



Advancing Natural Infrastructure in Canada

A FORUM REPORT



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Executive Summary

In Canada and globally, there is growing use of natural infrastructure (NI) to address increasing risks related to climate change and to meet pressing environmental and economic needs. A recent report on *Combating Canada's Rising Flood Costs* by the Intact Centre on Climate Adaptation, IISD and the IBC shows that NI projects across the country demonstrate value for money in providing critical benefits to local communities and broader societal needs (Moudrak, Feltmate, Venema, & Osman, 2018).

Infrastructure Canada (2018c) defines NI as “the use of natural resources such as plants, soil and wetlands to reduce or mitigate the impacts of climate change or natural hazards.” Others define NI as natural systems that are activity managed to provide infrastructure outcomes and benefits (Adapted from ICF, 2018).

On November 14, 2018, IISD, along with IBC and ALUS Canada, convened the **Advancing Natural Infrastructure in Canada** forum in Winnipeg. This forum brought together experts in related fields from across the country to discuss how Canada can use NI to build more resilient cities, towns and landscape in the face of increasing climate uncertainty.¹

The day-long forum was divided into three main sessions, with presentations and discussions related to (i) understanding the importance of NI in the context of increasing infrastructure needs and impacts of climate change; (ii) discussing existing and innovative financing for NI; and (iii) understanding some opportunities and barriers to implementing NI projects in Canada.

¹ Additional information on the Advancing Natural Infrastructure in Canada forum can be found on IISD's website at <https://www.iisd.org/event/advancing-natural-infrastructure>



Table 1. Key Insights from the Forum

| Audience | Key Insights and Recommendations |
|---|---|
| Federal and Provincial Governments | Insurance costs due to extreme weather events, particularly floods, are rising exponentially, becoming increasingly unviable; average costs for property and casualty insurance went up from CAD 405 million annually between 1983 and 2008 to CAD 1.8 billion between 2009 and 2017. NI is emerging as a cost-efficient means of reducing risks to extreme events (Moudrak et al., 2018). |
| | Current federal programs such as the Investing in Canada Infrastructure Program (ICIP) and the Disaster Mitigation and Adaptation Fund (DMAF) have some practical barriers to uptake. ICIP: Eligible projects target infrastructure that support public benefit and use, including NI. Provinces and territories, non-for-profit and for-profit entities, municipalities and Indigenous communities are eligible to receive funding, however, private land-owners are not eligible recipients. Projects on private lands can be eligible but are assessed on a case-by-case basis. Funds only support capital infrastructure projects, excluding funds for ongoing operating costs, meaning necessary maintenance of natural systems as part of an NI project is excluded. DMAF: Land acquisition is allowed under specific conditions, although easements are excluded. The minimum threshold of CAD 20 million precludes smaller NI projects with potentially high impacts. |
| | Based on the strong interest in NI programming, develop dedicated programs to fund and support NI projects, acknowledging their value and potential for achieving community, environmental and federal priorities. |
| | Governments should consider green bonds to finance NI projects, ensuring that proposals and the approved project meet overall outcomes such as improved water supply, flood mitigation, waste management, etc. ² |
| | Allow natural asset accounting in the <i>Public Sector Accounting Handbook</i> , ³ in turn allowing NI projects to be formally considered in municipal infrastructure planning, operations and maintenance. |
| Municipal and Local Governments | Municipalities own the bulk of core infrastructure assets that provide Canadians with key services; according to the <i>Canadian Infrastructure Report Card</i> , one third of our municipal infrastructure is in fair, poor, or very poor condition (Canadian Construction Association, Canadian Public Works Association, Canadian Society for Civil Engineering, & Federation of Canadian Municipalities, 2016). NI projects should actively be considered as cost-effective alternatives to built infrastructure. |
| | Decision-makers need to understand how NI can cost-efficiently and effectively complement or replace built infrastructure projects to meet specific local service requirements. They must collaborate with experts on developing guidance on how NI can meet municipal needs and services, including water storage and treatment, delivery, wastewater treatment and flood mitigation, as well as on asset management, accounting and NI financing. |
| | Include economic value of natural assets on financial position statements to support sustainable asset management, as well as natural asset maintenance. |

² The Government of Ontario has successfully launched four green bond issues to date for approved government-led projects falling under forestry, agriculture and land management, and climate adaptation.

³ The *Public Sector Accounting (PSA) Handbook* that guides public services accountants only allows the inclusion of purchased natural assets where they meet certain criteria.



| Audience | Key Insights and Recommendations |
|---|---|
| Banks and Insurance Agencies | Clarify specific needs for green bonds that can be adapted for NI-related bonds and other financing mechanisms. This includes providing guidance on developing a credible business case for NI projects to enable their inclusion in private investment mechanisms. |
| | Identify key performance metrics that are critical for private sector financing. Work with conservation groups to formalize some of these metrics. |
| | Identify the limitations of private sector financing as they relate to NI projects, such as space and time lags in achieving benefits. |
| | Highlight how insurance-linked resilience bonds can be applied to NI projects based on reduced risk to floods and other disasters. |
| Implementation Agencies (planners, watershed groups, non-governmental organizations) | Collaborate with conservation experts and others to prioritize NI projects that can meet regional- and watershed-level service needs. |
| | Provide clear, context-specific cost-benefit analyses related to improving the uptake of NI projects across the country. |
| | Develop methodologies and guidance for context-specific cost-benefit analyses for NI projects. Existing resources include the Sustainable Asset Valuation tool ⁴ and frameworks developed by the Municipal Natural Assets Initiative ⁵ and Moudrak et al. (2018). |
| | Showcase the clear co-benefits from NI projects, contributing to a growing body of knowledge on the value of NI projects as cost-effective, viable complements or alternatives to built infrastructure projects. |
| | Provide guidance on how NI can complement built infrastructure in meeting key outcomes. |
| | Convene experts and practitioners to enable interdisciplinary efforts to implement NI. |

⁴ IISD’s Sustainable Asset Valuation tool (SAVi) is described at <https://www.iisd.org/sites/default/files/publications/sustainable-asset-valuation-savi-tool-brochure.pdf>

⁵ The Municipal Natural Assets Initiative’s guidance to local governments on defining and scoping municipal natural assets is accessible at: <https://mnai.ca/media/2018/02/finaldesignedsept18mnai.pdf>



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List of Abbreviations

| | |
|-------------|---|
| DMAF | Disaster Mitigation and Adaptation Funds |
| ECCC | Environment and Climate Change Canada |
| NI | natural infrastructure |
| IBC | Insurance Bureau of Canada |
| ICIP | Investing in Canada Infrastructure Program |
| IISD | International Institute for Sustainable Development |
| MNAI | Municipal Natural Assets Initiative |
| NCC | Nature Conservancy of Canada |
| SAVi | Sustainable Asset Valuation tool |
| SPI | Smart Prosperity Institute |
| SRI | socially responsible investing |



1.0 NI: Context and introduction

Natural infrastructure (NI) is being recognized as an important response to accelerating risks related to climate change, the widening infrastructure gap resulting from aging infrastructure, and growing infrastructure needs in Canada and globally. The European Commission describes green infrastructure as a “catalyst to economic growth,” as being cheaper than grey infrastructure, and as a means to create clean jobs and bring greater returns on investments (European Commission, 2018). The World Business Council for Sustainable Development has created the Natural Infrastructure for Business platform (NI4Biz), which makes the case that businesses must invest in and manage NI to secure access to resources, as well as to reduce their exposure to risks linked with ecosystem degradation, while creating value for society and the environment (Natural Infrastructure for Business, n.d.). The United Nations Environment Programme (2014) created a guide for using green infrastructure (including natural systems) for water management and highlighted the need for better economic analyses to gauge the value and effectiveness of these systems in a variety of contexts.

In Canada, Infrastructure Canada (2018c) defines NI as “the use of natural resources such as plants, soils and wetlands to reduce or mitigate the impact of climate change or natural hazards.” Examples of NI projects include wetlands for flood control and fire breaks to mitigate wildland fires. Others have defined NI¹ simply as natural systems that are actively managed to provide infrastructure outcomes and benefits, such as cleaner water, improved biodiversity or flood management (ICF, 2018). NI includes managed natural systems, such as wetlands, or naturalized systems, such as municipal lagoons for treating waste water. NI is one type of the broader term, green infrastructure, which includes man-made or natural systems targeting environmental outcomes. These projects could include traditional wastewater treatment facilities aimed at cleaner water or renewable energy grids without any natural elements at all. At the other end of the spectrum are the traditional, built or grey infrastructure that are constructed by humans, such as culverts or dams.

Box 1. Definitions

Natural infrastructure: active management of natural systems to provide infrastructure outcomes and benefits (e.g., green spaces, managed wetlands, etc.).

Green infrastructure: infrastructure that has positive environmental outcomes (e.g., solar panels, permeable pavement, etc.)

Built infrastructure: traditional infrastructure that has been constructed by humans (e.g., dams, culverts, wastewater treatment facilities, etc.).

Source: Adapted from ICF, 2018.

NI provides improved climate resilience, as well as environmental, economic and social benefits that are not produced by traditional infrastructure (ICF, 2018; Moudrak et al., 2018). For example, healthy forests provide clean air and wetlands can be managed for flood mitigation, but they can also improve biodiversity, water storage, improved water quality and habitat. The rationale for using NI to meet infrastructure needs such as water treatment and waste management and decreasing risks related to floods, fires and droughts is becoming stronger. The fact that NI provides various co-benefits can also prove that such infrastructure systems are cost efficient and more effective in certain cases.

¹ In other regions of the world, NI may be referred to as nature-based solutions, which the International Union for the Conservation of Nature defines as “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits” (Cohen-Shacham, Walter, Janzen, & Maginnis, 2016, p. 4).



Moudrak et al. (2018) explain that these added benefits of NI must be reflected in a cost–benefit analysis to assess financial, environmental and social costs.

Reflecting the growing interest in NI, the Government of Canada has developed programs and funding for implementing NI projects in the country. Federal Budgets for 2016 and 2017 committed funds for green infrastructure projects (including NI), including for clean water and waste water. In addition, Budget 2017 announced the creation of the Disaster Mitigation and Adaptation Fund (DMAF), a CAD 2 billion merit-based fund that supports infrastructure development to help communities better manage the risks related to natural hazards and potentially include NI solutions. In Manitoba, a newly established Conservation Trust² sets aside funding in the form of an endowment in perpetuity that allows for NI programming for a range of final outcomes, including carbon storage, water quality and quantity management, soil conservation and biodiversity.

Two recent reports discuss best practices related to NI for climate resilience in Canada (ICF, 2018) and how to combat flood damages and costs in Canada with NI (Moudrak et al., 2018). These reports provide a framework for implementation and highlight the importance of valuating and financing NI. Moudrak et al. (2018) shared a list of three steps toward the most cost-effective method of utilizing NI for climate adaptation: (1) retain what you have, (2) restore what you have lost and (3) build what you must.

While programs and interest in NI are rapidly increasing in Canada, the implementation of NI projects remains slow (ICF, 2018). To identify and address some key opportunities and barriers to accelerate NI programming in Canada, IISD hosted a one-day forum in Winnipeg, Canada, in November 2018. This report presents highlights of the presentations, discussions and insights from that forum.

Box 2. Examples of NI

Aquifers: permeable rock that transfers water to wells; can be used for water storage, recharge and drinking water.

Bioswales: designed to filter suspended particles, debris and pollutants from surface runoff using vegetation or rocks in narrow depressions.

Green roofs: vegetation-covered roofs used to reduce and filter stormwater runoff, with added benefits such as habitat, temperature reduction, improved energy use and public space.

Living shorelines: managing vegetation and rocks to stabilize and protect shorelines from erosion.

Managed wetlands: managed for water storage, filtration, nutrient sequestration, habitat, biodiversity and protection during flood events; includes wastewater lagoons designed to receive, store and treat wastewater with biological, chemical and physical processes.

Urban green spaces/forests: managed to provide social benefits while storing/filtering runoff, reducing temperature, decreasing energy use and reducing carbon emissions

Source: ICF, 2018

² See <https://www.mhhc.mb.ca/the-conservation-trust/>



2.0 The 2018 Advancing Natural Infrastructure in Canada Forum

The Advancing Natural Infrastructure in Canada forum on November 14, 2018, in Winnipeg brought together experts in related fields from across the country to discuss how Canada can use NI to build more resilient cities, towns and landscapes in the face of increasing climate uncertainty.

Broadly, the day-long forum was divided into three main sessions:

- Understanding the importance and value of NI in light of climate change and increasing infrastructure needs in Canada
- Discussing existing and innovative financing for NI
- Understanding the opportunities and barriers to implementing NI projects across the country

The forum included representation from Canadian federal government departments, provincial governments (including Manitoba, Ontario and Saskatchewan), municipal governments, the insurance sector, the banking sector, academia, and a range of non-governmental organizations and foundations. A list of participants and event contributors is appended to this report, and shareable presentations and the final agenda are included on the website at <https://www.iisd.org/event/advancing-natural-infrastructure>.

The morning session was opened by **Jane MacDonald, Managing Director of IISD**, who acknowledged the forum's presence on Treaty 1 territory and thanked various funders and supporters of this important conversation. She introduced the day as a meeting of unconventional collaborators who would need to work together to raise awareness of how NI could serve to build climate resilience. She expressed IISD's support for this cause generally and indicated that IISD would continue to provide strategic inputs as needed in this process.

The Honourable Rochelle Squires, Minister of Sustainable Development in Manitoba, provided welcome remarks from the Government of Manitoba, indicating that natural area management and developing NI; maintaining outcomes such as clean water, flood and drought resilience; and focusing on carbon storage and climate adaptation are critical priorities for this government. She highlighted Manitoba's Climate and Green Plan as the means to sustainable development in the province and highlighted the importance of NI in many of the government's current programs and plans within the context of the Green Plan. The minister encouraged the forum participants in their work and indicated an interest in its outcome.

Toby Barrett, Member of Provincial Parliament, Ontario, indicated support and provided remarks on behalf of Ontario. He highlighted his private members' bill (Bill 28), "respecting a voluntary program for the alternate use of agricultural land and the production of ecosystem services on that land" that was introduced and received unanimous support in the Ontario legislature. The proposed legislation aims for a framework and plan for voluntary programming on agricultural lands to achieve outcomes such as clean air, clean water, healthy soils and a better environment.

David McLaughlin, Director of Climate Change, Canada at IISD, introduced the day's proceedings and provided an overview of the agenda and the expected outcomes from the day, while moderating the proceedings.



2.1 Session 1: NI and the Climate Imperative in Canada

Session Summary

Session one of the forum delivered presentations and a panel discussion on the need for, and the value of, NI in Canada. The session included presentations by Craig Stewart from the Insurance Bureau of Canada (IBC), *Elevated Climate Risks and Implication for the Insurance Sector*; by Natalia Moudrak from the Intact Centre for Climate Adaptation, *The Utility of Natural Infrastructure for Climate Adaptation in Canada*; and by Andrea Bassi from IISD, *Sustainable Asset Valuation Model: Transparency for Decision-Makers and Investors*.

A panel discussion highlighted federal and provincial programs. It was moderated by Craig Stewart with Tara Pratt, Director of Economic Development Programs from Manitoba Strategic Infrastructure Secretariat; Annie Geoffroy, Acting Director of DMAF from Infrastructure Canada; and Laniel Bateman, Acting Executive Director of Strategic Policy Directorate from Environment and Climate Change Canada.

Main Points:

- Climate change and related risks (e.g., floods and droughts) are making the need to consider NI projects urgent and necessary. These projects should complement grey “engineered” options for climate resilience in Canada.
- Risk management measures such as insurance are rapidly becoming unviable due to steeply rising costs, as seen in recent examples of Canadian floods.
- NI projects, such as in Gibsons, British Columbia, and Pelly’s Lake, Manitoba, are demonstrating that NI projects are cost efficient, provide flood protection and have other co-benefits.
- Rising natural disasters are incenting the development of mechanisms such as guidelines and standards for new buildings and development, particularly in flood-prone areas.
- Federal programs such as the Investing in Canada Infrastructure Program (ICIP) and the DMAF can enable NI projects.
- Other government programs, such as those directed at adaptation, water, protecting species and risk (Environment and Climate Change Canada [ECCC]) and toward agri-environmental management (Agriculture Canada), can complement infrastructure programs toward NI implementation; however, more coordination is needed.
- The importance of performance measures and outcomes-based metrics was brought up, especially regarding contextual uncertainties related to ecosystems underlying NI.
- Specific barriers related to NI programs include high minimum thresholds for funding of the NI projects, land ownership, and acquisition eligibility and outcomes measures.

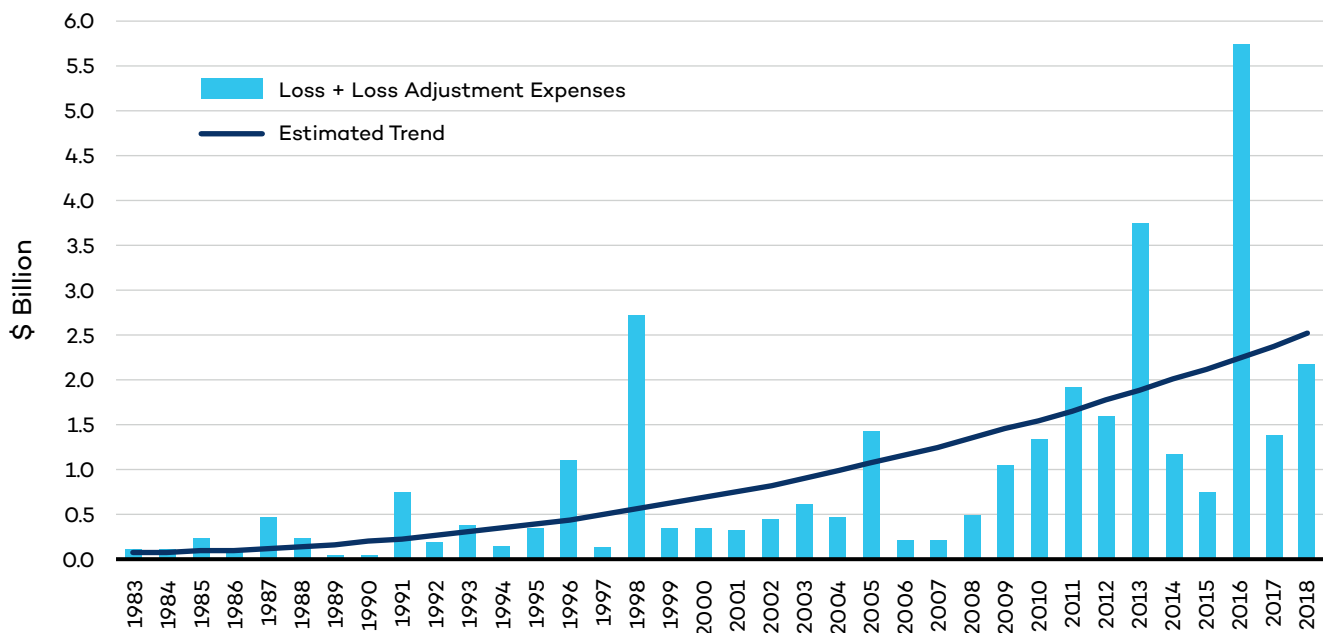
2.1.1 Presentations

Craig Stewart, IBC, provided the insurance sector’s perspective, highlighting the key link between NI as a means to address rising risks related to climate change. He highlighted that the number of global catastrophic events have increased dramatically from over 200 relevant natural loss events in 1980 to over 700 in 2016. These include geophysical, meteorological, hydrological and climatological events, and the majority are attributed to meteorological and hydrological events. In fact, water is the leading cause of personal property claims. The Intact Financial Corporation (2017) observed a doubling of water damage claims to 40 per cent of dollars paid in losses over the last decade, and the federal Disaster Finance Assistance Arrangements spending related to floods has increased from 76 per cent (1970–2014) to 88 per cent (2000–2014) (Stewart, 2018).



Total economic losses (insured and uninsured) are growing annually. In 1980 these annual losses were under USD 50 billion, and today they are nearing USD 200 billion. Figure 1 below displays the increase in insured losses and estimated trends in Canada from 1983 onwards. Since 1980, the number of climate-related catastrophic events have tripled, indicating there is a clear insurance case for managing climate risk (Stewart, 2018). Canada’s top five destructive floods have all occurred since 2010, including the southern Alberta flood in 2013 (CAD 2.72 billion in damages), the southern Manitoba flood in 2014 (CAD 1.16 billion in damages), the southern Alberta and Saskatchewan flood in 2010 (CAD 1.03 billion in damages), the Toronto flood in 2013 (CAD 940 million in damages) and the Manitoba flood in 2011 (CAD 600 million in damages) (Mettler, 2018).

Figure 1. Insured catastrophic losses in Canada



Note: values are in CAD 2018 prices, and include loss adjustment expenses

Source: Data compiled from IBC, PCS, Swiss Re, Deloitte and CatIQ, as cited in IBC, 2018, p. 17.

Natalia Moudrak, Intact Centre on Climate Adaptation, also stressed that our current infrastructure is typically not designed to withstand the severity or frequency of extreme weather events, and that housing/real estate in high-risk, flood-prone regions are of particular concern to the property and casualty insurance sector. Stewart mentioned that the pricing risk for these regions can be so high that some companies cannot offer flood insurance coverage, or that insurance premiums would no longer be affordable for the average Canadian. Moudrak reinforced the point that the uninsurable housing market is growing and that repeated flood events increase the risk of mortgage arrears for the average Canadian, who is already living paycheque-to-paycheque. As of December 2017, after hurricanes Harvey and Irma impacted the United States, there were over 150,000 Americans who were overdue on their mortgage by over 90 days associated with these natural disasters. Moudrak stated that this is not something that Canadians are “immune” to. In fact, Moudrak et al. (2018) highlight that 19 per cent of Canada’s population is at risk of flooding. With the average cost to repair a flooded basement at CAD 43,000 and growing uninsurability of homes in high-risk areas, how can citizens survive these costs? What actions can they take to reduce their flood risk?

These trends put immense pressure on communities in Canada to adopt new flood-resilient practices, including conservation and restoration of NI. Moudrak noted there are new flood resiliency guidelines and standards



currently under development for homes (CSA-Z800), new community design (CSA-W204) and existing community retrofits, as well as industry-led guides for flood-resilient commercial real estate retrofits. Canada is currently leading these efforts globally and is supported by the National Research Council of Canada, Standards Council of Canada and the CSA Group. By implementing these fundamental guidelines and standards for flood resilience, the risk of flood damage can be reduced. This has potential to lower annual home insurance premiums from 5 to 15 per cent, enhancing insurance coverage and increasing coverage limits (Intact Financial Corporation, 2017; Moudrak, 2018).

Box 3. The Municipal Natural Assets Initiative in Gibsons

The Town of Gibsons, British Columbia, used the Municipal Natural Assets Initiative (MNAI) to demonstrate the use of NI solutions for climate adaptation. The MNAI is a tool used to help municipalities to evaluate NI services and make asset management decisions (Brooke et al., 2017). The Gibsons local aquifer was assessed for water storage and local ponds for stormwater management. They discovered that the aquifer served 70 per cent of the population and that the naturally occurring ponds provided the same services as a grey infrastructure alternative that costs CAD 3.5 million to 4 million during a 100-year storm event and CAD 437,500 during an average year (Sahl et al., 2016). The asset valuations led the initiative for Gibsons to protect, enhance and manage local NI and to be the first North American municipality to recognize natural assets as an asset class (Town of Gibsons, 2017). Understanding the asset value of NI in local municipalities provides incentive for protection and management, all while enhancing additional ecological and social benefits.

Andrea Bassi, IISD, presented the Sustainable Asset Valuation (SAVi) tool to illustrate the need and means to evaluate the environmental, social and economic risks and externalities of infrastructure, including NI, using a system-dynamics-based approach. This tool captures costs, benefits, risks and externalities of NI to build robust understanding and a business case for investors or decision-makers and has been used in the context of natural and grey infrastructure in countries such as Tanzania, India and the Netherlands. As in the case of built infrastructure systems, natural systems can be assessed to determine value for money for local investments, assess financial returns of sustainable infrastructure practices or to assess whether sustainable assets trigger positive externalities, to name a few (Bassi, Pallaske, Stanley, & Perera, 2018). This contributes to the growing interest and understanding of where and how natural systems can replace or complement built systems in meeting infrastructure needs. SAVi has been applied globally to different infrastructure assets.

Recently, the SAVi tool was applied to monetize the benefits and costs of two assets in Manitoba: Stephenfield Reservoir and Pelly's Lake. Pelly's Lake is a wetland that provides a number of critical services: carbon sequestration, nutrient removal, flood protection and biodiversity. Revenues (cattail production) and costs of the project (operation and maintenance) were estimated along with the replacement value of services³ for irrigation, waste water and carbon abatement to make a case for conserving NI in place of building new infrastructure. This tool is further described in the section below on NI financing.

2.1.2 Panel: Federal and Provincial Programs for NI in Canada

Annie Geoffroy, Infrastructure Canada, reviewed Infrastructure Canada programs and funds to provide predictable and long-term support for Canadian infrastructure systems. The department aims to address challenges of rapid population growth, growth of cities and climate change impacts by working with stakeholders around infrastructure projects. Without owning assets, the federal department relies on partners to advance projects in jurisdictions and communities.

³ Cost to replace the services provided by NI project by built infrastructure alternatives.



The Pan-Canadian Framework on Clean Growth and Climate Change is “Canada’s plan to address climate change and grow the clean economy” (ECCC, 2016). The plan was developed together with provinces, territories and Indigenous partners, and its implementation relies on the combined efforts of all the stakeholders. To reduce climate-related hazards and disaster risks, the Pan-Canadian Framework outlines the need for federal, provincial and territorial governments partnering “to invest in traditional and NI that reduces disaster risks and protects Canadian communities from climate-related hazards such as flooding and wildfires” (Environment and Climate Change Canada, 2016, p. 35).

In Budget 2017, the federal government committed to investing CAD 21.9 billion in green infrastructure nationally, including into initiatives that will support the implementation of the Pan-Canadian Framework on Clean Growth and Climate Change (Infrastructure Canada, 2018d).

In 2018 Infrastructure Canada launched the CAD 2 billion **DMAF**. This is a merit-based program that will increase community resilience to natural hazards and extreme weather events (Infrastructure Canada, 2018c) by targeting large-scale infrastructure projects. The program supports NI under both types of eligible projects—new construction and modification of existing public infrastructure. Projects must have a minimum of CAD 20 million in eligible expenditures (Infrastructure Canada, 2018e). The DMAF complements the ICIP.

Adaptation and disaster mitigation projects below the DMAF’s CAD 20 million project threshold can be funded under the **Investing in Canada Infrastructure Program’s Infrastructure Green Stream** (Infrastructure Canada, 2018a)

According to the Manitoba Strategic Infrastructure Secretariat (n.d.a), the Green Stream supports greenhouse gas emission reductions, greater adaptation and resilience to the impacts of climate change and climate-related disaster mitigation, and ensuring more communities can provide clean air and safe drinking water for all citizens.

Under DMAF, when related to NI projects and/or components, land acquisition is eligible under some conditions (Infrastructure Canada, 2018e).

Tara Pratt, Manitoba Strategic Infrastructure Secretariat, indicated that Manitoba signed the ICIP Bilateral Agreement on June 4, 2018, with the goal to support infrastructure needs throughout Manitoba into 2028 (Manitoba Strategic Infrastructure Secretariat, n.d.b). The Green Stream allocation for Manitoba is CAD 451,790,568 (Infrastructure Canada, 2018a). Pratt highlighted climate change mitigation, disaster mitigation and environment quality as priority outcomes identified in Manitoba, complementary to Manitoba’s Climate and Green Plan.

Pratt emphasized that, in the context of southern Manitoba, one of the key challenges faced by NI is loss to land-use changes, which include agriculture, cities and modern lifestyles. It is important to have land as an eligible cost in infrastructure funding programs, which is not often the case. Contestation, nevertheless, is ongoing on land eligibility.

Laniel Bateman, ECCC, highlighted that NI is eligible for support through not only Infrastructure Canada, but other federal departments. Crown-Indigenous Relations and Northern Affairs Canada can support NI through the Climate Change Preparedness in the North Program and the First Nation Adapt, Agriculture and Agri-Food Canada through Canadian Agricultural Partnership (Bateman, 2018). She highlighted the Climate Lens for assessing whether proposed infrastructure projects are achieving adaptation-related metrics desirable in specific contexts.

Bateman indicated her department’s efforts at coordinating programs that contribute to adaptation from across federal Canadian agencies. She indicated that a guide was under development that would identify the various programs and perhaps lead to better coordination and a collaborative process moving forward. She highlighted the report on best practices in NI (ICF, 2018) and some need for simple frameworks for NI programming accommodating the multiple benefits in the future.



The importance of outcomes measurement and design of appropriate metrics was brought up by many forum participants. This is particularly important in the context of the dynamic nature of ecosystems and NI, both based on local context and due to natural cycles and seasonal shifts.

A discussion on issues related to performance and, therefore, value of NI depends on climatic conditions. For example, the value of a wetland to protect against floods and filter nutrients can increase during wet years and decrease during dry years when this function is not as effective. Therefore, the value of services that NI projects provide can change depending on the year, which affects the value of these services in the future. A wetland, for example, does not perform as an infrastructure asset in the same way and through different seasons. Since the value of natural assets increases drastically under climate stress, there is a related issue of properly evaluating climate risk and possible responses through natural systems. The implications of climate risk for asset valuation, outcomes measurement and implementation of NI projects require further investigation among stakeholders.

Bateman noted that some outcome measurement is embedded into government funding programs. However, it is always worth asking if we are looking at the outcomes in the right way. It can be especially problematic to understand the long-term outcomes of investments in NI projects. Moreover, outcome measurement can also be expensive. Some stakeholders need to turn to consultants for outcome assessments; however, they do not have capacity to hire them.

There is wide recognition that we need to convene experts and practitioners to develop NI guidelines on how to design and evaluate projects. Consistent and standardized metrics will ensure scalability of NI projects.

The panel discussion involving ECCC and infrastructure departments in government highlighted the different landscape-based programs that might have implications for NI in Canada. The need for coordination between (particularly government) programs with complementary actions or outcomes was highlighted. Wetland restoration for flood mitigation could be combined with efforts on wetland restoration for biodiversity and water quality management. This might entail a minor change in program delivery, coordination of program measurement, and allowing projects to access complementary funds to add easily achievable outcomes.

2.2 Session 2: NI Funding

Session Summary

Session two of the forum focused on private sector financing options for conservation and restoration of NI in Canada. This session comprised presentations from Mark Hadden, Managing Director and Head of Government Finance at Scotiabank on Social Financing within Global Capital Markets; Kevin Teneycke, Regional Vice President – Manitoba Region (Acting) at Nature Conservancy of Canada (NCC) on conservation programming by the NCC; and Thomas Börtzler, VP and Chief Innovation Officer, Munich Reinsurance Company of Canada on NI Financing. The subsequent panel discussion was conducted by Natalia Moudrak, Director of Infrastructure Adaptation Program at the Intact Centre on Climate Adaptation, with the presenters addressing specific questions around financing gaps, opportunities and future needs.

Main points:

- A strong business case is needed to attract and retain financing for building, restoring and maintaining NI projects in Canada.
- Tools such as the SAVi tool and methodologies such as the one showcased in Moudrak et al. (2018) can help quantify costs, benefits and externalities towards a clearer understanding of a range of NI projects.
- Socially responsible investing (SRI), including green bonds, sustainable bonds and resilience bonds, provide emerging opportunities to finance NI.



- Green bonds are relatively new in Canada; however, the issuance is growing rapidly.
- The Government of Ontario has successfully launched four green bond issues to date, totalling CAD 3.05 billion to finance approved government-led projects. The projects funded to date predominantly focus on clean transportation and energy efficiency; however, Ontario's Green Bond Framework allows for projects such as sustainable forest management and flood protection to be equally financed by green bonds.
- Insurance-linked resilience bonds are an emerging concept to encourage resilience-related investment. These investments use disaster risk mitigation to lower insurance premiums, thus further encouraging investments in resilience NI projects.
- Resilient infrastructure projects can be especially difficult to finance with traditional revenue and payback models, because the benefits are often diffuse and realized far into the future. Also, some NI project benefits are “cost avoidance,” as opposed to a predictable stream of revenues, which may be generated through grey infrastructure projects.
- Standardized measurement and verification of outcomes are necessary to ensure investors have the level of information needed for private sector financing and to scale up financing for NI projects. Third-party taxonomies and benefit verification audits are expected from investors.

2.2.1 Presentations

NI can be a strong complement to engineered assets for flood protection, drought attenuation, water quality improvement, carbon sequestration and other services (Moudrak et al., 2018). A comprehensive assessment of natural assets' financial, environmental and social costs and benefits is required to highlight otherwise undocumented benefits of NI projects (Moudrak et al., 2018).

Understanding the full range of positive environmental, social and economic externalities of NI in financial terms can strengthen the case for investing in these types of projects and help attract investors. Furthermore, this approach has the potential to demonstrate value for money for the public purse. This is particularly important in light of significantly rising costs faced by public service sectors and the insurance sectors in light of increasing natural disasters (Stewart, 2018). Understanding the value of existing NI assets means those assets can be protected, which was emphasized by Andrea Bassi (IISD).

2.2.2 Panel: Financing Options for Scaling up NI Investments

2.2.2.1 SOCIAL FINANCING WITHIN GLOBAL CAPITAL MARKETS

Mark Hadden, Scotiabank, stressed that, in order to attain the Paris Agreement targets and mitigate climate risk, government public capital needs to be supplemented by private capital (Hadden & Taylor, 2018). What is the revenue stream there to attract private capital? What does the model look like? How can we diversify who comes to the table? These questions were raised by government experts at the 2018 forum.

The global capital markets attract vast amounts of investments, and daily trading volumes are high. In his presentation, *Social Financing Within Global Capital Markets*, Hadden specified that daily trading volume in October 2018 was CAD 56 billion for fixed income bonds in Canada, and annual government debt issuance was around CAD 125 billion (long-term fixed income raised in Canada).

SRI, also known as sustainable, socially conscious, “green” or ethical investing, is gathering momentum. SRI is any investment strategy that seeks to consider both financial return and social/environmental good to bring about a positive change. Examples include green bonds, social impact bonds and sustainable bonds (see Box 4). Generally, these instruments suit those who are interested in longer-term investments. According to Hadden, Canadian



green bond issuance is lagging behind some other countries like United States, China or France, but growing annually. Green bond issuance in Canada increased dramatically in 2017, exceeding the total of all previous years combined (Government of Canada, 2018). In 2019 global green bond issuance is projected to double (Hadden & Taylor, 2018), and Canadian sustainable finance issuance is expected to follow with a two- to three-fold increase. The Government of Ontario has successfully launched four green bond issues to date, totalling CAD 3.05 billion to finance approved government-led projects. Although the projects funded to date predominantly focus on clean transportation and energy efficiency, Ontario's Green Bond Framework allows for projects such as sustainable forest management and flood protection to be financed by green bonds. In 2018, Manulife Financial Corp issued a bond of CAD 600 million in principal amount with a coupon rate of 3.2 per cent to fund renewable energy, green buildings, sustainably-managed forests, energy efficiency, clean transport, sustainable water management, and pollution prevention and control projects (Critchley, 2018).

Kevin Teneycke, NCC, mentioned that the NCC and other conservation practitioners engaged in this field have the experience to understand the changing requirements within an NI framing of programming for biodiversity conservation, but may need to learn more on financing systems such as bonds to accelerate work in this area. He suggested that conservation frameworks are well suited to performing as green bonds since the foundation of biodiversity conservation is landscape resilience. So, conservation activities themselves can be funded as green bonds given their positive impact on the environment. A certification framework for these bonds (e.g., Climate [Green] Bond Certification) could facilitate financing and connect to environmental outcomes of conservation projects.

Box 4. Socially responsible investing: Types of bonds

Bonds: a fixed-income financial instrument that represents a loan made by an investor to a borrower. A bond may be issued by a financial institution, the government or even a company (as borrowers) to raise funds for a defined period to finance projects.

Green (aka Climate) bonds: the issuer has to ensure that the bond proceeds are invested in green projects leading to reduced carbon emissions, such as renewable energy.

Social (impact) bonds: a contract with the public sector attracting private capital to finance social services delivery to achieve positive social outcomes.

Sustainable bonds: the proceeds will be exclusively applied to financing or refinancing a combination of both green and social projects.

Sustainable Development Goal-linked bonds: issued where proceeds are exclusively applied to one, or more, of the goals.

Source: Hadden & Taylor, 2018.

Thomas Börtzler, Munich Re Canada, highlighted the important role of insurance for infrastructure project implementation, indicating that, without insurance, projects would not get off the ground. The insurance sector plays an important role when it comes to SRI, including investing in NI projects. Insurance covers risks of projects in case they do not reach the desired outputs.

As catastrophic events became more common and associated risks increased, the reinsurance sector began to look for alternative methods to hedge their risks, particularly through collaboration with capital markets companies (Artemis, n.d.). Innovative instruments that help diversify risk, attract private capital and fund resilience projects are emerging, such as catastrophe and resilience bonds.

Presentations and discussions that touched on the following issues are further elaborated in the sections below.



2.2.2.2 BUILDING RESILIENCE WITH INSURANCE-LINKED BONDS

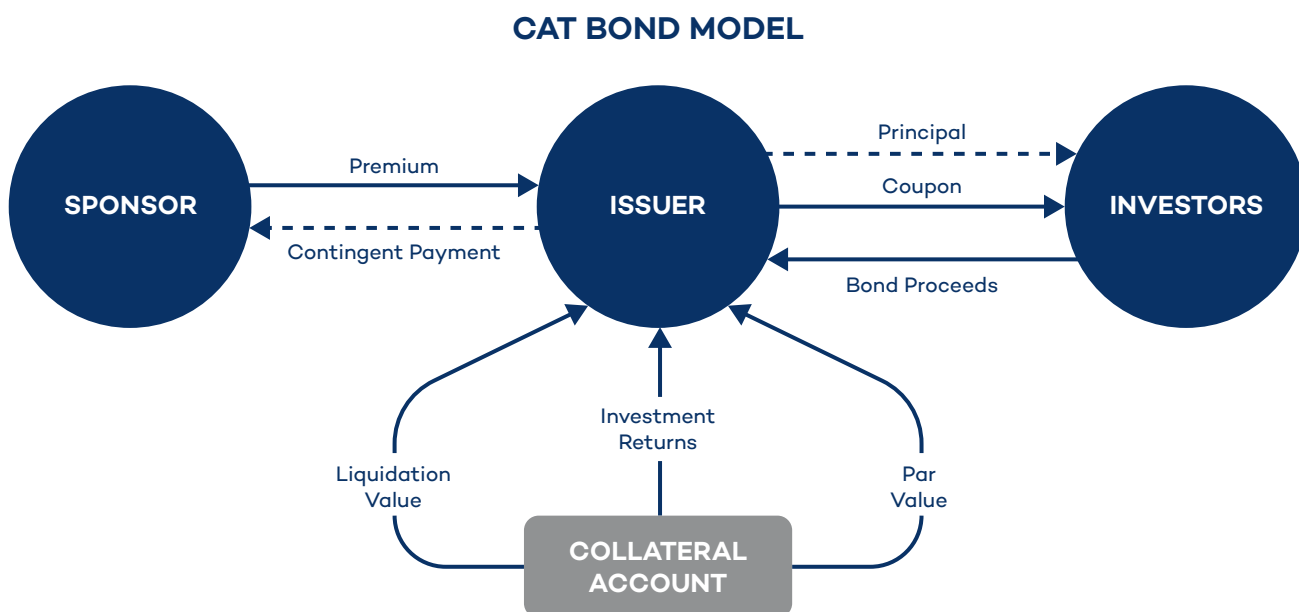
Catastrophe Bonds

A catastrophe bond is a high-yield debt instrument that is meant to raise money in the event of a catastrophe such as a hurricane or earthquake. The insurer (or reinsurer) first enters into a reinsurance agreement with a sponsor (or counterparty) who wishes to pass down some of the catastrophe or natural disaster risk to another entity. The insurer accepts a portion of the potential obligation and receives premiums from the sponsor for providing coverage via issued securities (catastrophe bond) (Artemis, n.d.). The insurer issues the bond to investors and receives the principal amount in return. The principal is then deposited into a collateral account, where it is typically invested in highly rated money market funds. The investor’s coupon is comprised of interest made from the collateral and the premiums the sponsor pays (Artemis, n.d.).

If a specific catastrophic event is triggered and the insured party suffers a loss, then the collateral is used to pay for the losses, and the investors lose the principal they invested. So the payout is based on very specific evaluation criteria and not on actual loss. For example, a flood can be defined as rainfall greater than 100 mm (“Parametric Basis”). Money that is paid out does not have to be paid for damages. Investors, in turn, take on the risks of a specified catastrophe event occurring in return for attractive rates of investment.

Overall, this instrument can appeal to insurance buyers because, whenever there is a crisis, there is no need to prove exactly what was lost (Ruggeri, 2017). Instead, the payout happens automatically as soon as a certain parameter is reached.

Figure 2. Catastrophe bonds



Source: Re:Focus Partners, 2015, p. 35.

Resilience Bonds

Catastrophe bonds do not reduce physical risks and prevent damages from taking place—they only enable payout when disasters strike. Resilience bonds, on the other hand, expand on the catastrophe bond structure to combine insurance coverage that public sector entities may already purchase (such as catastrophe bonds) with capital investments in resilient infrastructure systems.

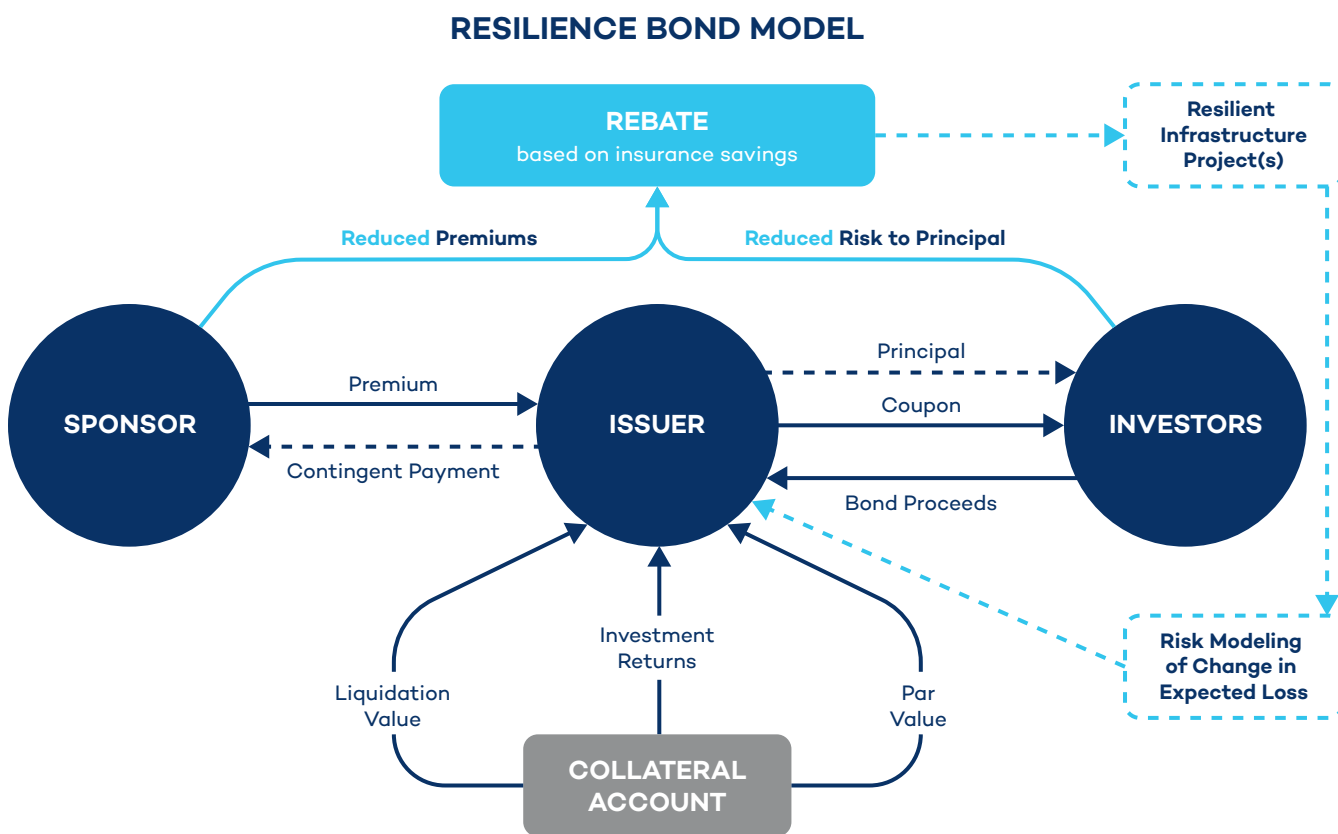


Resilience bonds are designed to manage risk from weather-related catastrophes while promoting investment in infrastructure such as flood barriers (Government of Canada, 2018). Resilience bonds also have a trigger-based payout. However, a resilience bond, unlike a catastrophe bond, considers the probability of lowered risk as the result of investments in resilient infrastructure projects and the reduction in the expected losses. The issuer uses models to validate if and how much a resilience project reduces expected losses. This sets the value of the resilience rebate from the reduced cost of coupon payments to investors (Börtzler, 2018). These cost savings are then passed on to the bond sponsors in the form of a reduced premium, which can be used to finance risk reduction investments, such as resilient NI (Börtzler, 2018).

Overall, the bonds discussed above offer potential mechanisms to diversify risks and encourage resilient investments by attracting private capital. Hadden pointed out that these instruments are still new to investors, so demonstrating success stories is important. It will be possible to bring more investors to the table based on previous track records.

Resilient infrastructure projects can be especially difficult to finance with traditional revenue and payback models, because the benefits are often diffuse and realized far into the future (Vajjhala, 2015). The range of funding mechanisms and financing instruments such as bonds, insurance and public sector program funds must be considered carefully to understand and accommodate the need for resilient infrastructure financing, including NI.

Figure 3. Resilience bonds



Source: Re:Focus Partners, 2015. p. 35.

2.2.2.3 SAVi

The SAVi tool, presented by Andrea Bassi, combines the results of systems thinking and system dynamics simulation with project finance modelling. NI projects tend to have an uneven distribution of benefits and costs over time (Moudrak et al., 2018), so one of the key features of the tool is looking at the project over time. The tool is customized



to each individual infrastructure project, given that each project involves its specific externalities and risks (Bassi et al., 2018) This allows testing the assumptions relative to the project and runs the model in real time as a valuable service provided to clients. Investors use a SAVi analysis to assess the impacts of improved sustainability on future cash flows and financial returns. Governments use a SAVi analysis to assess value for money for public investments and determine changes in government revenues and expenditure (Bassi, Pallaske, Stanley, & Perera, 2018).

Bassi emphasized that the model can provide transparency for decision-makers and help investors ask the right questions rather than point to a specific answer. He stressed the importance of remaining unbiased and the need for systematic analysis when choosing between natural and grey infrastructure.

Box 5. Valuing natural assets

Municipal Natural Assets Initiative: At the municipal level in Canada, efforts have already been made to identify, value and account for the contribution of natural assets to government service delivery (Moudrak et al., 2018). MNAI engages with municipalities across Canada to understand the value of natural assets in sustainable service provision. The method involves calculating the replacement cost of services provided by the natural assets. Stephanie Cairns, MNAI, mentioned that having a somewhat narrow approach to evaluation speaks to engineers and government officials in the municipality. Gibsons, British Columbia, was the first municipality in North America to utilize an MNAI assessment framework and declare NI assets as municipal assets (Moudrak et al., 2018).

Recognition of Natural Assets in Public Accounting Standards: Placing natural assets on balance sheets is necessary to attribute due value to municipal natural assets and the services they provide and to enable public sector entities to protect and conserve these assets. Cairns indicated that municipal governments are recognizing this need and sometimes include comments on the value of natural assets in the notes section of their reporting.

However, official recognition of natural assets in Canadian public sector accounting framework is required (Brook, 2018). For this to transpire, there needs to be a consensus on the costs, benefits and economic value of natural assets.

Characterizing natural assets as tangible assets in financial reporting may also make these assets eligible for collateral in applying for funding. Annie Geoffroy, Infrastructure Canada, pointed out that discussions were already underway on characterizing NI as tangible capital assets.

2.3 Session 3: NI Implementation

Session Summary

Session three of the forum included presentations from Lara Ellis, ALUS Canada, on *Program Models: Criteria to Deliver Successful Multi-Stakeholder NI Programs*; Marian Weber, InnoTech Alberta, on *Proving the Business Case for NI: Evidence Base for Natural Capital Markets*; and a panel discussion led by Dimple Roy, Director of Water Policy, IISD, with Tim Sopuck, Manitoba Habitat Heritage Corporation; Stephanie Cairns, MNAI, the Smart Prosperity Institute; and Colleen Sklar, Winnipeg Metropolitan Region.

Main points:

- An emphasis on NI creates a new pathway for municipal, provincial and regional decision-makers to retain, manage or build naturalized systems to meet specific priorities and needs. These needs include water storage (flood and drought mitigation), water purification/filtration (water quality improvement), wastewater treatment and carbon sequestration.



- NI represents an opportunity to reduce infrastructure costs for all levels of government. Much of the know-how of NI implementation exists in the nature conservation sector.
- The definition of NI and the eligibility of private land projects currently limits NI programming significantly.
- There is a need to connect NI outcomes with clear, tangible service delivery outcomes for local governments and decision-makers.
- Numerous efforts to restore and manage boreal forests and wetlands, riparian areas and waterfowl habitat have implementation mechanisms tied to land securement such as long-term conservation easements, legal protection (i.e., protected areas) and payment for ecosystem services (as used by ALUS). Land ownership is therefore a critical component of NI programming.
- Capacity building and guidance are needed on NI implementation at the local level, particularly in the context of municipalities.
- We need a clearer understanding of what constitutes NI to advance NI programming for priority outcomes such as flood/drought mitigation, water treatment, carbon sequestration, etc.
- Some thought is needed on how natural and grey infrastructure complement each other and co-exist toward more effective infrastructure outcomes.
- Not all NI projects are the same; scale, management, benefits, priorities and associated technologies play a role in implementation and affect adoption—particularly on private land.
- Better local cooperation and collaboration are necessary in Winnipeg and Manitoba to take advantage of funding opportunities and to reduce bureaucratic duplication and overlap in planning and implementation of NI opportunities.

2.3.1 Presentations

Lara Ellis, ALUS Canada, shared best practices related to NI programming. She highlighted that the United States recently passed the American’s Water Infrastructure Act of 2018. This act enables the Environmental Protection Agency to accept green infrastructure for stormwater management and for the U.S. Army Corps of Engineers to consider nature-based projects as alternatives to traditional infrastructure. It also provides funding for drinking water source protection and a new grant assistance program to support local needs for climate resiliency (Ellis, 2018).

Box 6. Wastewater treatment in Dunnotar, MB

The Village of Dunnotar, Manitoba, committed to reducing its impact on the health of downstream Lake Winnipeg. The municipality invested in a three-cell lagoon to improve their wastewater treatment, including the installation of a pilot passive filter adjacent to the lagoon. Over the operating season from 2009 to 2012, the removal efficiency of nutrients, pathogens, biochemical oxygen demand (BOD) and suspended solids ranged from 50 to 80 per cent, with nitrogen reduction at 60 per cent and phosphorus reduction at 70 per cent. The passive filter installation in the lagoon reduced phosphorus loads to Lake Winnipeg by 50 per cent (Dillon Consulting Limited, 2013). While this initiative pre-dates the NI efforts, it demonstrates some early efforts on the part of local governments to meet municipal service needs through passive, natural or naturalized systems that provide comparable or improved benefits.

2.3.1.1 ALTERNATIVE PROGRAM MODELS

Ellis discussed the multiple stakeholder program led by ALUS Canada to deliver NI projects across Canada (Ellis, 2018). ALUS Canada is working with partners in 23 communities across six provinces to implement NI projects. The program provides incentives to farmers and ranchers to restore, enhance and conserve natural features.



ALUS is working on several pilot projects that will quantify the infrastructure-related benefits of environmental restoration in the Lake Erie basin and upstream of Edmonton, Alberta. ALUS is fostering a clearer understanding of NI value to spur investment. NI is a cost-effective way to manage risk and meet regulatory requirements, and it has many co-benefits.

Farmers and ranchers are the largest holders of private land in Canada. In much of southern Canada, the majority of land is privately held. Financial tools and mechanisms are essential to increasing NI on private lands to improve water quality and mitigate flood and drought. With the increasing risk of floods/droughts and the need to improve water quality, private land owners are essential stakeholders for implementing NI.

Some of the challenges to alternative financing models include geographic boundaries. Programs that are dispersed over a large area generally have lower participation; supply and demand vary per region, and there are high transaction costs. It remains difficult to ensure the long-term sustainability of financing and translating co-benefits to various users within a multistakeholder model.

Ellis and others recommended that the federal government address barriers in existing infrastructure funds and that a portion of green infrastructure program funds (from ICIP and the DMAF) should be fully dedicated to NI projects. Alternatively, a national and stand-alone funding program modelled on Alberta's Watershed Restoration and Resiliency Program could be created.

Specific challenges related to ICIP include that the use of public sector accounting standards preclude NI proponents from outside government, and that funding does not cover any ongoing operating costs (which is a larger component in NI projects). In DMAF, barriers include a minimum eligible threshold of CAD 20 million, which precludes smaller, cost-efficient NI projects.

Marian Weber, InnoTech Alberta, discussed the business case for NI and how we can integrate natural with built infrastructure. In order to prove the business case, we need to:

- Understand the cost-effectiveness and risk of NI
- Understand the necessary scale of NI to substitute grey infrastructure
- Provide clear guidance to decision-makers
- Support technology transfer to create a revenue stream.

The costs of NI include the foregone agriculture returns and the construction/maintenance costs. NI may have minimal costs up front; however, we must consider management costs throughout its lifetime. The benefits include reduced agricultural damages from flooding and droughts, avoided cost saving for stormwater and wastewater treatment, and other damages such as avoided recreation losses or energy and road infrastructure.

Weber spoke of InnoTech's work with ALUS through the Modeste Municipal NI Project to model the role of NI for climate resilience with a wetland restoration project. Challenges with modelling include various infrastructure options and adaptation scenarios, time horizons, project scale and performance variables. InnoTech has invested in a platform called Integrated Modelling for Watershed Evaluation of Best Management Practices (IMWEBs) to evaluate the best management practice effects of ecosystem services. The difficulty with these models is that they do not consider/understand land owner behaviour and adoption scale—for example, why is there low participation in water trading in the United States? We need to connect NI to a value chain to include insurance benefits, corporate social drivers and natural capital. There remain challenges to scaling up from case studies to real world implementation, including level of performance, metrics, spillovers and externalities, project failures, etc. Marian Weber stressed the need to consider all factors to inform real markets.



2.3.1.2 OPPORTUNITIES AND BARRIERS

The panel discussion led by **Dimple Roy, IISD**, included overcoming practical barriers and leveraging opportunities for NI implementation.

Stephanie Cairns, MNAI and Smart Prosperity Institute (SPI), spoke on an SPI approach to developing a partnership model with local governments, to coach them, build capacity and internal knowledge, and eventually develop an ongoing asset management cycle. SPI uses a narrow approach to working with governments to understand replacement costs for assets in local municipalities. It encourages groups to understand the value of their systems in the context of protection and management. Cairns stated that it is incredibly important to have evidence-based documentation on NI in terms of dollar value, as it provides a different perspective on asset protection. It is also important to include these assets in financial statements to ensure their management, although the currently accepted Public Sector Accounting Board guidelines prohibit the inclusion of natural assets in financial statements.

Colleen Sklar, Winnipeg Metropolitan Region, works with 17 municipalities to enable collaborative efforts around regional municipal planning. She spoke of the importance of NI for municipal managers as they try to balance the demands of community needs, tight budgets and demands of aging infrastructure, of which one third needs replacing. Colleen also mentioned that, beyond understanding what assets we have, it is important to know what your neighbours have. We need to ensure that our municipalities and governments gain the proper education on how NI can provide municipal services for local needs.

Box 7. The Canadian Infrastructure Report Card

The *Canadian Infrastructure Report Card* assesses “the condition of Canada’s municipally owned infrastructure to help decision-makers identify cracks in this important foundation, and inform solutions to address them.” The 2016 report card emphasizes the role of municipalities as owners of almost 60 per cent of Canada’s core public infrastructure, valued at approximately CAD 1.1 trillion, and indicates that “one-third of our municipal infrastructure is in fair, poor or very poor condition.” Municipal infrastructure, therefore, provides a clear opportunity in the context of NI programming in the country.

Source: Canadian Construction Association, Canadian Public Works Association, Canadian Society for Civil Engineering, & Federation of Canadian Municipalities, 2016.

Tim Sopuck, Manitoba Habitat Heritage Corporation, discussed that previous conservation work is focused on the funder’s expectations, but successful NI work focuses on the landscape. He stressed the importance of promoting NI on private land and re-emphasized points made by Ellis, ALUS Canada, and that NI needs to be flexible. We are currently observing barriers to delivering on these activities, including consensus on the definition of a tangible asset and of NI. Sopuck stressed the importance of speaking the same language and for interdisciplinary groups to work together. He specifically focused on barriers to NI implementation, such as private land ownership being ineligible as infrastructure assets. Manitoba Habitat Heritage Corporation’s upcoming role as administrator of Manitoba’s Conservation Trust provides a provincial priority and funding opportunity to coordinate NI programming for multiple outcomes.

A clear message of the session was to link NI to tangible municipal services. Cairns highlighted examples of where NI projects meet service delivery needs of municipal governments. A clear gap is the capacity to plan and implement NI projects at the local level. Sklar highlighted that the Winnipeg Metropolitan Region works with municipalities to develop regional plans and to build internal capacities. While municipalities understand the value of NI, there is no clear guidance on how to do it. Both Sklar and Cairns highlighted the creation of clear guidance as a specific opportunity to drive NI programming forward. In addition, current efforts on asset management frameworks and natural asset accounting are of increasing importance in the local context. We need to show the value of these systems to municipalities and local decision-makers under climate stress scenarios.



3.0 Next Steps to Improving NI Implementation

The Advancing Natural Infrastructure in Canada forum was successful, particularly in bringing together various agencies and sectors that do not typically connect on practical levels. The event began the process of developing a common understanding of opportunities and next steps related to NI programming and implementation. Key insights from the forum are summarized in the Executive Summary.

Some priority next steps, as identified through forum discussions, are:

Consider NI in federal infrastructure programming: Some targeted changes are needed in federal programs and accounting systems to simply allow NI projects to be incorporated more easily into current infrastructure planning, financing and maintenance. Specifically, the ICIP and DMAF programs administered by Infrastructure Canada present real opportunities to enable NI project implementation:

Recommended changes in ICIP: allowing the use of Generally Acceptable Accounting Practices in addition to Public Sector Accounting Standards to enable NI project proponents outside of government, who are currently most involved in NI project delivery; allowing operating costs in eligible NI projects, as upfront costs are a significantly lower component of total costs in comparison with built projects.

Recommended changes in DMAF: removing the minimum threshold of CAD 20 million to allow smaller cost-efficient and low-cost NI projects.

Consider a federal program dedicated to NI support: A recommendation to dedicate funding and programming support is built on the understanding that natural assets are critical for current and future infrastructure needs, as well as for expected challenges arising from climate change. A program dedicated to NI programming can incorporate many suggestions provided for ICIP and DMAF.

Natural assets should be considered in public sector accounting: Canada needs to build incentive for municipalities to value and protect their natural assets. Currently, the Public Sector Accounting Board prohibits the inclusion of natural assets in public sector financial statements; current guidelines only recognize purchased natural assets (Brooke, 2018).

Watershed and municipal demonstration projects are needed: A watershed approach is being used across much of Canada to address water supply, water quality and climate resilience to flood/drought. Municipal leaders are responsible for making many of the infrastructure planning and investment decisions. Municipal leaders, watershed managers and necessary experts should collaborate to understand common priorities and the potential use of NI to address these.

Private sector financing for NI: Public revenues and government support are inadequate to address the infrastructure gap that is emerging across the country. SRI, including green bonds, sustainable bonds and resilience bonds, provide emerging opportunities to finance NI. Green bonds are relatively new in Canada; however, the issuance is growing rapidly. Projects around renewable energy and energy efficiency are commonly targeted for financing through green bonds. Nevertheless, conservation NI projects can also be well suited to perform as green or resilience bonds.

Outcome evaluation and performance metrics: The stated goal of the ICIP program includes that it aims to “provide communities with more reliable water and wastewater systems” (Infrastructure Canada, 2018d). The DMAF program aims to “invest in the public infrastructure we need to mitigate the potential economic, environmental and social impacts of climate change, and strengthen our resilience to disasters triggered by natural hazards and extreme weather events” (Infrastructure Canada, 2018b). Systematic evaluation of infrastructure



assets to understand how we are meeting these needs is a critical part of ensuring value for money and meeting our societal objective. Performance measurement is also critical to attracting private sector investments that require feedback on return on investment and how the asset is performing over time and space. Consistent and standardized metrics will allow projects to be scaled up from case studies to actual large-scale implementation.

Guidance and capacity building are needed at the infrastructure planning and implementation levels:

With a growing understanding of the potential for NI to address key environmental and community priorities, practical guidance and capacity building are needed where the critical gaps still exist. It was suggested in the forum that we need clear and functional guidelines on how NI can offer municipal services for local needs. This will ensure that local groups understand the value of their natural assets and provide incentives for protection and management. These guides should also include options and processes for NI implementation and options on financing and eligibility. We also need to consolidate plans and invite various stakeholders to the discussion.

Address fragmented programming: Currently, different private sector entities, non-governmental organizations, government departments and even levels of government and experts are tackling different aspects of infrastructure planning and implementation. While collaborative projects could demonstrate how these groups can come together on common interests, enabling interdisciplinary conventions and dialogue to align interests, particularly between government departments, insurance agencies, financial groups and municipalities, is needed.

Communicate: We need to build a common understanding of NI and how it can be financed and implemented. While the communication of best practices, such as by Moudrak et al. (2018), have highlighted the cost-effectiveness and value of NI projects, communications on projects that fail provide lessons for future implementation. Better communications around success, process, failures and analysis on what works and what doesn't are critical steps to mainstreaming NI into planning processes and meeting our infrastructure needs through a variety of means. The need for convening experts, practitioners and government departments was emphasized at the NI forum.



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