around the lake.

Many interviewees emphasized that if natural infrastructure is not managed on a watershed-scale, efforts to reduce climate risks may be nullified and even counterproductive. The challenge lies in the fact that *"physical boundaries of watersheds seldom coincide with political boundaries, administrative planning or management units; therefore, a significant part of watershed management involves balancing competing interests and resolving conflicts between upstream and downstream users of the resource."*[27] What this implies is that cross-jurisdictional co-governance will be essential to the effective implementation and management of natural infrastructure.

[25] Government of Canada Parks Canada Agency, "National Urban Parks Policy," March 17, 2023, https://parks.canada.ca/pun-nup/politique-policy.
[26] Global Landscape of Climate Finance 2021," CPI, accessed June 14, 2023, https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2021/.
[27] Agriculture and Agri-Food Canada, "Understanding Watersheds."

The federal government is moving in the right direction, but action on climate risk reduction and adaptation is currently inadequate[28] both in terms of funding and policies to fully address the complexity in a holistic manner. The federal government is still in its early days of climate adaptation. Given that climate action will remain one of today's most pressing policy issues, and that old solutions will not necessarily tackle the complexities of climate action and governance, there is a window of opportunity for innovative policy solutions that will bring together various actors who hold different pieces of the puzzle. Innovative co-governance arrangements are needed to coordinate adaptation infrastructure planning, including natural infrastructure - in ways that are effective, inclusive and collaborative. This includes partnerships and engagement with different levels of government, the private sector, civil society, Indigenous communities and the Canadian public. Here, the federal government is in a unique position to convene these actors and ensure that there is sufficient coordination and resources.

As a signatory to the Paris Agreement, an international treaty established within the United Nations Framework Convention on Climate Change (UNFCCC), Canada commits to combating climate change and *"limit global warming to well below 2 degrees Celsius above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5 degrees Celsius"*. Under the Paris Agreement, countries are required to submit NDCs, which outline their goals and targets for reducing GHG emissions. Canada, as per its NDC, has *"committed to reducing GHG emissions by 30% below 2005 levels by 2030"*. It also includes a longer-term goal of *"achieving net-zero emissions by 2050"*, in sync with all other G7 nations. Through its mandate letters for the Minister of ECCC also pledged to *"conserve 25 percent of Canada's land by 2025 and 30 percent by 2030 to halt and reverse nature loss in Canada"*. In addition to these, Canada's commitment towards climate adaptation, as per its national adaptation strategy also highlights the need to focus on nature-based solutions.[29]

Challenges faced by provinces, territories, and municipal governments

Both infrastructure and environmental issues are shared jurisdiction between the federal and provincial and territorial governments. When it comes to IWM, different provinces and territories have differing mandates, if any at all.[30] Stakeholder interviewees have also raised a pertinent challenge in that municipal governments shoulder the bulk of Canada's public infrastructure with 60 percent of Canada's infrastructure and access to only 10 cents on every tax dollar[31]. This is despite municipalities in Canada facing capacity challenges. They are also unable to run deficits and do not have as many financial instruments as provincial governments for earning revenue

[28] Ness and Miller, "Closing Canada's Adaptation Gap: Key Elements of a National Adaptation Strategy."
[29] Service Canada, "Canada's National Adaptation Strategy: Building Resilient Communities and a Strong Economy," August 11, 2021, https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/national-adaptation-strategy.html.
[30] Canadian Council of Ministers of the Environment, "Summary of Integrated Watershed Management Approaches Across Canada," 2017..
[31] The Canada Community-Building Fund | Federation of Canadian Municipalities," accessed June 14, 2023, https://www.fcm.ca/en/focus-areas/infrastructure/canada-community-building-fund.

beyond revenues generated through property tax. Despite these obstacles, municipalities are at the forefront of renewal, maintenance and updation of climate adaptation infrastructure[32].

Stakeholders that frequently engage with governments on natural infrastructure reported that the concepts, terminologies, and measurements used in this field are fairly new. Consequently, there is limited consideration for natural infrastructure as a real and viable infrastructure solution to a number of climate problems[33]. This is also despite the fact that grey infrastructure is not always the most sustainable, cost-effective solution.

For example, in case of flooding in a city, calls are delegated to a Public Works Department, responsible for an engineering solution and increasing the capacity of grey infrastructure such as the drainage network. This process does not necessarily consider improvements to the quality of green spaces and their permeability with co-benefits like access to recreational green spaces and improvements to air quality. Moreover, there is a lack of maintenance efforts and guidelines for the management of natural assets, such as large green areas and water bodies. Interestingly, Engineers and Geoscientists BC is the only professional regulator in Canada that has, to date, developed professional guidelines related specifically to natural assets management[34]. In practice, conventional adaptation infrastructure is biased toward grey, engineered solutions, while there is a general lack of awareness of the potential cost-saving benefits of natural infrastructure solutions[35].

Making the economic case for natural infrastructure and underinvestment in adaptation

The economic case for investing in adaptation for governments is more or less made. Adaptation - including natural infrastructure - will pay for itself a number of times over. The cost of doing nothing is significant. For example, the CCI estimates that GDP could fall by 12 percent by the end of the century compared to a stable-climate scenario. Life will be less affordable for households given reduced income, reduced investment and opportunities, higher costs of living and potential supply chain disruptions, and higher taxes to pay for climate disasters and job losses. In contrast, the CCI estimates that for every dollar spent on adaptation, there is a return on investment of $13-$15 in direct and indirect benefits[36].

Natural infrastructure also yields a number of benefits in both climate mitigation and adaptation, giving it an advantage over conventional adaptation infrastructures. A restored natural shoreline does not only sequester carbon, improve water quality, prevent erosion and protect coastal

[32] Insurance Bureau of Canada and Federation of Canadian Municipalities, “Investing in Canada’s Future: The Cost of Climate Adaptation | Federation of Canadian Municipalities,” February 2020, https://fcm.ca/en/resources/investing-in-canadas-future.https://fcm.ca/en/resources/investing-in-canadas-futureInsurance Bureau of Canada and Federation of Canadian Municipalities., 4.
[33] Moudrak et al., “Combating Canada’s Rising Flood Costs: Natural Infrastructure Is an Underutilized Option.”http://assets.ibc.ca/Documents/Resources/IBC-Natural-Infrastructure-Report-2018.pdfMoudrak et al., 23.
[34] Roy Brooke et al., “Natural Assets Management Considerations for Engineering and Geoscience Professionals” (Municipal Natural Assets Initiative, July 2021), https://mnai.ca/media/2022/03/MNAI-EGBC-companion-guide-mar2021-105.pdf.
[35] Moudrak et al., “Combating Canada’s Rising Flood Costs: Natural Infrastructure Is an Underutilized Option.”http://assets.ibc.ca/Documents/Resources/IBC-Natural-Infrastructure-Report-2018.pdf., 16.
[36] Dave Sawyer et al., “Damage Control: Reducing the Costs of Climate Impacts in Canada.”

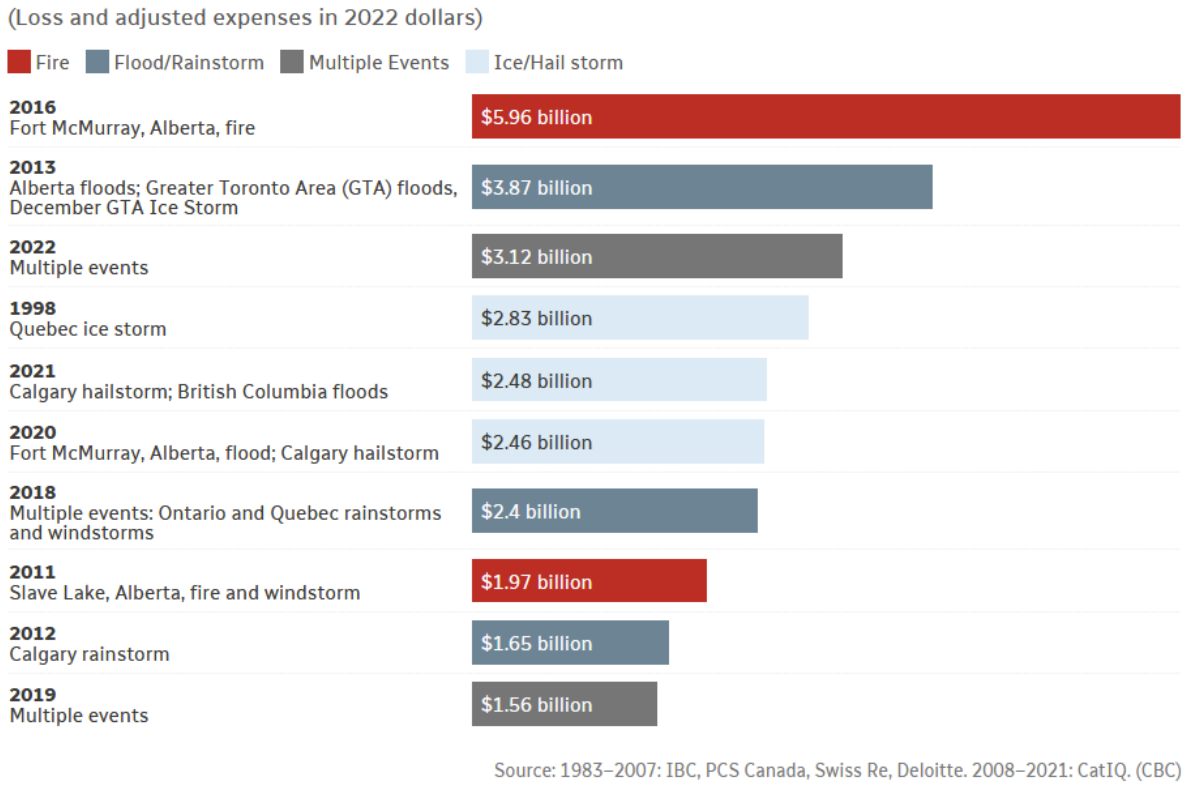
communities from floods, but it can also provide benefits in terms of biodiversity, recreational use, education, and more. (See a more in-depth discussion of the benefits and costs of natural infrastructure and *Parks+* in **Section VII. Making the Case for *Parks+*** and **VIII. Project Costing and Considerations**)

Despite the strong economic case for natural infrastructure, the challenge remains to scale up funding and investment, awareness and action in this area. For one, unlocking private capital and public-private partnerships remains a significant untapped potential. There is an alignment of interests between the public and private sector stakeholders which provides interesting opportunities for inter-sectoral collaboration. While strong climate policies and a robust natural infrastructure system are important for the government to advance the interests of the public, they also fall within the business interests of the private insurance sector. This is because climate risks create both short and long-term impacts on the private sectors' business models, devaluing their assets, physical and human capital, as well as erode the predictability of risk.

As climate change-related disasters rise in both frequency and scale, insurance companies will need to collect enough premiums in order to payout in the event of damage. (See **Figure 1** on Canada's Top 10 Highest Insured Loss Years on Record). Increasing climate risk results in either increased premiums or the withdrawal of insurance offerings. With no action, insurance companies may become non-viable if payouts from climate disasters skyrocket. Without private insurance, the payouts to these communities experiencing climate disasters would fall to each individual household or the government. In fact, insured damages from Hurricane Fiona in 2022 have risen from its estimate of $660 to $800 million due to increased personal property claims. This figure omits a large number of affected residents in high-risk flood areas where flood insurance coverage is not available. The IBC estimates that costs to governments from Hurricane Fiona alone *"total well into the billions of dollars once infrastructure and disaster financial assistance to uninsured residents are tallied"*[37]. To avoid a situation where the government becomes responsible for increasingly expensive climate-related events and insurance becomes a "luxury for the rich", private insurance must remain viable and accessible.[38] To this end, the federal government has recently announced in Budget 2023 proposing $31.7 million over three years to create a national flood insurance program aimed at protecting households at high risk of flooding and without access to adequate insurance.[39]

[37] Insurance Bureau of Canada, "Insured Damages from Hurricane Fiona Now Over $800 Million," 2023, http://www.ibc.ca/ns/resources/media-centre/media-releases/insured-damages-from-hurricane-fiona-now-over-800-million.
[38] Steven D'Souza, Jeremy McDonald, and Jenny Cowley · CBC News ·, "Up to 10% of Homes Could Now Be 'uninsurable' Because of Flood Risk. Yours May Be One of Them | CBC News," CBC, November 26, 2021, https://www.cbc.ca/news/canada/marketplace-home-insurance-1.6262386.
[39] Department of Finance Government of Canada, "Chapter 4."

Figure 1. Canada's Top 10 Highest Insured Loss Years on Record[40]



To build political support, Canadians need to see the benefits of natural infrastructure

Finally, and critically, to ensure sustained climate action and political support, everyday Canadians will need to be on board. Not only are they the ones experiencing climate impacts, from wildfire smoke, floods and hurricanes but also the health and economic costs of climate change. Natural infrastructure is directly related to community health and resiliency[41]. Typically, parks, which can be forms of natural infrastructure, may be solely appreciated for its aesthetics and recreational value, while their functions associated with adaptation and mitigation are not widely well understood. This is an opportunity to engage and educate Canadians at large on the benefits of natural infrastructure. There are also potential benefits from building local capacity to help manage and advocate for these natural assets. As such, policies and programs will need to be able to draw connections between bold climate action and the well-being of communities.

There are considerable key co-benefits for adopting *Parks+*, that if done well, can be integrated into the everyday lives of Canadians. Think about well-loved urban parks, such as Mont Royal Park in Montreal, Stanley Park in Vancouver or Central Park in New York. These are parks that make up the "heart" of a place or community. Similarly, natural infrastructure can also contribute

[40] Benjamin Shingler, "As Climate Changes, Insurance Is Becoming More Complex — and Pricey | CBC News," CBC, June 6, 2023, https://www.cbc.ca/news/canada/climate-change-insurance-fires-1.6863796.
[41] Moudrak et al., "Combating Canada's Rising Flood Costs: Natural Infrastructure Is an Underutilized Option."

to placemaking. This is crucial to raising awareness of the role natural infrastructure can play in reducing climate risks. Its popularity and public support can help build political will to advance the creation of natural infrastructure. To ensure that the full benefits can be reaped, there may be costs associated with each benefit. For example, the benefits of public education and awareness can be realized but not without resources and funding to carry out the programming (see **Appendix C** for a summary of benefits).

IV. Policy Recommendations and Analysis

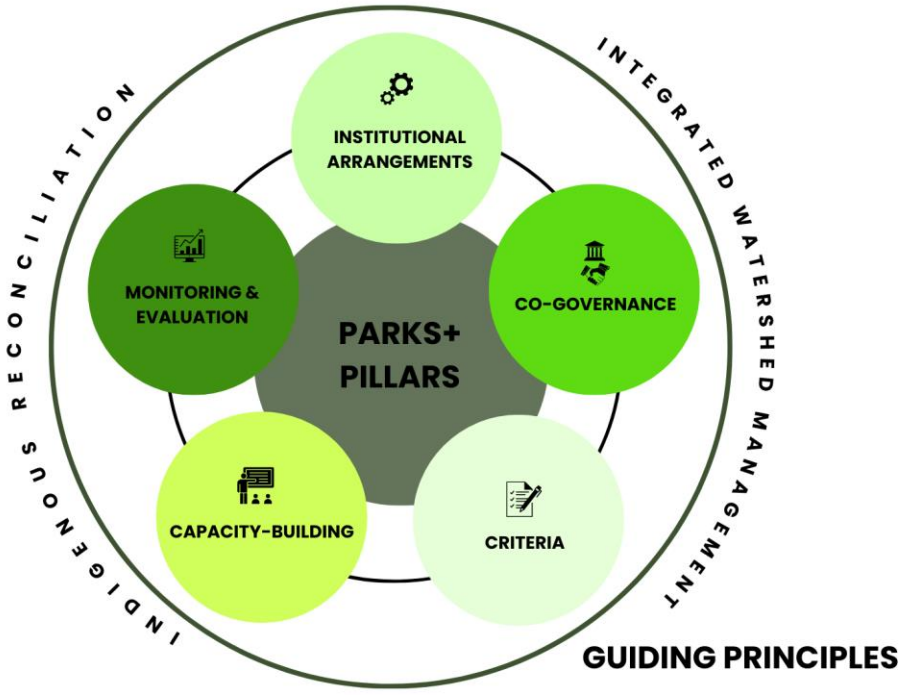
Policy Objectives

The proposed *Parks+* policy is an ambitious program and opportunity for the government to expand upon its current plans by establishing at least one urban park in every province and territory and working collaboratively with partners across the insurance sector, civil society and public postsecondary institutions. *Parks+* will accelerate natural infrastructure solutions through new institutional arrangements that will fast-track the establishment of natural infrastructure. *Parks+* also scale up action on natural infrastructure because it provides an avenue for multiple sites for this infrastructure and builds capacity for future action. Primarily, *Parks+* will help to advance the federal government's, as well as communities across Canada, goals of reducing climate risks and building community resilience. Leveraging multiple opportunities to increase environmental, social and health benefits through an established network of parks can demonstrate the significance of natural infrastructure. Citizens and communities can demand more action from decision-makers, who in turn have the buy-in from constituents to further invest into nature-based solutions.

Parks+ Guiding Principles and Pillars

This proposal recommends that the design and implementation of *Parks+* be guided by principles of **IWM** and advancing **Indigenous Reconciliation** in Canada (See **Figure 2**).

Figure 2. *Parks+* Pillars and Guiding Principles



IWM is a continuous adaptive process of managing human activities and ecosystems at the watershed scale. It also brings together many aspects of governance such as policy, planning and legislation on the basis of a geographic area or watershed, and it also brings together people and their activities to build relationships among actors.[42] Centering reconciliation includes implementing the Truth and Reconciliation Commission Calls to Action[43] and upholding recent commitments through the passage of the United Nations Declaration on the Rights of Indigenous Peoples Act[44]. This legislation requires the federal government to work in consultation and cooperation with Indigenous peoples to co-develop an action plan to achieve the objectives of the United Nations Declaration as well as take measures to ensure that federal laws are consistent with the Declaration. Centering these principles is necessary for implementing nature-based solutions that multisolve climate challenges in a manner that is equitably, collaborative, and effective.

Key Recommendations

Central to the foundation of *Parks+* are five pillars necessary to accelerate and scale-up natural infrastructure in every province and territory including (1) institutional arrangements (2) co-governance (3) parks criteria (4) capacity-building, and (5) monitoring and evaluation.

Institutional Arrangements

Institutional arrangements involve the foundational, coordinating and administrative components for *Parks+*. Currently, Infrastructure Canada is a leader and a significant funder of natural infrastructure projects. Since natural infrastructure can further enhance the longevity of other infrastructures, the department should play a larger role in spearheading natural infrastructure initiatives. Other departments also have a critical role to play as convening partners for implementing this project with their technical and administrative expertise. For instance, NRCan can contribute to this project through its expertise on national data management and sustainable forest management practices.[45] While other departments like ECCC and Parks Canada can play a considerable role at the implementation and coordination levels with partners. Successful administration must involve consultations with provincial, territorial governments as well as Indigenous partners, the insurance sector, civil society and academia.

Recommendations

1. It is recommended that the federal government establish a federal policy for *Parks+* that includes a Steering Committee with membership across federal departments responsible for overseeing the commission of the study into the design, implementation and monitoring stages of *Parks+*.

[42] Canadian Council of Ministers of the Environment, “Summary of Integrated Watershed Management Approaches Across Canada.”
[43] “Truth and Reconciliation Commission of Canada: Calls to Action” (Truth and Reconciliation Commission of Canada, 2015), https://ehprnh2mwo3.exactdn.com/wp-content/uploads/2021/01/Calls_to_Action_English2.pdf.
[44] United Nations Declaration on the Rights of Indigenous Peoples Act (S.C. 2021, c. 14)
[45] Natural Resources Canada. “Enhancing Sustainable Forest Management Practices,” accessed June 16, 2023, https://publications.gc.ca/collections/collection_2021/rncan-nrcan/Fo4-142-2019-eng.pdf.

2. It is recommended that the federal government work in conjunction with Parks Canada's forthcoming NUPP and strategy to include other federal departments including Infrastructure Canada, ECCC, Public Safety Canada, and NRCan.

   More specifically, it is recommended that:
   - 2.1. Infrastructure Canada takes a lead role as the fund administrator, through its close collaboration with the Canada Infrastructure Bank, and convening body with leadership involvement from other federal government departments.
   - 2.2. Parks Canada provides technical expertise in co-managing parks with local partners.
   - 2.3. ECCC provides technical expertise on strategic planning and supports co-convening tables with local partners including Indigenous communities, civil society and the insurance sector.
   - 2.4. ECCC provides legislative support to establish each urban national park through the NUPP federally and standalone parks legislation through provincial and territorial governments.
   - 2.5. Public Safety Canada supports analysis of potential risks and responses in the context of emergency preparedness and response (i.e. extreme weather events like flooding).
   - 2.6. NRCan provides technical expertise on managing and conserving natural infrastructure and flood plain mapping, given its direct role and responsibility among federal departments and agencies responsible for its natural resource files that also involve land.

Co-Governance

Co-governance involves the specific governance model for each *Parks+* site. This implies establishing urban parks on lands and geography that will span multiple jurisdictions including municipal, provincial, and federal. Crucially, this model must also incorporate just and equal relationships with Indigenous treaty bodies and governments. A model of co-governance that centers reconciliation is imperative to ensure issues, responsibilities, and opportunities are adequately identified between partners a part of in *Parks+*. Moreover, a co-governance model that embraces IWM would be aligned with best practices in the field and would better support provincial and territorial jurisdictions that currently do not have the same capacity and expertise in IWM to expand their capacities.

Recommendations

1. It is recommended that the federal government establish co-governance boards across all 13 provinces and territories, which includes representatives from the federal government and other partners.
   - 1.1. Partners should include Indigenous communities, municipalities, post-secondary institutions, and civil society representatives.
   - 1.2. Governments must respect their obligation to take treaty and Indigenous rights into consideration and a duty to consult.

1.3. Each board would be accountable to the Steering Committee, or the successor of it. The board is also responsible for the selection and proposal of *Parks+* sites given their local expertise.

2. It is recommended Board members sign an agreement prior to establishing any *Parks+* sites.
    2.1. This agreement may be completed in the form of a memorandum of understanding, terms of reference, or an intergovernmental agreement.
    2.2. All parties should establish decision-making mechanisms in good faith, centering truth and reconciliation, and in line with principles such as respect, reciprocity and responsibility.
    2.3. Special attention must be placed on IWM principles in these agreements and arrangements.

Criteria

Parks+ will establish one urban site in each province and territory to ensure representation across Canada. It must also balance potentially competing priorities of partnership in the complex process of recommending, assessing, and selecting *Parks+* sites. Ultimately, as a large-scale natural infrastructure project with the goal of establishing a cohort of parks, the selected sites should fulfill certain criteria across categories like geography or catchment area, potential climate risk aversion, and community impact. There is strong evidence for nature-based solutions such as restoration of wetlands, and reforestation among others. Thus, prospective *Parks+* sites that strongly demonstrate these solutions should be prioritized in the assessment process.[46]

Recommendations

1. It is recommended that the federal government convene a cross-section of partners within a co-governance framework to assess potential *Parks+* sites at a watershed scale on a provincial and territorial basis.
    1.1. For instance, a group of assessors may develop an assessment matrix to support the review process for potential sites.
    1.2. The process should be iterative and include a public engagement component to ensure citizens' voices and concerns are heard and considered.
2. It is recommended that the following criteria be applied to all *Parks+* sites:
    2.1. It should be within an urban setting.
    2.2. A portion of the site should be visible to and interactable with the public.
    2.3. It should be either a repurposing of land, a major improvement of an existing park, or a restoration of a natural system.
    2.4. The main feature of the park should be to yield results in the reduction of climate risks to communities.
    2.5. There should be an established minimum threshold for the size that is demonstrably impactful on a neighbourhood scale to ensure a good return on

[46] Moudrak et al., "Combating Canada's Rising Flood Costs: Natural Infrastructure Is an Underutilized Option."

investment for climate risk reduction and other co-benefits.

2.6. There should be partnerships with public post-secondary institutions for creating training and learning opportunities related to natural infrastructure, as well as leveraging academic expertise.

2.7. There should be partnerships and co-governance with Indigenous communities.

3. Sites that display a strategic case for accelerating nature-based solutions should be prioritized, these may include:
   3.1. Sites within wetland environments, or prioritizes expanding wetlands, within the prospective urban park site.
   3.2. Sites that include plans for reforestation of native plant species that support climate resiliency.
   3.3. Sites along critical freshwater ways include plans to support riverbank or shoreline restoration.

Capacity-Building Ecosystem

Scaling up and accelerating natural infrastructure will require the involvement of professionals across several industries. Engineers who have expertise in retrofitting infrastructure within nature-based frameworks, scientists who are skilled in quantifying and measuring the benefits of implementing *Parks+,* and policymakers who can effectively communicate the importance of investing in nature-based solutions will be required. The federal government's National Adaptation Plan prioritizes building a more climate-resilient economy and workers.[47] This includes ensuring Canada has a skilled and an adaptable workforce that is supported by training, education and skills development to address future impacts of climate change. To support *Parks+* in the near future, capacity-building through public educational institutes and skills training opportunities must be prioritized.

Recommendations

1. It is recommended that the federal government partner with provincial and territorial governments responsible for higher education and skills development as well as post-secondary institutions to support the development of each *Parks+ site*.
   1.1. Each established park must, at minimum, engage with at least one public university, colleges or training institutes.
2. It is recommended that the federal government identify and create opportunities with public universities, colleges and training institutes to expand programming on natural infrastructure skills development to help prepare future graduates entering the workforce.
   2.1. Work-integrated learning opportunities and research opportunities can be created through partnerships between the federal government and ministries of postsecondary education, and/or directly with the postsecondary schools and institutes.

[47] Environment and Climate Change Canada, "Canada's National Adaptation Strategy Will Protect Communities and Build a Strong Economy."

2.2. Specialized funding streams can be established through existing research grants should be made available to researchers and students interested in advancing natural infrastructure solutions.
2.3. The federal government should leverage the capacity and leadership of NRCan in providing training and educational programs on natural infrastructure management to be involved in curriculum design.
2.4. The federal government should establish mandatory certification programs for public officials to be engaged in natural infrastructure projects within *Parks+* sites to ensure that they have a baseline understanding of the subject matter and context.

Monitoring and Evaluation

The benefits of natural infrastructure projects may not be fully realized until years after their establishment, nevertheless, shorter-term impacts and benefits should be monitored and measured. For instance, carbon levels, local temperatures, species and habitat diversity, including indicator species can all be measured to assess how these solutions are supporting ecosystem resilience and addressing climate impacts. Tracking these activities also helps build an inventory and archive of benefits to inform longer-term projections. There are many roles that can be contributed by various partners to support monitoring and evaluation efforts. For example, the insurance sector's technical expertise in risk assessments can support estimating projections, understanding communities risk profiles or identify gaps in *Parks+* project proposals. Partnerships with post-secondary institutions can also help to integrate research and innovations in monitoring and evaluation.

Recommendations

1. It is recommended that the federal government build a centralized data hub and be the keeper of the data and information collected across each *Parks+* site, which should also allow for decentralized access and management for each *Parks+* board.
    1.1. The federal government should prioritize open access and collaboration, knowledge and skill sharing, public ownership and ethical conduct in building any data collection process and organized hub.
    1.2. Guidelines or data agreements should be set for how data may be shared and the privacy of partners involved, possibly including data governance mechanisms, data management standards and reporting.
2. It is recommended that the federal government work with each local *Parks+* board to develop monitoring and evaluation metrics and performance indicators that can be reviewed and assessed over time.
    2.1. The federal government should create opportunities for knowledge exchange and skill building between each *Parks+* site.
    2.2. Guidelines should be developed for the management and monitoring of *Parks+* sites in accordance with their development criterias and expected outcomes.

3. It is recommended that the federal government establish an independent auditor or entity responsible for this process of reviewing outcomes against program goals and objectives as well as financial assessments.

VI. Key Partnerships

Central to the successful design, development, implementation and evaluation of a large-scale climate adaptation and resilience proposal like *Parks+* is close collaboration between key partners. Aligned with best practices, climate adaptation and mitigation is a complex and layered policy issue, which requires extensive collaboration across both public and private sectors. Specifically, *Parks+* requires close working relationships between the key partners at the federal government, provincial and territorial governments, the private insurance sector, Indigenous communities, and civil society.

The Federal Government

It is recommended that *Parks+* involve the expertise of several federal departments. These federal departments should send a clear message to all other key partners regarding national-level commitments towards natural infrastructure. The following federal departments are critical to the administration of *Parks+*, particularly in the form of funding support and convening other partners.

- **Infrastructure Canada** is responsible for large-scale federal-level public infrastructure projects. Currently, the department manages several key funds including the Natural Infrastructure Fund, and the Disaster Mitigation and Adaptation Fund, and is Investing in Canada Infrastructure Program - Green Infrastructure Stream. It is recommended Infrastructure Canada take a lead role as the fund administrator, through a close collaboration with the Canada Infrastructure Bank.
- **ECCC** is responsible for advancing policies and programs that protect and conserve natural heritage along with ensuring a clean, safe and sustainable environment for present and future generations. It is recommended ECCC provide technical expertise on strategic planning and support co-convening tables with local partners including Indigenous communities, civil society and the insurance sector.
- **NRCan** develops and manages natural resources in the country. As one of the key drivers in developing Canada's first National Adaptation Strategy, and the department that is also undertaking the $164.2 million Flood Hazard Identification and Mapping Program[48], this brief recommends NRCan provide technical expertise on managing and conserving natural infrastructure and flood plain mapping, given its direct role and

[48] Natural Resources Canada, "Flood Hazard Identification and Mapping Program" (Natural Resources Canada, January 28, 2022), https://natural-resources.canada.ca/science-and-data/science-and-research/natural-hazards/flood-hazard-identification-and-mapping-program/24044.

responsibility among federal departments and agencies responsible for its natural resource files that also involve land.
- **Parks Canada** is the lead agency currently responsible for managing the country's network of national parks and leading Canada's urban national park's policy. It is recommended Parks Canada provide technical expertise in co-managing parks with local partners.

Through close collaboration with these federal departments, the following opportunities to support the design and implementation of *Parks+* can be put into place:

- **Intragovernmental Coordination:** Coordinating effectively across different federal departments and varying levels of provincial, territorial and municipal governments is needed to standardize benchmarks for *Parks+* sites.
- **Technical Data:** Collecting, monitoring and synthesizing data and information on *Parks+* sites from across the country.
- **Asset Evaluation:** Facilitating mechanisms to incorporate private sector expertise on asset evaluation and risk management.
- **Project Management:** Coordinating with external and internal partners to establish a Steering Committee and co-governance mechanisms which would commission further studies for the design, location, and implementation of *Parks+*.
- **Local Co-governance:** Integrating co-governance models to leverage the strengths of different partners. Examples can be drawn from existing case studies such as:
    - **Meewasin Valley National Urban Park:** In 2021, Parks Canada announced that they will work closely with local partners and Indigenous partners to consider an national urban park. For example, its Steering Committee includes City of Saskatoon, Government of Saskatchewan, Meewasin Valley Authority, Métis Nation-Saskatchewan, Saskatoon Tribal Council, Rural Municipality of Corman Park, University of Saskatchewan, Saskatoon North Partnership For Growth, and more[49].
    - **MacKenzie River Basin Transboundary Waters Master Agreement:** Through a joint organization with representation from the federal, territorial and Indigenous governments, including the Government of Canada, British Columbia, Alberta, Saskatchewan, the Northwest Territories and Yukon, they signed the Mackenzie River Basin Transboundary Waters Master Agreement. The agreement commits all six governments to work together more closely to manage the water resources of the whole Mackenzie River Basin.[50]
    - **Conservation Authorities:** Unique to Ontario province in Canada, conservation authorities are a good example of community-based collaborative agencies who undertake watershed-scale programs. These are usually governed by a legal mandate to *"protect people and property from flooding, and other natural hazards, and to conserve natural resources for economic, social and*

[49] "A National Urban Park - In the Saskatoon Region," accessed July 5, 2023, https://urbanparksask.ca/.
[50] "Mackenzie River Basin Board," Mackenzie River Basin Board, accessed March 31, 2023, https://www.mrbb.ca/.

environmental benefits."[51] While this model exists in Ontario, it is not widespread across Canada and should therefore be incorporated as a good co-governance practice for *Parks+*.

Indigenous Communities

An important guiding principle of *Parks+* is reconciliation. Currently, 44% of Indigenous people live in urban areas[52]. Thus, there is a significant opportunity to ensure the inclusion of Indigenous voices and perspectives in *Parks+*. Through Nation-to-Nation efforts in building relationships, *Parks+* would facilitate close partnerships with Indigenous governments. Moreover, urban Indigenous Peoples must also be engaged on their vision for the *Parks+* sites, alongside other key partners.

The model of Community or Land Trusts could be applied here to increase the participation of Indigenous communities in *Parks+*. Community or land trusts actively seek out and apply for grants offered by government agencies, foundations, and other funding bodies that prioritize climate action and natural infrastructure development. If led by Indigenous communities, they can develop compelling grant proposals that highlight the environmental, social, and economic benefits of urban parks as climate adaptation and mitigation infrastructure. Collaborative efforts such as these can also increase the credibility and impact of the project proposal, making it more attractive to potential funders.

Additionally, *Parks+* would benefit from many knowledge and insights Indigenous partners can offer such as Indigenous knowledge and stewardship practices, co-governance models and insights from existing program. For instance, the Indigenous Guardians program, led by Indigenous Leadership Initiative trains community members to monitor and manage natural resources, protect cultural sites, and provide leadership in conservation efforts.[53] While they has worked with the federal government in wildfire management, this could be extended to managing other natural infrastructures. Indigenous Peoples must be a part of *Parks+* including through representation on the proposed Steering Committee through the federal government as well as through membership on each *Parks+* boards.

Provincial and Municipal Governments

A key challenge for resilience efforts is the trend of rapid growth in Canadian cities. As urbanization intensifies across the country, municipal governments much adapt in order to address climate-related stressors. At local levels, municipal governments work in coordination with provincial and federal-level agencies to design and implement community-based climate adaptation, mitigation, and resilience efforts. Yet, municipalities exercise limited jurisdiction and

[51] "Conservation Ontario," accessed March 31, 2023, https://conservationontario.ca/about-us/conservation-ontario.
[52] Statistics Canada Government of Canada, "Canada's Indigenous Population," June 21, 2023, https://www.statcan.gc.ca/o1/en/plus/3920-canadas-indigenous-population.
[53] "Indigenous Leadership Initiative," accessed July 5, 2023, https://www.ilinationhood.ca/guardians.

their financial powers are largely determined by provincial governments. Close collaboration with respective provincial governments of city governments is a requisite for designing and implementing long-term investments in natural infrastructure[54].

For instance, the Association of Municipalities of Ontario (AMO) has documented concrete efforts between the provincial government and municipalities in Ontario on climate action. Based on research by AMO, Ontario municipalities require varying forms of support from the Ontario provincial government to better prepare, manage, and recover from floods and erosion[55]. Moreover, as the national voice of municipal government, the Federation of Canadian Municipalities (FCM) is currently working with different levels of government to develop a modernized fiscal framework for strengthening the capacity of municipal governments in climate efforts. Since FCM connects a significant number of partners including 2,100 cities and communities including provincial and territorial municipal associations, it is recommended that FCM is included as a key partner for *Parks+*.

Additionally, NAI, funded by FCM, is changing the way municipalities deliver everyday services, increasing the quality and resilience of infrastructure at lower costs and reducing risk. The NAI team provides scientific, economic and municipal expertise to support and guide local governments in identifying, valuing and accounting for natural assets in their financial planning and asset management programs and developing leading-edge, sustainable and climate-resilient infrastructure. Partnerships with local governments are formed to develop resilient, long-term infrastructure alternatives at substantial savings.

The Private Insurance Sector

If Canada does not accelerate its efforts towards community resilience, gradually more and more Canadians will become vulnerable, leading to a widened protection gap to climate impacts. As demonstrated through IBC, the insurance sector is already concerned with climate resiliency, given its focus on supporting clients recover after a loss and to help Canadians protect themselves and their property assets from severe weather-related events. As a crucial advocate and voice of the insurance sector, it is recommended IBC partner in *Parks+* in leading research and development on strategies[56].

[54] Insurance Bureau of Canada and Federation of Canadian Municipalities, “Investing in Canada’s Future: The Cost of Climate Adaptation | Federation of Canadian Municipalities.”
[55] Association of Municipalities of Ontario (AMO), “Come Hell or High Water: Flooding, Climate Change and Municipal Responses.,” October 19, 2020, https://www.amo.on.ca/sites/default/files/assets/DOCUMENTS/Reports/2020/ComeHellorHighWaterFloodingClimateChangeandMunicipalResponses20201019.pdf.
[56] Insurance Bureau of Canada and Federation of Canadian Municipalities, “Investing in Canada’s Future: The Cost of Climate Adaptation | Federation of Canadian Municipalities.”

Intact Financial Corporation

Intact has already gained a reputation for making concerted efforts to invest in long-term, committed natural infrastructure initiatives for climate adaptation and mitigation in Canada[57]. Additionally, Intact already advises the federal government's Disaster Resilience and Security Advisory Table, the Sustainable Finance Action Council, the National Flood Insurance Task Forces, ClimateWise, among others.[58] It is recommended that Intact scale up its existing reputation nationally by becoming a key partner for *Parks+*. The following roles can be assumed:

- **Providing technical expertise in risk assessments and asset evaluation:** Intact, as a member of the insurance sector can provide valuable technical expertise related to climate change impacts on natural infrastructure assets. Private insurance companies like Intact periodically undertake climate risk assessments and collect primary data on communities and environments to finesse their products. This research data could be leveraged to help identify potential park sites, create accurate risk profiling of communities within these sites, and generate estimations on *Parks+* sites for reducing risks within these environments.
- **Building on existing local natural infrastructure projects:** Natural infrastructure is gaining momentum as a front-line climate adaptation solution for corporate social responsibility initiatives led by private sector organizations. Intact is pioneering efforts in this field and *Parks+* will be the ideal opportunity to scale up existing initiatives that are already in place. For instance, Intact Financial Corporation recently established a collaborative partnership with the Nature Conservancy of Canada and the Intact Centre on Climate Adaptation to invest $8 million over the next five years to harness the benefits of wetlands[59].

Intact, with its current engagement in different projects and key partners associated with natural infrastructure is ideally positioned to support and play a key role in *Parks+*, but it cannot do this in isolation from other private organizations or insurance companies that could also add more value to this project. A collaborative approach from the insurance sector could be guided by Intact. A concentrated, publicly focused role for Intact could be viewed as having a basis in vested corporate interests. Therefore, Intact's role in *Parks+* must be grouped within the larger role of the private insurance sector, which is represented by IBC.

[57] Moudrak et al., "Combating Canada's Rising Flood Costs: Natural Infrastructure Is an Underutilized Option."
[58] Intact Financial Corporation. "Intact Financial Corporation Announces Five-Part Climate Transition Plan." Newswire Canada, 2022. https://www.newswire.ca/news-releases/intact-financial-corporation-announces-five-part-climate-transition-plan-833367799.html.

[59] Intact Financial Corporation, "Make It Intact," Social Impact Report (Canada: Intact Financial Corporation, 2021).

Civil Society Organizations and Academic Institutions

Civil society organizations play a key role in complementing top-down planning approaches with bottom-up public and stakeholder engagement. This is essential for building strong partnerships with those who are most likely to be directly affected by extreme weather events arising from climate change.They can help us communicate the benefits of the programs to the public, while highlighting their needs and concerns associated with the project.

On the other hand, academic institutions and policy think tanks can help provide technical expertise on different aspects of the project including stakeholder engagement, monitoring and evaluation, data analysis among others. They can assist in advanced research studies focused on long-term sustainability of *Parks+*. Additionally, they can play a key role in designing capacity-building and skills training programs through sensitization of different stakeholders, and by developing course modules for new certification programs.

The Intact Centre on Climate Adaptation, in collaboration with the University of Waterloo regularly conducts and publishes original research on addressing climate risks. *Parks+* offers opportunities for research support, data analysis, capacity-building and skills training housed by civil society organizations and research centers in post-secondary institutions. The evidence-based outcomes of such collaborative projects can be utilized for future natural infrastructure projects.

VII. Making the Case for *Parks+*

The field of Disaster Risk Management discusses the concept of the “triple dividend of resilience” which includes the avoidance of losses as disasters strike, increased economic activity that is realized given reduced risks of disaster, and development co-benefits of the specific investment to disaster risk management[60]. Similarly, *Parks+* would also enjoy the triple dividend of resilience. Some aspects of these “dividends” or benefits can be calculated in monetary terms, while others, although just as, if not more important, may be more difficult to quantify. The primary benefit of *Parks+* lies in its focus on delivering ecosystem services that reduce climate risks. This distinguishes it from other existing green infrastructure, parks, and other policies such as Parks Canada’s forthcoming NUPP.

Economic benefits of natural infrastructure

There are several benefits that can be calculated and assessed through monetary or economic valuations through the adoption of natural infrastructure. One approach for calculation is through **replacement costs method** which estimate the value of ecosystem services or a natural

[60] Thomas Tanner and Emily Wilkinson, “The Triple Dividend of Resilience,” ODI: Think change, December 9, 2015, https://odi.org/en/publications/the-triple-dividend-of-resilience/.

asset's service that are provided, and how much it would cost to reproduce or replace them from an engineering standpoint[61]. In terms of comparing this to typical infrastructure project costs, there can be two perspectives:

- **Cost Avoidance,** which involves avoiding the costs associated with either taking no action - the status quo - or costs associated with alternatives. For instance, potential financial savings that are realized through the implementation of natural infrastructure that helps the mitigation or adaptation to climate disasters or other events. In lieu of these nature-based solutions, the cost of climate disasters on households, businesses and the government would be more significant.
- **Cost Savings,** which are potential financial savings derived through investing in natural infrastructure projects, rather than traditional grey infrastructure alternatives, which may have additional costs associated with them in the longer term. This differs from cost avoidance given that natural infrastructure has the potential to be most cost-effective than grey infrastructure alternatives.

A recent report from the CCI finds, for every $1 spent on the adaptation measures modeled there is an estimated $13-$15 in total benefits accrued.[62] This also includes $5-$6 of benefits for every adaptation dollar spent by avoiding direct damages, such as through premature infrastructure repair and replacement costs, and $6-$10 through benefits that are circulated through the economy.

If the estimated cost for *Parks+* is approximately $1.7 billion, given a baseline costing estimate (see the next section on **Costs and Considerations** for costing scenarios), then there would be an estimated $22.1 billion in benefits accrued.

The significance of these savings from these potential costs is beneficial as these cost savings can be invested elsewhere in communities and the economy. In other words, rather than diverting scarce resources towards rebuilding status quo solutions like grey or traditional infrastructure, the savings from investing in nature-based solutions can be put towards other programs. Although the benefits of grey infrastructure, such as dams and seawalls, can be enjoyed immediately, its value depreciates over time given its limited functional lifetime. Natural infrastructure, on the other hand, typically appreciates in value over time as the restored ecosystem matures. Natural infrastructure can also complement and help extend the functional lifespan of existing grey infrastructure.

[61] J.L Eyquem et al., “Getting Nature on the Balance Sheet: Recognizing the Financial Value of Natural Assets in a Changing Climate” (Intact Centre on Climate Adaptation, University of Waterloo, 2022), https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2022/10/UoW_ICCA_2022_10_Nature-on-the-Balance-Sheet.pdf.
[62] Dave Sawyer et al., “Damage Control: Reducing the Costs of Climate Impacts in Canada.”

Co-Benefits in Action - Canadian Examples

The New Brighton Park Shoreline Habitat Restoration Project, Vancouver[63]
Co-governance and management between the Vancouver Fraser Port Authority and the Vancouver Board of Parks and Recreation. In 2017, they started working in collaboration with Musqueam, Squamish and Tsleil-Waututh Nations to restore urban parkland through the New Brighton Park Shoreline Habitat Restoration Project. Activities included installing approximately 25,000 salt marsh plugs, 4,000 coastal shrubs and 200 native trees. By 2021, fish and wildlife habitats were restored successfully and public access to nature increased significantly. In fact, tidal influence was restored for the first time since the 1960s. This example demonstrates how the benefits of natural infrastructure were restored for the benefit of the public in a relatively short period of time.

The Natural Assets Initiative (NAI)[64,65] assesses the financial value of natural infrastructure in terms of the municipal services it provides. NAI collaborates with municipalities across Canada to identify, value and account for the contribution of natural assets to municipal government service delivery like services that engineered assets would otherwise need to be delivered. Municipalities can utilize NAI assessments to integrate natural infrastructure into traditional asset management decisions. Gibsons, BC was the first municipality in North America to use the NAI assessment framework and declare natural infrastructure assets as municipal assets. The town then committed to operate and maintain its natural assets in the same manner as storm sewers, roads and other traditional engineered assets. NAI's work could be leveraged across Canada as a standard practice to account for the economic value that natural infrastructure delivers as a municipal asset.

The Intact Centre on Climate Adaptation[66] developed an approach to quantify the value of wetlands cost-reduction from flood damages through piloting its approach at two pilot sites in southern Ontario including in an urban setting. The Intact Centre found that if wetlands are maintained in their natural state, under conditions of severe weather events like rainfall (a one-in-500-year event) they can reduce flood damage costs to buildings including homes and apartments as well as industrial, commercial and institutional structures by close to 40%. In the urban site, the cost of flood damages were $84.5 million, which was $51.1 million or 38% lower than the $135.6 million that would have occurred due to cost replacements. The study demonstrates supporting wetlands in their natural state is meaningful for flood mitigation.

[63] The Vancouver Fraser Port Authority, "New Brighton Park Shoreline Habitat Restoration Project" (Port of Vancouver, December 2022), https://www.portvancouver.com/wp-content/uploads/2023/04/2022-12-22-03-600-PDF-NBP-Project-Overview-Rev1.pdf.
[64] Moudrak et al., "Combating Canada's Rising Flood Costs: Natural Infrastructure Is an Underutilized Option."
[65] Brooke et al., "Natural Assets Management Considerations for Engineering and Geoscience Professionals."
[66] Natalia Moudrak, Anne-Marie Hutter, and Blair Feltmate, "When the Big Storms Hit: The Role of Wetlands to Limit Urban and Rural Flood Damage."

Intangible benefits span health, social, capacity-building and political support

> *"Ecosystem goods are the products from natural capital such as food, fibre, clean air, and water; ecosystem services are the less tangible but no less significant benefits from ecosystem processes such as nutrient cycling, water purification and climate regulation, and non-material benefits such as recreation, aesthetic and cultural benefits."*[67]
>
> *- Canadian Climate Institute*

There are also many indirect or intangible benefits that can be derived from natural infrastructure projects spanning areas such as health, social, capacity-building and political support. These benefits can be enjoyed in the immediate and short-term, and more importantly, yield longer-term benefits. Natural infrastructure offers several key benefits over grey infrastructure, particularly when considering the long-term horizon. One significant advantage is that the costs associated with natural infrastructure tend to decrease over time, whereas grey infrastructure often experiences increasing costs.

Programs like *Parks+* are not only a form of natural infrastructure, but also a form of social infrastructure, which can be understood to be spaces that help to foster and maintain community connections. As studies on social infrastructure find, they can play a measurable role in ensuring recovery and less mortality in disaster events like tsunamis and earthquakes.[68] Natural infrastructure projects can reduce these losses by building community resilience.

Access to green spaces and nature are also linked to positive health outcomes and can reduce costs and impacts on the healthcare system. This is necessary as the CCI projects healthcare costs of ozone exposure are on par with those of other high-priority illnesses. For example, the annual healthcare costs of cancer have been estimated between $3.5 and $7.5 billion and one-quarter of current costs could be linked to cancer should emissions continue to increase.[69] This is particularly important for urban settings as they have been criticized for both being disproportionate contributors to accelerating climate impacts and having a less quality of life due to fewer opportunities to access nature.

Investing in natural infrastructure also supports capacity building and professional development. There are opportunities for partnerships with post-secondary institutions and professional associations can be created to draw research expertise for the monitoring, data collection and evaluation of this program. There is an opportunity to build cross-sectoral expertise in fields of engineering, public works, environmental and resource management, landscaping, urban studies, public participation, finance and insurance, corporate social responsibility, public health, and others. It can be coordinated in ways that draw learnings and mobilize knowledge across the country. Finally, this also enhances political support for future natural infrastructure projects, with greater attention and recognition of these co-benefits.

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[67] Municipal Natural Assets Initiative, "Defining and Scoping Municipal Natural Assets," 2017, https://mnai.ca/media/2018/02/finaldesignedsept18mnai.pdf.
[68] Daniel P. Aldrich, "How Social Infrastructure Saves Lives: A Quantitative Analysis of Japan's 3/11 Disasters," *Japanese Journal of Political Science* 24, no. 1 (March 2023): 30–40, https://doi.org/10.1017/S1468109922000366.
[69] "The Health Costs of Climate Change," *Canadian Climate Institute* (blog), accessed June 14, 2023, https://climateinstitute.ca/reports/the-health-costs-of-climate-change/.

Co-Benefits in Action - International Examples

London National Park City, UK[70]	**Yarra River Rehabilitation Project, Australia[71]**
London became the first municipality to establish its National Park City in 2019. London emphasizes public visibility and governance by engaging citizens in the conservation and enhancement of natural infrastructure, culminating in a Parks Charter. The initiative includes various components such as increasing green spaces, promoting biodiversity, and creating a network of accessible parks and green areas. This case study demonstrates the importance of engaging the public and promoting awareness of the benefits of natural infrastructure for urban settings.	The Yarra River Rehabilitation Project is an ongoing initiative to restore and improve the ecological health of the Yarra River. The project aims to enhance water quality, restore habitats, and provide recreational spaces. In 2017, the local government passed the Yarra River Protection (Wilip-gin Birrarung murron) Act which includes a 50-year Community Vision document and established Melbourne Water as the lead agency. Additionally, the Act requires independent auditing and reporting on the Yarra Strategic Plan and also ensures the translation of names of geographical sites along the Yarra in Indigenous languages. This case study demonstrates, in practice, co-governance with Indigenous communities and advancing reconciliation.

VIII. Project Costing and Considerations

To estimate tentative ballpark figures for this project, two commonly used methods for estimating project costs based on existing case studies, with similar scope of work, are utilized.

Firstly, the method of **Analogous Estimation**[72]:

- Analogous estimation is a top-down approach that relies on data from similar projects to estimate costs.
- It involves identifying comparable projects in terms of size, objectives, and features, and using their cost data as a basis for estimating the current project's costs.
- This method can be quick and efficient, especially when there is a lack of detailed project information or when the project is in a conceptual stage.

Secondly, the **Bottom-Up Activity-Based Approach**[73]:

[70] "Get Outside with the London National Park City," London National Park City, accessed July 5, 2023, https://www.nationalparkcity.london/.
[71] "Yarra River Action Plan," accessed July 5, 2023, https://www.water.vic.gov.au/waterways-and-catchments/protecting-the-yarra/action-plan.
[72] L. Angelis and I. Stamelos, "A Simulation Tool for Efficient Analogy Based Cost Estimation," *Empirical Software Engineering* 5, no. 1 (March 1, 2000): 35–68, https://doi.org/10.1023/A:1009897800559.
[73] Akhilesh Ojha et al., "Bottom-Up Resource and Cost Estimation for Restoration of Supply Chain Interdependent Critical Infrastructure," *Engineering Management Journal* 33, no. 4 (October 2, 2021): 272–82, https://doi.org/10.1080/10429247.2020.1800387.

- Bottom-up approach involves estimating costs based on the individual activities or components of the project.
- It requires a detailed breakdown of project tasks, resources, and associated costs.
- This approach requires estimating the quantities, durations, and costs for each activity and then aggregates them to determine the total project cost.
- The bottom-up approach is more time-consuming but generally results in more accurate cost estimates, especially for developing detailed implementation plans for projects.

For *Parks+,* a combination of both these methods are used to estimate tentative project costs. The analogous estimation method was used to identify relevant case studies that could be used to estimate the cost of individual urban parks. Following this, this information was aggregated on individual parts as subcomponents of the *Parks+* project to estimate the total cost. This provides a broad estimate of the total cost of the *Parks+* sites, assuming that relevant calculations associated with planning, implementations and monitoring are covered under the project cost of individual case studies. This estimate may not include costs associated with institutional set-up, programming, communications, capacity-building exercises and public engagement. These costs can be determined in a later phase of work.

Based on these assumptions, the actual cost of the project can vary depending on the project scale, site conditions, regulatory requirements, and design considerations. Certain components such as capacity-building programs and establishing a Steering Committee and governance mechanisms for the program also requires funding, however, these costs can be calculated prior to the implementation stage, when more specific information becomes available.

Relevant case studies for cost estimation and their components

The case studies, used as reference to estimate the cost of individual urban park projects under the *Parks+* initiative have been presented in **Table 1**. The type of case study projects listed includes both extensive restoration projects as well as relatively less intensive protection and conservation projects[74]. Natural infrastructure projects can lean towards either one of these approaches or typically a combination of both, depending on the existing condition of the natural systems and their components. Based on this understanding, the costs of the projects can vary significantly, depending on the project components and intervention intensity, despite having similar geographical areas. To this end, the estimates made here are generous as to capture the possible range of project costs.

A brief description for each case study below includes details about the type of project, its location and size in terms of geographical area, components of the project, its initial project cost, and annual operation and maintenance costs. For example, the Buffalo Bayou Park project from Houston, US was an extensive restoration project commissioned in 2018 that covered an area of approximately 65 hectares. The initial project development cost for the project and annual maintenance cost has been estimated to be around $75 million CAD and $2.6 million CAD

[74] John A. Wiens and Richard J. Hobbs, “Integrating Conservation and Restoration in a Changing World,” *BioScience* 65, no. 3 (March 1, 2015): 302–12, https://doi.org/10.1093/biosci/biu235.

equivalent in 2023 respectively. Such data has been extracted from publicly available project information for each project, from documents such as master plans and detailed project reports. Based on this information, the most expensive project included in the table below costs $1.25 million CAD per ha in terms of the initial development cost whereas the least expensive project cost $0.16 million CAD per ha. Similarly, the annual maintenance cost of projects ranged from $20,000 CAD per ha to around $60,000 CAD per ha equivalent in 2023.

Table 1. Relevant case studies for cost estimation and their components

Project Name (size, year)	Key Components	Initial Capital Cost (in Canadian dollars)	Cost per unit area (million CAD per ha), 2023 Adjusted	Annual Maintenance Cost Per Unit Area (million CAD per ha), 2023 Adjusted
1. Buffalo Bayou Park - Houston, US (65 ha, 2018)[75]	Land Acquisition, Ecological Restoration, Flood Management and Resiliency Measures and Recreational Facilities	Approx. $75 million	1.25	0.04
2. Battersea Park - London, UK (80 ha, 2002)[76]	Floodplain Restoration, Habitat Enhancement to enhance the park's ecological value, including wetlands	Approx. $26.5 million	0.47	0.06
3. Lincoln Park North Pond Sanctuary Restoration Project, Chicago, US (12.2 ha, 2022)[77]	Watershed enhancement and management, habitat restoration and recreational area development	Approx. $9.75 million	0.8	0.02

[75] Taner R. Ozdil, Sameepa K. Modi, and Dylan M. Stewart, "A 'Texas Three-Step' Landscape Performance Research: Learning from Buffalo Bayou Promenade, Klyde Warren Park, and Ut Dallas Campus Plan," *Landscape Research Record* 2 (2014): 117–31.
[76] Wandsworth Council, "Battersea Park 10-Year Green Flag Management and Maintenance Plan 2016-21" (Wandsworth Council, 2016), https://www.wandsworth.gov.uk/media/5164/battersea_park_green_flag_application_2016_21.pdf.
[77] "North Pond Restoration Update: July 15, 2022 - Lincoln Park Conservancy," July 15, 2022, https://lincolnparkconservancy.org/north-pond-restoration-10/.

4. Stanley Park Forest Restoration Project, Vancouver, CA (79 ha, 2007)[78]	Forest fire risk reduction measures, slope stabilization, enhancing park ecology and management in partnership with First Nations	Approx. $9 million	0.16	Not Available

Estimating *Parks+* project costs

Based on the above reference case studies, the total cost can be estimated for *Parks+* project and its annual maintenance cost based on aggregated information, and a few assumptions about the total area to be covered. It should be noted that the costs indicated for the above case studies have been price adjusted as per 2023 price variations and exchange rates. It is assumed one park will be selected for each of the ten provinces and three territories, a total of 13 parks can be considered towards the project cost. For selection purposes, if 3 large parks of at least 200 ha (for reference, the size of High Park in Toronto is 161 ha, and the size of Parc du Mont-Royal in Montréal is 280 ha) and 10 smaller parks of 100 ha area each, the total area to be covered turns out to be 1600 ha.

Deriving from this approach, three potential scenarios can be developed as presented in **Table 2**. In the most likely **baseline scenario** (depending on the wide range of projects with different scopes), *Parks+* could cost around $1.7 billion dollars over a period of 10 years. In an alternate **high-cost scenario**, *Parks+* could cost as high as $3 billion dollars over a period of 10 years taking into account the highest initial development cost and annual maintenance costs. Similarly, under a **low-cost scenario**, *Parks+* could cost around $0.6 billion dollars over a period of 10 years. Prior to implementation, a subsequent sensitivity analysis could help determine the feasibility of the baseline scenario and examine the extent to which results are affected by changes in methods, models, values of unmeasured variables, or assumptions. Based on these preliminary estimates, the federal government and partners can select the most appropriate alternative in consultation with different stakeholders and rights holders, and expert inputs from academic institutions and insurance companies such as Intact.

[78] “Stanley Park Forest Restoration Plan” (Vancouver Park Board, 2007), https://cfs2.sites.olt.ubc.ca/files/2014/04/a1_stanley_park_restoration_plan.pdf.

Table 2. Tentative Development and Cost Estimation Scenarios for *Parks+*

Tentative Scenarios	Assumption*	Initial Development Cost		Annual Maintenance Cost		Total Project Cost
		Per ha	Total	Per ha	Total for 10 Years	
Baseline	**Considering Average Costs**	0.67 million CAD	1.07 billion CAD	0.04 million CAD	0.64 billion CAD	1.7 billion CAD
High-Cost	**Considering Highest Costs**	1.25 million CAD	2 billion CAD	0.06 million CAD	0.96 billion CAD	3 billion CAD
Low-Cost	**Considering Lowest Costs**	0.16 million CAD	0.26 billion CAD	0.02 million CAD	0.32 billion CAD	0.6 billion CAD

*Common Assumption: Assuming total area to be covered is 1600 ha. Costs indicated are approximate estimates that can be scaled up or down based on change in project scope and size.

IX. Funding Strategies

Strategic funding mechanisms are necessary for successful implementation of *Parks+*. Pooling resources from a diverse range of financial streams and leveraging the strengths of different stakeholders including the federal government, from provincial and municipal partners and exploring private funding opportunities, are critical to financially sustain *Parks+.*

Federal funding

It is recommended the entire **NIF** be earmarked to this initiative. Recognizing that the scope of other existing federal funds may be beyond natural infrastructure, a part of funds such as the **Climate Action Fund and the DMAF.** Additionally, it is recommended to direct revenue generated by the carbon tax towards this initiative given that the goals of the carbon tax align with that of *Parks+*. **Carbon taxes** are designed to incentivize emission reductions and promote the transition to low-carbon alternatives. Redirecting a portion of the revenue from carbon taxes towards natural infrastructure initiatives aligns with the goal of mitigating climate change and promoting sustainable development. Integrating a direct revenue stream into this process could also help sustain this project in the long term.

Provincial and municipal funding

By securing federal funding as a **foundational investment**, this project can also attract additional contributions from provincial and municipal governments. Matching funds would demonstrate a shared commitment to the project and further enhance its credibility and potential for success. These contributions can be in the form of direct funding or in-kind support, such as land or infrastructure resources for the program implementation. The federal government can also allocate funds as incentives to different provincial and municipal governments for undertaking this project or developing proposals with measurable impacts. The specific percentage of matching funds can be negotiated and agreed upon during the funding allocation process. For instance, the **Green Municipal Fund,** administered by FCM, which supports municipal projects that promote sustainability, including natural infrastructure initiatives, can be partly redirected to *Parks+*. These funds are pooled by the municipality through various means, such as allocating a portion of property tax revenue, charging environmental levies or fees, and attracting private investment.[79]

Private capital funding

Private companies, foundations, and philanthropic organizations interested in supporting climate adaptation initiatives could provide contributions through financial investments, corporate sponsorships, and in-kind contributions, such as expertise, resources, or technology. For example, insurance companies can co-fund specific projects within the program or provide technical inputs for components that align with their objective of reducing climate risks. For instance, through **Corporate Social Responsibility (CSR)** initiatives and **Environmental, Social, and Governance (ESG)** mandates**,** private organizations can choose to actively participate in natural infrastructure projects such as *Parks+* as part of their CSR initiatives or ESG mandates. They can either provide financial contributions towards projects, provide in-kind contributions, or offer their expertise to help develop and implement the project. This also aligns with their commitment to environmental stewardship and community engagement.

In addition, **Green Bonds** and environmental impact investments can be directed to *Parks+*. Green bonds are financial instruments that raise capital specifically for environmentally beneficial projects, including natural infrastructure. The federal government's green bonds are issued under the Canada Green Bond Framework, which provides guidelines and criteria for the selection and evaluation of eligible projects. Companies can invest in these bonds or make environmental impact investments to support and finance natural infrastructure projects.

[79] "Green Municipal Fund," accessed June 16, 2023, https://greenmunicipalfund.ca/.

X. Challenges, Risks and Limitations

If planned and implemented well with adequate resources, the benefits of *Parks+* will multiply for generations to come. However, as with many large-scale infrastructure projects, there will be many challenges along the way. These challenges, risks and limitations may be technical, economic or political. Regarding each obstacle, this brief will also note considerations for strategies to mitigate them by drawing on domestic and international lessons.

Timescale

On two sides of the same coin, natural infrastructure's long timescale is both a benefit and a challenge. Large-scale infrastructure projects have a long lifespan. Natural infrastructure, like *Parks+* is no different. In fact, the appeal of *Parks+* is that as the natural infrastructure matures, the benefits will increase over time. To illustrate this point, a restored wetland might have marshes and trees in the area which function as a habitat and nursery for local species of birds and fish. The ground covering also prevents erosion while both the plants and the permeable ground allow for increased absorption which in turn mitigates flood risks. A restored wetland, converted from perhaps concrete roads and pipes may take years to get to that point. As years pass and as the plants grow and the animals return, the benefits will increase.

However, this long timeline poses considerable challenges. Without sustained commitment from governments and partners, the full benefits of natural infrastructure might never be realized. If political commitment is not sustained, the initial investment will not realize its full returns given that the largest rewards are not felt immediately upon construction or restoration, but rather after the passing of some years.

Policy certainty is critical to private sector involvement. To unlock private capital which is needed for the speed and scale of climate action required, governments must send clear and repeated signals to the private sector that they want investments in this area. Long-term political commitment is also required across the political spectrum to ensure longevity. Accompanying legislation may also be considered to ensure sustained commitment to natural infrastructure.

Natural infrastructure is not one-size-fits-all

The geography, ecology and economy, among others, will shape what type of natural infrastructure is suitable to best address the area's climate risks. Some neighbourhoods may face flood risks, others may be more related to drought, hurricanes or heat domes. Some neighbourhoods may have existing wetlands, a shoreline, or perhaps a forested area to be restored or built. Different geographical and ecological contexts will necessitate different types of natural infrastructure. Given that *Parks+* would be designed for urban areas, current land use practices are significant considerations. Complex issues like transportation will also be intertwined in the assessment of sites. For example, the Cheonggyecheon restoration project in Seoul, South Korea was based on revitalizing the Cheonggyecheon Stream that had been

covered for decades by a highway overpass.[80] This had an impact on transportation in the city. In anticipation of this issue, the project ensured adequate transit infrastructure in the absence of the Cheonggye motorway.

Municipalities will also ultimately be a key partner in the maintenance and governance of *Parks+* meaning that local economic considerations on the city level might shape choices that are made for these natural infrastructures. Natural infrastructure is not a one-size-fits-all solution. Rather, it is context-dependent. As such, this poses challenges in creating cost-benefit estimates. This issue is nothing new as it is pervasive in the field of environmental economics and researchers, like those at the Intact Centre for Climate Adaptation, are finding ways to best "put nature on the balance sheet".[81] Although it may be possible to provide general high-level estimates, reaching a more precise cost-benefit analysis would require a more technical assessment of each site. Additionally, since each site will be different, it will be important to develop a broad range of criteria to ensure a minimum standard and cohesion, while leaving enough flexibility for diverse contexts.

The co-governance of natural infrastructure will also differ depending on the context. While we recommend that the federal government establish a co-governance model, a similar principle would apply in that only minimum standard requirements could be established, while leaving adequate room for innovation and adaptability in local contexts where geography, political contexts, economic circumstances, culture, and actors will vary.

Jurisdictional challenges

Climate impacts are not bound by administrative or political borders. Any scaled-up or coordinated climate solution will likely face jurisdictional challenges in the context of Canada's federalism. *Parks+* as a coordinated natural infrastructure program would be no exception. National-scale coordination is part of this proposal in order to effectively scale and accelerate action on natural infrastructure, while ensuring some level of standardization, public visibility and benefits from economies-of-scale. Establishing robust co-governance mechanisms will be crucial for overcoming jurisdictional challenges when it comes to both day-to-day and strategic decision-making around the governance and management of *Parks+*.

Working in ways that embed Truth and Reconciliation will require governments of all levels to work with local Indigenous governments and communities in ways that respect traditional knowledge, rights and culture. When considering any infrastructure or land-use projects, it is crucial to recognize this truth and colonial history and its legacy today. Although there may be no one exact model of co-governance and navigating jurisdictional issues that will be the 'right one', the benefits of addressing and navigating this challenge can yield systemic, long-lasting changes to the well-being of urban Indigenous communities across the country.

[80] Society for Ecological Restoration, "Restoration Resource Center South Korea: Restoration of the Cheonggyecheon River in Downtown Seoul," accessed June 15, 2023, https://www.ser-rrc.org/project/south-korea-restoration-of-the-cheonggyecheon-river-in-downtown-seoul/.
[81] Eyquem et al., "Getting Nature on the Balance Sheet: Recognizing the Financial Value of Natural Assets in a Changing Climate."

There are a number of examples and models of cross-jurisdictional collaboration. For example, California's State Senate Bill 852 allows cities, counties and special districts to collaborate to "*establish climate resilience financing districts to undertake projects and programs to address climate change. The districts will be able to raise revenue through tax increment funding, voter-approved supplemental property taxes, property benefit assessments or fees.*"[82]

Risks to marginalized communities

Restoration projects for creating livable and desirable neighbourhoods can attract the attention of upscale property developers, leading to a sharp rise in property valuations. This can adversely affect low-income communities and households with fixed incomes. Additionally, increased property values can inadvertently displace those who are no longer able to afford rent in the area. This is also known more colloquially as "green gentrification"[83]. Failure to ensure safeguards for communities affected or displaced could result in decreased community resilience, decreased community buy-in, loss of reputation for natural infrastructure projects, and increasing inequality. An equity lens needs to be applied to the planning and implementation of *Parks+* while considering other criteria such as climate risk reduction and other co-benefits.

The success of *Parks+* hinges on good communication and engagement with the public

Parks+ proposes a new way of looking at what parks can be at a time of growing climate risks. If the *Parks+* program does not do a good job of communicating with the public from the get-go, it may not receive the political support it needs to succeed and be sustained. Given the technical dimensions of the program, it will be important to ensure that Canadians understand the importance of natural infrastructure in reducing climate risks. Engaging with media and journalists may be important to build literacy around this issue. Public education is a key objective of this program for this reason since it is a demonstration program that hopes to pave the way for more natural infrastructure projects to come.

It will be important to also engage with civil society and community organizations that can help inform and be involved in the shaping of the natural infrastructure itself and its programming. Buy-in from community organizations and civil society can provide greater social acceptability and legitimacy. This requires engagement upon the assessment of each *Parks+* site. Moreover, should the area identified coincide or even affect property owners in the area, particular care must be taken to ensure meaningful engagement. Otherwise, it may risk opposition from local communities and property owners affected by the change. Innovative arrangements and settlements may also be considered depending on the *Parks+* site.

[82] "Governor Signs Sen. Dodd's Climate Resilience Bill," Senator Bill Dodd, 2022, https://sd03.senate.ca.gov/news/20220909-governor-signs-sen-dodd%E2%80%99s-climate-resilience-bill
[83] Isabelle Anguelovski et al., "Green Gentrification in European and North American Cities," *Nature Communications* 13, no. 1 (July 2, 2022): 3816, https://doi.org/10.1038/s41467-022-31572-1.

XI. Conclusion and Recommended Next Steps

Given the rising scale and frequency of severe weather events and Canada's commitments to net-zero emissions by 2050, a *Parks+* policy can be one of the programs to rapidly scale and accelerate Canada's action on natural infrastructure. The long time horizon of *Parks+* and the complexity of coordinating a country-wide program means that in order to realize its full benefits, it would be in everyone's interest to begin as soon as possible.

Should this policy proposal be accepted, the following next steps are recommended:

Specifically, Intact Foundation should:

- Engage with government partners on the federal, provincial and local levels to gauge support and validate the proposal.
- Engage with other insurance and private sector actors through the IBC or through other tables it is a part of to garner commitment to support the federal government in the rollout of *Parks+*. Intact can also play a leading role in spearheading a strategy that would streamline the actions of the insurance sector.

At a later phase of the program, the federal government should:

- Engage with Indigenous partners, provincial and territorial governments, and communities to establish effective co-governance.
- Study and establish a model for a federal-level Steering Committee to oversee the implementation of *Parks+* across the country, with the recognition that each *Parks+* site should have its own independent co-governance structure.
- Commission further studies to identify preliminary sites for consideration of *Parks+* within each province and territory. The results of this study could inform a more in-depth analysis of the costs and benefits associated with this proposal.

In conclusion, the types of infrastructure that are built are a good indicator of what is valued as a society. By choosing to make long-term investments in natural infrastructure such as in programs like *Parks+*, society are showing that it is possible to tackle complex problems like climate change in ways that prioritize both sustainability and community resilience. Infrastructure projects can be daunting in scale and costs, but if Canada wants to fulfill its climate commitments, and protect communities from the devastating impacts of climate change for years to come, long-term investments in natural infrastructure programs must be made.

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Appendices

Appendix A - Stakeholder Interviews

Stakeholder interviews were conducted with individuals from the following organizational affiliations:

1. Action on Climate Team, Simon Fraser University
2. Asset Management BC
3. Asset Management Ontario
4. Canada Mortgage and Housing Corporation
5. Ducks Unlimited
6. Dunsky Energy and Climate Advisors
7. Environment and Climate Change Canada
8. Federation of Canadian Municipalities
9. Forum for Leadership on Water
10. Forum on Water Law and Governance, University of Ottawa
11. Global Institute for Water Security, University of Saskatchewan
12. Indigenous Leadership Initiative
13. Intact Centre on Climate Adaptation, University of Waterloo
14. International Boreal Conservation Campaign
15. Lake Winnipeg Foundation
16. Municipal Natural Assets Initiative
17. Natural Conservancy of Canada
18. Natural Resources Canada
19. Nature Canada
20. School of Public Policy, Simon Fraser University
21. Smart Prosperity Institute
22. The Co-operators
23. Toronto Regional Conservation Authority
24. L'Université du Québec à Montréal

Appendix B - Glossary of key terms and acronyms

Climate Action Fund: The Climate Action Fund is a program of the Government of Canada designed to support initiatives that reduce GHG emissions and address climate change. It provides funding for projects and programs that advance clean technology, promote sustainable practices, and contribute to Canada's efforts to mitigate and adapt to climate change. (Environment and Climate Change Canada, 2018)

Climate Change - "Climate change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle. But since the 1800s, human activities have been the main driver of climate change". (UN, 2023) Anthropogenic activities such as burning of fossil fuels lead to GHG emissions that can increase the earth's potential to trap the sun's heat and cause scenarios like global warming.

Climate Change Adaptation - "Adaptation refers to adjustments in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects. It refers to changes in processes, practices and structures to moderate potential damages or to benefit from opportunities associated with climate change. Adaptation actions can range from building flood defenses, setting up early warning systems for cyclones, switching to drought-resistant crops, to redesigning communication systems, business operations and government policies." (UNFCCC, 2023)

Climate Change Mitigation - "Along with adaptation, mitigation is one of the two central approaches in the international climate change process. Mitigation involves human interventions to reduce the emissions of greenhouse gases by sources or enhance their removal from the atmosphere by sinks." (UNFCCC, 2009) A "sink" refers to forests, vegetation or soils that can reabsorb or store some of the GHGs like carbon dioxide and methane.

Climate Resilience - Climate resilience is the ability of social, economic and environmental systems to survive and thrive despite the impacts of climate change. "It means reducing exposure and vulnerability to climate hazards, cutting back greenhouse gas emissions and conserving biodiversity are given the highest priorities in everyday decision-making and policies on all aspects of society including energy, industry, health, water, food, urban development, housing and transport. It is about successfully navigating the complex interactions between these different systems so that action in one area does not have adverse effects elsewhere and opportunities are harnessed to accelerate progress towards a safer, fairer world." (IPCC AR6, 2023)

Co-benefits - Co-benefits are additional positive outcomes that are delivered by systems (such as, social, economic or environmental) or interventions (such as, policies and programs) beyond their primary function, objectives and outcomes. "Climate co-benefits are beneficial outcomes that are not directly related to climate action. Such co-benefits can include cleaner air, green job creation, public health benefits from active travel, and biodiversity improvement through expansion of green space. Planning climate action that also delivers co-benefits can enable

cities to bolster support from key stakeholders, mobilize scarce resources across city departments, and maximize opportunities to address multiple social, environmental, and economic challenges." (CDP, 2020)

Disaster Mitigation and Adaptation Fund: The DMAF is aimed at strengthening the resilience of Canadian communities through investments in infrastructure projects, including natural infrastructure projects, enabling them to better manage the current and future risks associated with natural hazards, such as floods, wildfires and droughts. (Infrastructure Canada, 2021)

Ecosystem Goods and Services – "The Millennium Ecosystem Assessment defines Ecosystem Services as "the benefits people derive from ecosystems". Besides provisioning services or goods like food, wood and other raw materials, plants, animals, fungi and micro-organisms provide essential regulating services such as pollination of crops, prevention of soil erosion and water purification, and a vast array of cultural services, like recreation and a sense of place." (IUCN, 2023)

Extreme Weather Events - "The occurrence of extreme events will increase with increasing global warming." (IPCC AR6, 2023). Human-induced climate change is already affecting many weather and climate extremes across the globe with observed changes in heatwaves, heavy precipitation, droughts, and tropical cyclones." (WMO, 2023)

Greenhouse Gasses - "Earth's atmosphere is made up of many different gasses, some of which are GHGs. They are called that because they effectively act like a greenhouse or a layer of insulation for Earth: they trap heat and warm the planet." (Climate Atlas of Canada, 2023) Examples of GHGs include carbon dioxide, methane, and hydrofluorocarbons. The global warming potential (GWP) of GHGs like methane can be more than the GWP of carbon dioxide, but generally overall emissions are quantified in terms of their carbon dioxide equivalent.

Natural Assets/Capital - "The concept of natural assets or natural capital is used as an economic metaphor for the limited stocks of physical and biological resources found on earth. A complex web of biological, chemical, and physical processes produce ecosystem goods and services that flow like interest or dividends from those stocks, supporting all life on earth and deeply influencing the quality of human life." (MNAI, 2017) "The extent of the services provided by natural assets can be identified using a combination of modeling and monitoring. A frequently recommended method for assessing the value of natural assets is the Replacement Cost method that shows what it would cost to replace or substitute a natural asset's service typically by an engineered means. For example, A seven-kilometre riverbank in the Oshawa Creek watershed in Ontario provides $18.9-million worth of stormwater conveyance/drainage annually to nearby communities based on replacement cost." (Intact Centre on Climate Adaptation, 2022)

Natural Infrastructure - According to IISD, "**natural infrastructure** is an area or system that is either naturally occurring or naturalized and then intentionally managed to provide multiple benefits for the environment and human well-being." (IISD, 2020) "The International Union for Conservation of Nature (2016) defines **nature-based solutions** as measures that protect, restore and sustainably manage natural or modified ecosystems, with the aim of maintaining or

enhancing the services provided to human communities and benefits to biodiversity." (CCME, 2021) "**Green infrastructure** refers to the natural vegetative systems, engineered and built features, and green technologies that collectively provide society with a multitude of economic, environmental and social outcomes" (GIO 2020; Stanley et al. 2019). Terms such as natural infrastructure, nature-based solutions and green infrastructure are often used interchangeably or synonymously in a more global sense to discuss policies and interventions that are related to leveraging the benefits of nature, either naturally occurring or through engineered solutions, or through a combination of both, depending on the context. Natural infrastructure and green infrastructure are generally classified under the broad category of nature-based solutions, but natural infrastructure is also "differentiated from green infrastructure based on its composition of exclusively natural ecosystem features and materials" (CCME, 2021).

Natural Infrastructure Fund: The Natural Infrastructure Fund (NIF) is a $200 million program of Infrastructure Canada that aims to support projects focused on utilizing natural assets and ecosystem services to address infrastructure challenges and enhance climate resilience across Canada. The fund recognizes the importance of nature-based solutions in building sustainable infrastructure and promoting environmental sustainability. (Infrastructure Canada, 2021)

Acronyms and Abbreviations

CCI	Canadian Climate Institute
CSR	Corporate Social Responsibility
DMAF	Disaster Mitigation and Adaptation Fund
ECCC	Environment and Climate Change Canada
ESG	Environmental, Social, and Governance
FCM	Federation of Canadian Municipalities
GHG	Greenhouse gasses
IBC	Insurance Bureau of Canada
IISD	International Institute for Sustainable Development
ISED	Innovation, Science and Economic Development Canada
IWM	Integrated watershed management
NAI	Natural Assets Initiative
NDC	Nationally Determined Contributions
NIF	Natural Infrastructure Fund
NRCan	Natural Resources Canada
NUPP	National Urban Parks Policy

UNFCCC	United Nations Framework Convention on Climate Change

Appendix C - Summary of Natural Infrastructure Benefits

Benefits	Description/details	Potential size of benefit	Time scale
Reduction of climate risks and adaptation to climate impacts	This is the primary goal of these urban parks. Reducing climate risks by incorporating adaptation strategies can strengthen community resilience. These strategies can help mitigate the impact of events such as storms, floods, droughts, heat waves, and wildfires.	These strategies can help minimize the economic damage caused by extreme weather events and other climate impacts, while also providing intangible benefits in the form of saving lives, and livelihoods, and improving the quality of living of different communities.	Long time scale with increase in benefits over time (decades)
Comparative advantage: Natural infrastructure solutions offer low-carbon alternatives to conventional grey infrastructure	*By relying on natural ecosystems such as wetlands and forests, these solutions provide a range of benefits with minimization in GHGs. Whereas grey infrastructure such as dykes and dams are carbon intensive, and usually more expensive to build and maintain*	*The benefits of natural infrastructure can be calculated by comparing them to the cost of grey infrastructure built with similar objectives - over their lifecycle. Beyond climate adaptation, benefits can also be calculated in terms of their development and maintenance costs.*	*Long time scale*
Positive impacts on the restoration of natural habitats and biodiversity	Unlike conventional grey infrastructure, which often disrupt and destroy ecosystems, natural infrastructure works in harmony with nature to restore and preserve habitats. They can contribute to improvement in biodiversity health including that of local flora and fauna.	Accounting for benefits of natural infrastructure projects to biodiversity health in economic terms can be a difficult preposition as monetary benefits are inherently human-centric. This is a challenge for accurately measuring their impacts, and putting nature on the balance sheet.	Long time scale

Positive health impacts derived from the use of natural/green space	Natural infrastructure can potentially improve health outcomes of communities, through ecosystem services associated with water filtration, cleaner air, and provision of recreational spaces for better physical and mental health, and socio-cultural interactions.	This could be measured in terms of improvements to health outcomes such as reduction in disease outbreaks, reduction in mortality rates associated with poor environment or increase in life expectancy. In monetary terms, the amount spent on healthcare could serve as a proxy indicator for these benefits.	Short to long time scale
Research, skill development and capacity-building benefits	Collaboration with academic institutions, policy think tanks and professional associations can help converge and enhance expertise on data collection, evaluation and monitoring of natural infrastructure projects. This is an opportunity to build cross-sectoral expertise in engineering, planning, environmental management and urban development. It can be coordinated in ways that draw learnings and mobilize knowledge across the country.	Even though these benefits are difficult to measure, they can lead to improved project design, implementation, and management, resulting in cost savings and increased efficiency. Additionally, collaboration with academic and professional institutions can contribute to human capital development, leading to a skilled workforce capable of driving future green and sustainable initiatives. While assigning a precise economic value to these benefits may be challenging, recognizing their positive impact on project outcomes and long-term sustainability can inform decision-making and justify investments in collaborative partnerships.	Medium to long term
Public education, awareness, community building & participation	Public engagement is a key component of this project that can generate public awareness about the benefits of natural infrastructure that go beyond aesthetics and recreation. Involving the public in co-	By raising awareness and understanding, the public can become advocates for natural infrastructure, and support necessary policies and funding strategies. Additionally, tracking the incorporation of local knowledge and ideas into	Short term

	developing strategies can also foster a sense of ownership and empowerment. By actively participating in decision-making processes, the public can contribute valuable local knowledge, ideas, and solutions, leading to more contextually appropriate and effective natural infrastructure interventions.	project design and monitoring the effectiveness of contextually appropriate interventions can help quantify the impact of public participation on the outcomes and success of natural infrastructure projects.	
Placemaking, identity	Parks that are well-loved and well known in a place can contribute to community identity, pride and place. This builds resilience and connection in a community.		Medium to long term
Tourism	Done well, the natural infrastructure can also be a site for tourism and visitors near and far. Especially if this is built/restored as a world-class natural infrastructure, there is potential for not only public education but also to generate tourism revenue.	Tourism revenue can potentially be calculated in monetary terms. For example: User fees, or other indirect revenue through hotels, food and local goods and services associated with the natural infrastructure.	Medium to long term
Reconciliation and co-governance	Partnerships with local Indigenous nations will be crucial to the success of the natural infrastructure.	Revitalization and bringing traditional knowledge can bring multiple benefits that are not just social but also cultural.	Medium to long term