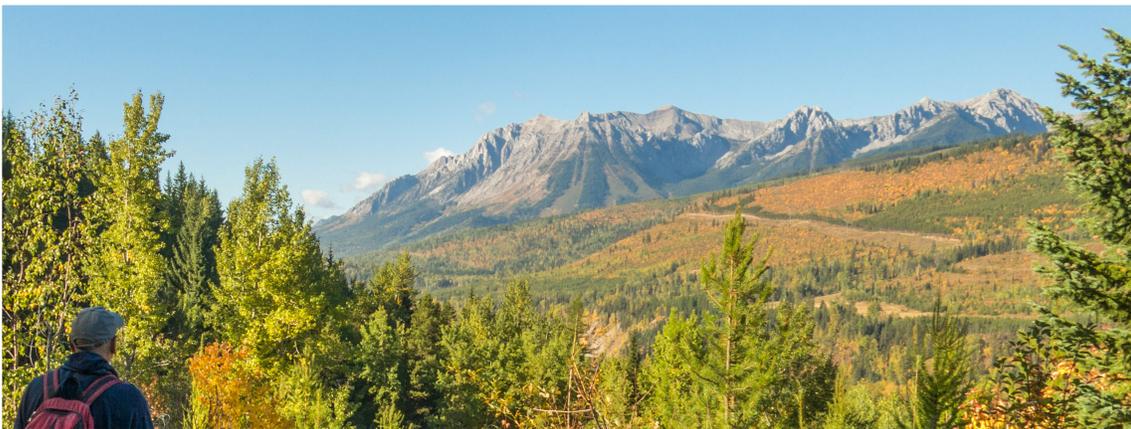


COHORT 2 NATIONAL PROJECT OVERVIEW



Municipal Natural Assets Initiative
FEBRUARY 2020



INVEST IN NATURE

The Municipal Natural Assets Initiative (MNAI) is changing the way municipalities deliver everyday services, increasing the quality and resilience of infrastructure at lower costs and reduced risk. The MNAI 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.

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Convening Organizations



Convening organizations: Smart Prosperity Institute, David Suzuki Foundation, Town of Gibsons, BC, and Roy Brooke and Associates were the original convening partners for the Municipal Natural Assets Initiative and the Cohort 2 project leading to this report was initiated by them.

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MUNICIPAL NATURAL ASSETS INITIATIVE: RESULTS FROM THE SECOND NATIONAL COHORT

Decision-maker Summary

Natural assets, such as wetlands, forests, and creeks, provide many critical services to communities, and are important assets in the sustainable provision of core municipal services. A wetland, for example, provides stormwater management and flood mitigation services that would have to be replaced by an engineered alternative if the wetland were lost. However, while natural assets are key to sustainable service delivery, they are generally not accounted for and/or are undervalued in asset management practices.

This is changing. A growing number of Canadian local governments are recognizing that it is as important to understand, measure, manage and account for natural assets as it is for engineered ones. Doing so can allow them to manage climate, service delivery and financial risks by better understanding what services come from natural assets yet have not been accounted for, and how those services may be affected under conditions of climate change. In looking at the value that is or can be provided by natural assets, many are also finding that the quality of the services can, in some cases, meet or exceed those from engineered assets such as pipes, culverts, groundwater wells, or seawalls – but cost much less and provide many other benefits such as cooler and shadier cities in the summer and urban recreation.

This Project Overview document outlines the findings of, and lessons learned by, six local governments as they investigated how natural assets are benefiting their communities, how to increase resiliency under future climate scenarios, and what economic value is being derived from these natural assets. While the focus was on water quality and quantity benefits, numerous other benefits were also identified for future analysis.

Municipal natural assets are the stock of natural resources or ecosystems that are relied upon, managed, or could be managed by a municipality, regional district, or other form of local government for the sustainable provision of one or more municipal services.

WHAT ARE MUNICIPAL NATURAL ASSETS AND WHAT IS MUNICIPAL NATURAL ASSET MANAGEMENT?

By conceptualizing nature as an asset, we can codify, measure, and monitor the ways in which we depend on and impact the environment. Business and economic activity depend on natural assets to provide important resources such as clean water, minerals, and timber. Natural assets are also important to human physical and social well-being. Benefits in terms of better air quality, water quality and climate stability as well as protection from flood and erosion impacts of extreme weather events are well established. Urban greenspaces, parks, wetlands and protected areas provide important recreation spaces and buffer the effect of extreme heat in urban settings, reducing the prevalence of respiratory infections and heat related illnesses.

Like any asset, natural assets need to be carefully protected and managed to ensure a sustainable supply of services. If natural assets are not managed responsibly, their value depreciates as does their ability to provide services from which humans, and all other species, benefit.

Based on pioneering work by the Town of Gibsons, BC, the municipal natural asset management approach adapts traditional asset management methods to the unique characteristics of nature but maintains the same goal of establishing sustainable service delivery. This is done through a 6 step approach (Figure 1).

Refining municipal natural asset management in a growing number of Canadian communities

The Municipal Natural Assets Initiative (MNAI) convened in 2016 with the goal of refining, testing, and scaling up the approach to natural asset management initiated by the Town of Gibsons. From 2016-2018, an initial five communities (Cohort 1) piloted a methodology and guidance documents to help local governments identify, value and manage natural assets within traditional financial and asset management planning frameworks. These pilots assessed the value of stormwater services provided by the natural asset studied under various scenarios. Some common messages emerged:

- Natural assets can provide the same level of stormwater management services as their engineered counterparts.
- Under both climate change and intensified development scenarios, the value of natural assets increased.
- The pilot results provided grounds for investigating the value of other natural assets.

Important lessons were also identified:

- Data availability influenced the scope of analysis, which may have impacted the overall findings. Better data will support better analysis and, in turn, better natural asset management and more fully informed financial and asset management decision-making.
- The assessed values of natural assets are likely to increase once additional benefits and services are incorporated, beyond the stormwater and flood mitigation services that were studied, to other services such as replenishing drinking water sources, pollution removal, recreation, and human health benefits.

In 2018, a second group of six projects in three provinces (Cohort 2) was launched to further refine the municipal natural asset management methodology and expand the evidence base, focussing particularly on the role of healthy natural assets in supporting resilience to climate change effects and to increased urban development. For participating local governments, the goal of these projects was to change their decision-making such that the natural assets studied would be understood, managed, and valued in terms of the ecosystem services they provide, now and under future climate change conditions.



OVERALL FINDINGS

While each of the six projects focussed on different types of local natural assets and had different project-specific goals, they all assessed the value of services provided by local hydrological features (rivers, creeks, ponds and wetlands) as well as forests. They also considered scenarios of future climate conditions, such as more extreme storm events or earlier snow melt. Some themes emerged:

- **Natural assets are providing local communities with millions of dollars of service value that is rarely accounted for**

The projects analyzed the cost of replacing the services provided by the natural assets under study with engineered infrastructure. They found that natural assets can play an important and cost-effective role in reducing maintenance and capital costs for the delivery of key municipal services, providing a total value of more than \$400 million benefitting over 200,000 residents across these six communities.

- **... and a multitude of other benefits**

Communities found a multitude of benefits associated with healthy natural assets. These included, for example, reduced flood risk, improved water quality, recreational space for residents, improved human health and well-being, increased local property prices, and habitat for aquatic and terrestrial wildlife.

- **The value of the assessed benefits to the community rises under scenarios of more extreme rainfall or intensified development**

Investing in natural assets is an investment in resilience under future climate scenarios such as more extreme rainfall and earlier snow melt. Actively protecting and enhancing natural assets in development areas can avoid or reduce the capital costs of building engineered alternatives.

- **Natural asset solutions can play an important role in flood management but are not always sufficient on their own**

In some cases, natural asset solutions need to be considered as part of a more comprehensive and hybrid flood management strategy, alongside engineered assets and changes to development bylaws and policies.

- **Including natural assets in the scope of asset management policies is fiscally responsible**

Identifying the municipal services provided by natural assets is the first step in developing a natural asset management policy and formally integrating nature into asset management at the strategic level of local governments, thereby achieving fully informed financial and asset management decision-making. As evidenced by the economic values found in these six very different projects, this is an important part of delivering core municipal services in an economically and environmentally responsible manner.

These findings confirm and reinforce the overall findings from the five Cohort 1 pilot projects completed in 2018.

PROJECT FINDINGS

CITY OF COURTENAY, BRITISH COLUMBIA		
Objective: What are the current and possible future roles of natural assets in the Courtenay River corridor in mitigating flood risks in the downtown core, including associated costs and benefits relative to engineered alternatives?		
Natural Asset Intervention	Assessed Benefits to the Community	\$ Value of the Benefit
Widening and naturalizing 1,292 meters of the Courtenay River riverbank	Flood attenuation for 1-in-200-year flood event	\$2.4 million In flood damage reduction to properties downstream

Much of the development of the City of Courtenay (pop. 25,559) has occurred in the Courtenay River floodplain, which is subject to high tides / storm surges coming inland, high water flows coming downstream after rains, and river flows influenced by BC Hydro dams. The City has been experiencing increasingly frequent and intense flooding that impacts transportation corridors, businesses, and public and private properties. This project modelled three options for flood mitigation from natural assets – widening the Courtenay river, naturalizing the foreshore of a former sawmill site, and re-instating natural flow paths in the Courtenay river – and considered a fourth option of land acquisition and remediation to gradually remove at-risk buildings from the floodplain. These were modelled individually and in combination, through the lens of two simulated flood events, one based on conditions of a flood that occurred in 2009, and one a larger, more extensive 1-in-200-year flood.

Key findings and recommended next steps: Natural asset improvements alone would not solve the flooding problems of the City of Courtenay, but would reduce flood damage. They would reduce the damages from a flood similar to that experienced in 2009 by \$723,000 and damages from a 1-in-200-year flood event by \$2.4 million. Identified co-benefits would include access to green and recreational space for residents, hydraulic detention, and water quality functions. Relocation of at-risk buildings on the floodplain would cost approximately \$6.8 million. The recommendations were to manage the flood events through a hybrid approach of engineered and natural infrastructure, and to consider natural asset solutions as part of a more comprehensive and phased flood management strategy with a wide range of approaches, including natural assets, engineered assets, and changes to bylaws and policies.

TOWN OF FLORENCEVILLE-BRISTOL, NEW BRUNSWICK		
Objective: What role do natural assets play in controlling erosion, and what are the associated implications for the maintenance of culverts and roadside ditches?		
Natural Asset Intervention	Assessed Benefits to the Community	\$ Value of the Benefit
Protecting 182 hectares of forested area along the St. John River	Flood and stormwater attenuation benefit for 1-in-100-year storm	\$3.5 million Based on cost of replacing forested area with stormwater management ponds <i>note: increases to \$4.1 million if climate change is factored in</i>

Increasingly frequent and intense rainstorms along the St. John River in the Florenceville-Bristol region of New Brunswick (pop. 1,604) have caused major flooding, ongoing damage to culverts, expensive repairs, road washouts, and access issues for residents and emergency services. This project, initiated by the Western Valley Regional Service Commission and World Wildlife Fund Canada, focused on catchments along the south side of the St. John River where ice jams and scouring cause erosion, and heavier rainfall events cause road washouts. The project developed two scenarios that examined flood and stormwater flows in two predominantly forested watersheds: one scenario using current forest cover, and one in which the predominantly forested land changed to agricultural land. Both scenarios modeled results from three increasingly intense storm conditions reflecting changing climate risks: a 1-in-5-year storm, a 1-in-100-year storm, and a 1-in-100-year +20% storm. The project also examined how much it would cost to replace the forests with engineered stormwater management ponds.

Key findings and recommended next steps: If the forested regions in the upper watershed were changed to agricultural land, there would be significant increases in the peak flows under all storm conditions. Appropriate management of the forested watersheds would help manage storm water, avoid further issues of erosion, and ease pressure on ditches and culverts. It would cost \$3.5 million to re-create the stormwater management services currently provided by the forests with an engineered alternative, and if the intensity of rainfall for a 1-in-100-year event increases by 20% in a changing climate, this value would increase to \$4.1 million. The forests also provide access to green and recreational space for residents, social and physical wellbeing, wildlife habitat, biodiversity, water quality, and protection from climate change, co-benefits which should be included in an asset management plan. Recommendations, which the Town has accepted, were to develop a natural asset management policy, to document the lifecycle costs of natural vs. engineered assets, and to adapt bylaws for future developments to recognize and protect natural infrastructure.

CITY OF OSHAWA, ONTARIO		
Objective: How to increase the quality and resilience of the riparian area and stream banks along the Oshawa Creek south of Oshawa's downtown core, in order to minimize erosion from more frequent storm events?		
Natural Asset Intervention	Assessed Benefits to the Community	\$ Value of the Benefit
Protecting 7 km of natural area in the Oshawa Creek Watershed	Maintaining the current stormwater conveyance benefit that the area provides	\$18.9 million Based on cost of constructing an open channel with similar flow rates to Oshawa Creek
Protecting entire 50 km of the Oshawa Creek Watershed	Maintaining the current stormwater conveyance benefit that the watershed provides	\$393 - \$414 million Based on capital cost of full channel realignment project, including land purchase, construction costs and contingency.

Oshawa Creek and its tributaries drain an area of approximately 119-square-kilometres from its headwaters in the Oak Ridges Moraine south through the Lake Iroquois Beach and into Lake Ontario. These are a prime conveyance of stormwater to Lake Ontario, providing a necessary stormwater management service to the City of Oshawa (pop. 172,434). The project examined natural assets along the southernmost, highly urbanized, 7-kilometre segment of the Creek.

Key findings and recommended next steps: Natural assets along this segment of the Creek currently provide a stormwater management value of \$18.9 million. When including the full Oshawa Creek watershed including the surrounding floodplain, this increases to between \$392 million and \$414 million. Important co-benefits include improved human health and well-being, better-looking creek corridors (which increases property prices), aquatic and terrestrial habitat, and reduced flood risk; however, these were not quantified. The comparison of natural assets to engineered assets under future land use and climatic conditions concluded that replacing the natural assets with an engineered asset would reduce the ability to retain water, leading to the potential for more flooding. This project identified preventative measures for the City of Oshawa to take to improve the function of natural assets to further protect against and prevent erosion in City-owned riparian lands, mitigate the negative impacts of urbanization, and avoid having to build additional engineered assets.

DISTRICT OF SPARWOOD, BRITISH COLUMBIA

Objective: How to improve water quality in the Elk River through management of the natural assets in the area of Sparwood known as "Sparwood Proper"?

Natural Asset Intervention	Assessed Benefits to the Community	\$ Value of the Benefit
Protecting a 150 m ² natural pond	Maintaining current water quality benefits that the pond provides	\$200,070 Based on cost of an engineered alternative, capable of treating 80% of pollutants <i>note: pond treats 90-95% of pollutants or total suspended solids.</i>

Sparwood (pop. 3,784)'s Official Community Plan places a strong emphasis on protecting, enhancing and using natural assets, which support the region's recreation, tourism and fisheries. Large stormwater flows have been regularly dumping sediment and other urban runoff into the Elk River, and this could increase with more frequent and intense rainfall events from climate change. This project focused on the potential role of a natural pond at the outlet of a culvert to improve water quality in the river. It analyzed the economic costs of the existing pond, an enhanced pond, and an engineered alternative in terms of upfront or capital costs, maintenance costs, and lifecycle costs, and also looked at how much sediment the pond captures or would capture under historical and future climate change scenarios.

Key findings and recommended next steps: The existing pond removes approximately 90% of total suspended solids (TSS) annually, with very little change under future climate change scenarios. An enhanced pond would capture 94% of sediment, now and under future climate conditions. The financial analysis concluded that the current pond has no capital, operating, or maintenance costs; an enhanced pond would cost \$64,000 in capital costs and maintenance costs over 25 years; and the equivalent service from an engineered alternative would cost \$248,000 in capital costs and maintenance costs over the same 25 years. These findings will inform the District of Sparwood's approach as they develop a master plan for water, wastewater and stormwater management.

VILLAGE OF RIVERSIDE-ALBERT, NEW BRUNSWICK

Objective: To assess the watershed that provides all the drinking water supply to the Riverside-Albert community and understand key management actions that maintain and improve the natural area's ability to maintain a long-term water supply.

Natural Asset Intervention	Assessed Benefits to the Community	\$ Value of the Benefit
Protecting ~203 ha of Arabian Vault watershed	Maintaining current drinking water supply that the watershed provides	\$0.8 - \$1.2 million Based on cost to construct a groundwater source system (i.e. wells)

Water quality and boil water advisories have been a concern in the past for the Village of Riverside-Albert (pop. 350), and climate change could affect both water quality and sufficiency of supply, particularly during dry summer periods when growing tourism adds to demand. New Brunswick's Southeast Regional Service Commission partnered with the Village to look at the value provided by the watershed using two approaches: calculating the cost of replacing the drinking water supplied by the watershed with wells, or the cost of trucked-in water. The project also looked at the potential implications of climate change, land cover change, and water shortages on the future quantity and quality of drinking water.

Key findings and recommended next steps: Replacing the water now supplied to the Village by the watershed with a groundwater system would be a capital cost of between \$0.8 and \$1.2 million. Alternatively, purchasing water and trucking it to the Village would cost \$0.8 to \$1.1 annually, which can be converted to a present value of \$27 to \$37 million. These values do not reflect the value of the other benefits provided by the watershed such as improvements to water quality, wildlife and aquatic habitat, health and recreational benefits, transportation benefits, safety and social

benefits, educational benefits, promotion of environmental sustainability, and economic benefits. Land cover change and increased tourism in the summer, combined with earlier snow melt due to climate change, could also lead to annual low-flow periods and future water supply shortages. Recommendations were to a) discuss conserving Crown land with the province and participate in a watershed management planning process to ensure any forest activity on the land protects water supply quality; and b) improve and increase water storage capacity to supplement supply during periods of drought or increased summer water demand.

TOWN OF RIVERVIEW, NEW BRUNSWICK		
Objective: How can stormwater management infrastructure be minimized through the management of natural assets in the Mill Creek area of Riverview?		
Natural Asset Intervention	Assessed Benefits to the Community	\$ Value of the Benefit
Protecting four wetlands, covering 13,791m ² area in Mill Creek Watershed	Flood attenuation for 1-in-100-year flood event	\$1.4 million Based on cost of replacing wetlands with stormwater management ponds or constructed wetlands <i>note: increases to \$2.3 million if climate change is factored in</i>

The Southeast Regional Service Commission also partnered with the Town of Riverview (pop. 20,000) to look into how to protect and enhance natural assets in a large development area proposed for the 47 km² Mill Creek Watershed, adjacent to a nature park. The project estimated the value of stormwater management services provided by existing wetlands based on the cost of replacing the same level of service with stormwater management ponds or built wetlands, and modelled these services for three scenarios: supplementing the wetlands with some engineered stormwater infrastructure, enhancing the wetlands to offset increased peak flow from development, and replacing the wetlands with a fully engineered replacement.

Key findings and recommended next steps: The wetlands provide a stormwater service value of \$1.07 million for a 1-in-5-year storm, under current climate conditions. This will rise to \$2.3 million with the Mill Creek Watershed development, and to \$2.41 million under future climate conditions. Under a more extreme 1-in-100-year precipitation event, the wetlands provide a stormwater service value of \$1.4 million under current climate conditions, rising to \$2.3 million with the Mill Creek development, and to \$2.89 million under future climate conditions. The forest in the watershed also reduces stormwater runoff, and the power and effectiveness of individual natural assets are enhanced when they are part of an intact ecological system. These findings demonstrate that the wetlands and surrounding natural areas within the Mill Creek Watershed provide valuable storage capacity that, if lost, will result in increased costs to meet regulatory requirements for stormwater management using engineered alternatives. The community plans to modify existing by-laws to implement these findings.

LESSONS LEARNED – LOCAL GOVERNMENT NEEDS

The goal of the MNAI Cohort 2 projects was to further refine the municipal natural asset methodology piloted in Cohort 1, and to add additional practical examples to the evidence base for municipal natural asset management.

Overall, the methodology piloted with Cohort 1 has proved robust, the Cohort 2 findings have been consistent with the overall findings from Cohort 1, and evidence and experience from six new projects are now available to inform additional actions.

At a local level, understanding and using a natural assets approach is only just beginning to be realized across Canadian municipalities. There is a continuing need to integrate natural assets into municipal asset management to provide more flexible, adaptive, cost-effective and sustainable solutions. To further integrate natural assets into municipal asset management approaches, local governments say they need:

- Resources for smaller and rural communities to provide the capacities needed for implementation;
- Leadership from the asset management experts in the municipality;
- Direction from regional and provincial governments to include natural assets in definitions of infrastructure assets, and requirements to consider the potential use of natural asset solutions in strategic asset management policy;
- Credible methodologies to formally account for natural assets in municipal asset management accounts, and inclusion of natural assets in the Public Sector Accounting Board’s standards;
- More funding programs with screening criteria that explicitly recognize the role of natural assets as infrastructure (e.g., disaster and mitigation funds, infrastructure grants);
- Revisions to regulations and bylaws to explicitly incorporate natural assets; and
- More natural asset inventory and other tools that allow municipalities to display and understand natural and engineered assets together, to prioritize actions and support more robust decision-making.

Both Cohorts 1 and 2 underscore the extent to which municipal natural asset management is a multi-year process. As such, the projects described in this report are only first steps in potentially longer journeys for these communities. Even the Town of Gibsons, where this all began in 2013, continues to learn almost daily about the value of natural assets, integrate this understanding into the strategic level of local government decision-making, and test and refine new approaches to sustainable service delivery. Similarly, Cohort 1 communities are still very much in the midst of their natural asset management journeys, as chronicled in periodic updates on the MNAI website at MNAI.ca.

NEXT STEPS FOR MNAI

While there are a number of natural assets initiatives and experts across Canada, no one else is doing what MNAI is doing: offering a rigorous, structured and scalable approach to valuing natural assets on-the-ground locally with communities. MNAI now receives almost daily requests for services or information including interviews, speaking engagements and general information on natural asset management. With two cohorts and 11 projects now completed, MNAI is shifting to new project models, broadening and strengthening its methodology to include more services, developing more tools that can be configured for local contexts, initiating a long-term monitoring framework, doubling down efforts to shape more supportive normative and enabling frameworks for natural asset management, and broadening its service offering. Examples include:

1. Two projects working with multiple local governments at a watershed level have been initiated, one in Comox Valley, BC, and one in Hamilton Region, ON. Another multi-community project has started in New Brunswick in 2020, and other projects are under development. MNAI will continue to support the emergence of practical examples of natural asset management in action.
2. MNAI is broadening its services slightly to provide both more tailored advisory services (e.g., how to do natural asset inventories, how to value natural assets, how to develop an asset management plan and policy that integrates natural assets); and, training and education services to expand the expertise available across Canada to assist municipalities.
3. The core MNAI municipal natural asset management methodology is being broadened beyond the current focus on stormwater management and surface water quality and quantity. For example, a new methodology for increasing coastal resilience to coastal flooding, storms, and erosion is being piloted in 2020. New tools are also being developed in support of MNAI's methodology including:
 - Species at Risk Tool to allow local governments to integrate species at risk and critical habitat considerations within their natural asset management framework and efforts, thus optimizing their asset management efforts;
 - First Nations Cultural Assets Tool to ensure recognition of the value of First Nations cultural assets, and activities compatible with those assets and values, in local government asset management processes.
4. In collaboration with the School of Planning at the University of Waterloo, a long-term monitoring framework is being developed to track qualitative and quantitative results of all MNAI projects. This will serve several purposes, including tracking and sharing results to help natural asset management evolve and, ideally, supporting decision-making in other fields, for example capital markets and the insurance sector.
5. MNAI will continue efforts to shape more supportive normative and enabling frameworks for natural asset management. This will include developing norms for the development of municipal natural asset inventories; working with the Engineers and Geoscientists of BC to integrate natural assets into a Practice Guideline (a profession norm); and providing input into processes with substantial promise of increasing support for natural assets management, such as the Public Sector Accounting Board's Handbook update. These efforts will ultimately support the emergence of a new economic sub-sector for natural asset management characterized by market demand for natural asset management; multiple players able to meet that demand; and, an overarching set of norms to ensure that natural asset management efforts are effective, comparable and replicable across Canada.
6. The first four years of MNAI have shown that sustainable service delivery requires collaboration between many landowners—private and public, levels of government, and other stakeholders. MNAI will continue to engage key stakeholders, including all levels of government, capital markets and ENGOs whose funding and programming can support natural asset management. More specifically, MNAI will continue to identify and help local governments deploy models that support collaboration with non-municipal entities that own or have jurisdiction over natural assets that provide local government services.

Identifying the municipal services provided by natural assets is the first step in developing a natural asset management policy and formally integrating nature into asset management at the strategic level of local governments, and achieving fully informed financial and asset management decision-making. This is an important part of delivering core municipal services in an economically and environmentally responsible manner.

For each pilot community, a technical report has been published that provides a detailed summary of the project scope, methodology, results and conclusions. They are available online at [MNAI.ca](https://mnai.ca).

