

Natural Asset Infrastructure in British Columbia: Barriers and Opportunities



January 2023

Municipal Natural Assets Initiative





Invest in Nature

The Municipal Natural Assets Initiative (MNAI) is a Canadian not-for-profit that 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 and watershed agencies 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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Summary

The Province of British Columbia commissioned the Municipal Natural Assets Initiative (MNAI), a Canadian not-for-profit, to explore barriers to the uptake of natural assets infrastructure in the province, and solutions to those barriers.

Findings are based on interviews with 26 B.C. subject matter experts and stakeholders in natural infrastructure. Interviews were guided by a literature review that informed a framework of known barriers to implementing natural infrastructure management. Interview responses fell into these main areas:

- **B.C. Barriers:** While responses of all types were encouraged from interviewees, the focus of discussions was on barriers and solutions where the Province of British Columbia has agency, or the ability to act, and more specifically where its legislation, regulations, policy and programming gives rise to barriers or presents potential solutions in addressing them.
- **Structural or Functional:** Where possible, the data was organized according to whether they constitute a barrier that blocks or impedes the use of natural assets, or a structural condition that underpins or gives rise to the barrier, and thus represents the context that gives rise to the barrier.
- **Indigenous:** Where data is relevant to First Nations communities specifically, this is noted. Barriers and solutions are relevant to both local governments and First Nations.
- **Prohibitive, Ambiguous or Absent:** distinction is drawn between barriers that are: prohibitive in nature; result from ambiguity/confusion; or from silence.
- **Context Framework:** A note is made regarding which number (B1-B14) of the 6-layer Sarabi et al., (2020) framework the barrier aligns with, or whether it lies outside this construct.

Pre-identified barrier categories considered most influential are listed in order of importance:

- Lack of sense of urgency among policymakers
- Lack of political commitment
- Lack of supportive policy and legal frameworks
- Misalignments between short-term plans and long-term goals
- Functionality and performance uncertainties
- Lack of skilled knowledge brokers for information translation and training programs
- Lack of design standards and guidelines for maintenance and monitoring

Factors that shape the context for natural infrastructure in B.C. reflect a dominant worldview of **nature as property**. This is entrenched in B.C. laws where nature has no standing and property rights do not include obligations for protecting and enhancing services from nature. This contrasts with Indigenous worldviews that generally hold everything as related and equally important as human beings.

Barriers, as well as solutions to reduce or remove them to increase natural infrastructure management in B.C., were considered in five categories:

- 1/ Institutional and Governance;
- 2/ Socio-Cultural;
- 3/ Knowledge;
- 4/ Technical and Biophysical; and,
- 5/ Funding and Markets.

While all barriers play a role, respondents found those in the Institutional and Governance category to be the most significant.

There was general agreement that more leadership is needed, especially to address the lack of policy and legislative direction for local governments. Many regulatory barriers can be addressed through specific legislative or regulatory reviews regarding wastewater, riparian areas, dikes, health, wildlife, heritage, private forest, and building practices.

Furthermore, programming, policy, incentives and benefits are mismatched to the scale of watersheds. The boundaries of most legislation do not accommodate the need for coordinated action across entire watersheds to effectively manage natural infrastructure. Better engagement with Indigenous communities and integration of First Nations worldviews, perspectives and knowledge is expected to improve natural infrastructure outcomes when making land use decisions.

The lack of affirmative direction for natural assets infrastructure is seen as an important issue in the *Local Government Act* and *Community Charter*. This lack of clear direction leads, for example, to the development of Official Community Plans that tend to focus on facilitating property development and Regional Growth Strategies that establish GHG targets without any connection to nature. Similar outcomes apply to Municipal Wastewater Regulation, Riparian Areas Protection Regulation and the Dike Maintenance Act, with general agreement that multiple regulatory barriers have cumulative relevance and impact.

Priority solutions to facilitate natural infrastructure as a common practice in B.C. focused on leadership across government and better alignment of regulation with ecosystem requirements and boundaries. These efforts can be informed by emerging national standards such as those under review by the Canadian Standards Association (CSA Group) for development and reporting of a natural asset inventory. Other barriers and potential solutions are discussed in detail in the full report.

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1 Purpose

This report provides the results of a project (hereafter referred to as “the Project”) to identify barriers impeding the use of natural assets infrastructure by local governments and First Nation communities in British Columbia, as well as potential solutions, with a focus on areas where the Province of British Columbia may have a positive influence.

2 Background

2.1. Natural Assets in Context?

Nature provides a wide range of services on which human well-being depends. This includes storing carbon, controlling floods and stabilizing shorelines and slopes to providing clean air and water, food, fuel, medicines and genetic resources (Millennium Ecosystem Assessment, 2005).

Unfortunately, about 25% of all assessed plant and animal species are threatened by human actions, with a million species facing extinction, many within decades.

In the face of these challenges and a rapidly changing climate, relationships to nature are being re-evaluated as both a source of risk through extreme weather, and the means to manage hazards through coordinated and holistic approaches to nature.

Building on significant research investment by the European Union, nature-based solutions (NBS) are emerging as cost-effective and long-term approaches to manage these complex challenges. (Connop & Vandergert, 2019; Kabisch et al., 2022; Ruangpan et al., 2020). NBS involve the maintenance, enhancement and restoration of ecosystems to simultaneously address interrelated social, economic and environmental challenges. NBS are commonly defined 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 (see for example CCME (2021)). NBS are increasingly being developed to address complex challenges by maximizing synergies between ecosystem stewardship and human wellbeing (Cohen-Shacham et al., 2016).

NBS can relate to infrastructure services such as water storage, flood mitigation, non-infrastructure services—for example, rewilding, or regenerative agriculture.

Natural assets such as aquifers, forests, streams, wetlands and foreshores are components of natural capital that allows NBS to leverage its advantages. Natural assets underpin the US\$ 44 trillion of economic value generation that is moderately or highly dependent on nature and its services. According to the World Economic Forum (2020), more than half of the world’s total gross

domestic product is exposed to risk from loss of nature.

Natural assets can provide important environmental services equivalent to those from many engineered assets. When healthy, they are also inherently resilient and adaptable to climate change. With effective monitoring, maintenance and rehabilitation, natural assets can provide services and add value for decades, to a degree that many engineered assets cannot match. Supporting natural assets can also reduce deforestation, leading to lower emissions.

There is global recognition that addressing ecological decline is of fundamental importance to society's ability to reach science-based net-zero targets by 2050, which are now codified in law in Canada and in many other jurisdictions (Pörtner, 2021).

2.2. Province of British Columbia and Natural Assets

Severe weather events made worse by climate change can result in large costs and significant impacts on local infrastructure and services, with local governments in Canada responsible for over 50% of infrastructure (Johal, 2019).

Recent major flooding events in British Columbia, including the November 2021 atmospheric river and the 2021 heat dome, have highlighted the urgency for more proactive planning to make local government infrastructure — including those based on natural infrastructure — more climate ready. Communities count on service provision (e.g. drinking water provision, stormwater management and flood risk reduction) to reduce risk and liability, support public health, community cohesion, the local environment, and local prosperity.

The Province of British Columbia's CleanBC Roadmap to 2030 (2021) acknowledges that “natural assets such as aquifers, forests, streams, wetlands and foreshores provide important environmental services equivalent to those from many engineered assets”. The CleanBC Roadmap to 2030 states a commitment to support the development of natural asset infrastructure for local governments and Indigenous communities, aligned with local government climate initiatives.

The Province of British Columbia has supported a variety of natural asset-related projects, including, for example, funding local-level projects coordinated by the Municipal Natural Assets Initiative.

However, the Province of British Columbia recognizes that there are barriers affecting the ability of local governments and Indigenous communities to protect and manage natural assets, and thus to preserve the services that they provide. This realisation gave rise to this Project, an examination of the barriers to the use of natural assets infrastructure in British Columbia, and solutions to overcome them, with the implicit objective of determining how to make the uptake or use of natural assets infrastructure solutions a mainstream or broadly based practice in the province.

2.3. Definitions

The terms “natural assets,” “natural assets infrastructure,” “natural infrastructure” are used in this document consistent with definitions published by MNAI (2019) to include natural assets such as forests, riparian areas, green spaces and coastal dunes, as well as enhanced natural assets, such as bioswales and raingardens. Engineered natural assets such as permeable pavers and green roofs are generally out of scope for the Project.

The term “barriers” is used in this report to mean barriers or obstacles to being aware of, and/or adopting, and/or successfully implementing natural asset solutions – both at the level of individual projects and in terms of allowing it to become a *broadly based practice* in British Columbia.

2.4. Scope and Limitations

The Project has several boundaries.

- **Specific focus.** The focus of this Project is on barriers and solutions to natural assets infrastructure where the Province of British Columbia has agency, and more specifically where its legislation, regulations, policy and programming either gives rise to barriers or present potential solutions in addressing them.
- **Framing.** In the literature and more generally, the framing of issues relevant to the Project varies widely. For example, they may not be framed in terms of NBS or natural assets infrastructure, but rather, in terms of flood risk reduction or some other desired impact such as coastal protection, water quality, or adaptation.
- **Definitions.** There are multiple definitional challenges in the literature. For example, barriers are rarely defined in relation to “natural asset infrastructure” which is a term used by the Province of British Columbia in the context of the Project nor, indeed, does the literature necessarily refer to “barriers” consistently. Terms such as “obstacles” and “challenges” may be used instead, for example.
- **Early stage of natural infrastructure.** Implementation of natural infrastructure projects remain, in British Columbia and beyond, generally limited to smaller-scale, local-level projects. There is no consistent monitoring or even definition of what would be monitored, and thus the understanding of barriers and their solutions is also necessarily limited. For example, detailed monitoring of projects so far by MNAI is limited to its first 11 initiatives, a few of which were in B.C.
- **Site-specificity.** In most cases, critical decisions about NBS design, costs, location and scale as well as levels of management intensity will involve a wide range of stakeholders and be fairly site-specific. This may create limits to what can be generalized about NBS cases in terms of barriers. In this context, some barriers and solutions identified in the literature are from national studies that include British Columbia participants and are used where B.C. is relevant.

- **Green infrastructure subset.** As noted, the Project focuses primarily on a subset of green infrastructure, natural assets.
- **First Nations.** There is little published literature specific to the uptake of natural asset management by Indigenous communities, including First Nations (Reed et al., 2022). Therefore, references to barriers they face is similarly limited, due to factors including lack of research and reporting with Indigenous communities, and differences in definition, approaches to managing assets and cultural relationships with nature. As work based on this Project continues, unique barriers for these communities may be identified and these will need to be addressed independently. Furthermore, among a number of First Nation communities contacted for interviews, only 3 of the 26 people interviewed for this report represented a First Nation or identified as Indigenous.
- **Depth.** There are multiple barriers and solutions identified in this report; and one of them could be the subject of an in-depth analysis.

3 Literature Review

The Project was grounded in a review of relevant academic literature based on the approach provided to the Province of British Columbia, separate from this report.

3.1. International Perspectives

Among recent studies that usefully frame barriers to the urban uptake of NBS (Kumar et al., 2020; Seddon et al., 2020), the work of Sarabi et al. (2020) stands out. Their study identified 15 political, institutional and knowledge-related factors as the most dominant barriers to NBS, as shown in list form in Table 1 and diagrammed in Figure 1.

TABLE 1: A 6-LAYERED MODEL FOR INTERDEPENDENT NBS BARRIERS FROM SARABI ET AL. (2020)

LEVEL	BARRIER
I	Property ownership complexities (B14) Space constraints (B15)
II	Lack of available financial resources (B12) Lack of adequate financial incentives (B13)
III	Lack of public awareness and support (B3) Risk aversion and resistance to change (B4) Silo mentality (B5) Perceived high cost (B11)
IV	Lack of design standards and guidelines for maintenance and monitoring (B8) Lack of skilled knowledge brokers and training programs (B9) Functionality and performance uncertainties (B10)
V	Misalignments between short-term plans and long-term goals (B6) Lack of supportive policy and legal frameworks (B7)
VI	Lack of political commitment (B1) Lack of sense of urgency among policymakers (B2)

Table 1: A 6-layered model for interdependent NBS barriers from Sarabi et al. (2020)

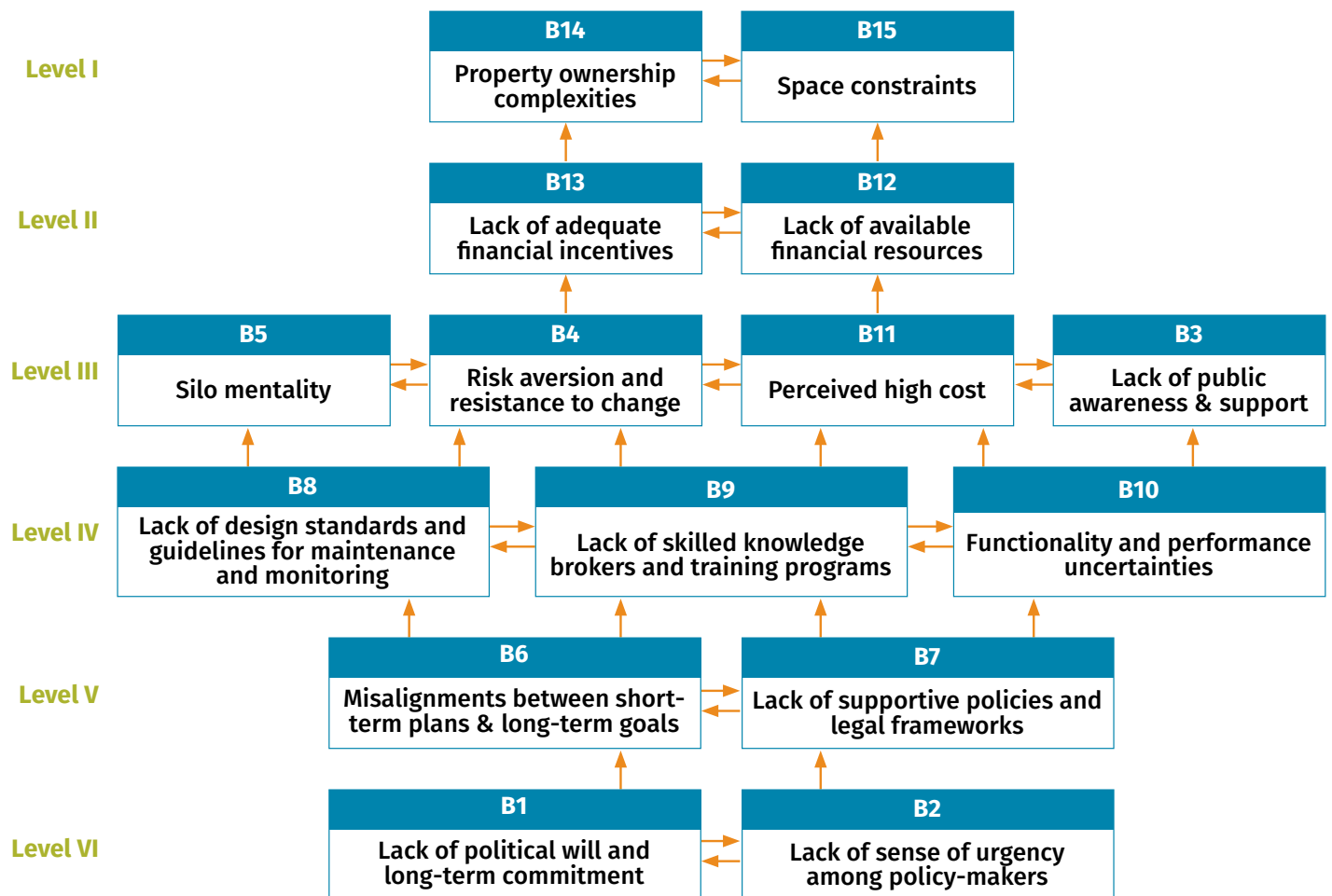


Figure 1: 6-layered model of barriers shown in list form after Sarabi et al., (2020)

These barriers have been further explored in the B.C. context through stakeholder interviews to identify their inter-relationships, and to structure them through a comprehensive systematic model, according to their level of importance. The six-layered model has already been used in other countries to support work addressing structural conditions behind the barriers (Dorst et al., 2022) and strategies to counter barriers and so make NBS a more mainstream approach (Xie et al., 2022). This report maintains a focus on NBS in urban areas, rather than large-scale NBS projects at provincial or national levels that are out of scope for this work.

The arrows in Figure 1 show the direction of the relationships among the different barriers, where level I barriers have the least relative importance and level VI barriers the most importance. Each barrier at a higher level is directly affected by at least one lower-level barrier and may be indirectly affected by multiple lower-level barriers.

Furthermore, the driving forces and dependence relationships among the barriers revealed that three of the barriers (B1, B6, B7) are political and institutional, and can affect all other barriers. The analysis also considers how factors are multiplied, and identified key factors that drive the system in various categories. These factors have been classified into four relationship categories

(i.e., autonomous, linkage, dependent and independent factors) with varied strengths and weaknesses in affecting one another (Attri et al., 2013).

The work of Dorst et al. (2022) builds on Sarabi et al. (2020) to develop a related analytical framing. These authors identify that trust in engineering practices underpins many of the identified barriers. While this may seem contradictory, the confidence in engineering approaches reinforced stakeholder silos, promoted the development of codes, standards, and knowledge paradigms ignoring ‘soft’ NBS benefits and performance, and incentivised innovation in engineering-heavy technologies. While confidence in engineering practices was not necessarily a causal barrier to NBS uptake, it exerted persistent and pervasive effects. In the UK for example, it was noted that more traditional engineered solutions were preferred to avoid risks related to innovative solutions (Dorst et al., 2022).

Another useful perspective is offered by Deely et al. (2020), who present an overarching framework to enable natural infrastructure planners to assess potential threats throughout a project’s lifecycle. They group barriers in five categories: Institutional and Governance (I&G), Socio-Cultural (SC), Knowledge (K), Technical and Biophysical (B), and Funding and Markets (F&M) (see Table 2).

TABLE 2: BARRIERS SHOWN IN LIST FORM, AFTER DEELY ET AL. (2020).

BARRIER CATEGORY	BARRIER	LINK TO 6-LAYERED MODEL
Institutional & Governance	<ul style="list-style-type: none"> • Lacks clear leadership • Roles and governance responsibilities • Interagency & Interinstitutional cooperation • Long term vision • Legislation & regulation • Lack of Climate Change policies • Competing priorities 	B1, B2, B6, B7, B5
Socio-Cultural	<ul style="list-style-type: none"> • Culture & behaviour • Societal perception of BGI (blue-green infrastructure) • Community Empowerment • Impacts on future land use 	B4, B11, B3
Knowledge	<ul style="list-style-type: none"> • Lack of general knowledge on BGI • Institutional inexperience • Lack of technical guidance • Lack of successful stories • Negative past experience • Lack of clear cause-effect relationships 	B8, B9, B10

Technical & Biophysical	<ul style="list-style-type: none"> • Onsite limitations • Design challenges • Construction challenges • Maintenance & performance challenges 	B14, B15
Funding & Market	<ul style="list-style-type: none"> • Lack of funding • Estimating benefits & costs • Linking providers and users • Finding appropriate for ecosystem services 	B12, B13

Table 2: Barriers shown in list form, after Deely et al. (2020).

While the framework is limited in that it does not specifically address overcoming the identified barriers, the category explanations below are useful to focus that identification.

- Institutional and Governance (I&G) barriers originate from governing bodies and largely affect managerial stakeholders and those working in a political or legislative function. These barriers are often due to poor governance and a lack of relevant policy development.
- Socio-Cultural (SC) barriers grow from embedded cultures within a stakeholder group and issues relating to perception. Such barriers are not homogeneous across stakeholder groups, some of which may highly value familiar systems that reinforce their expertise while others may not understand or value the benefits of NI.
- Knowledge (K) barriers reflect different understandings of natural infrastructure (NI) including their functions and comparative unintended consequences of grey infrastructure, with significant impact on governing bodies and planners.
- Technical and Biophysical (B) barriers stem from how a proposed site is understood and evaluated leading to design, construction and performance issues predominantly involving managers of the ecosystem services or associated areas and project planners.

Funding and Markets (F&M) generally affect implementation, differently involving residents, managers and landowners on both sides of funding and market tensions. Residents who pay for services aim to minimize costs while landowners gaining income from NI practices aim to maximise profits. When governing bodies manage buying and selling in ecosystem services markets, they may be most concerned with how to transfer monies from one group to another.

References from Deely et al. (2022) related to three specific Canadian studies, two in Montreal (Bissonnette et al., 2018; Dupras et al., 2015) and one in Toronto (Johns, 2019). By reviewing the cited studies, we found that many overlapping barriers were identified and Institutional and Governance barriers figure predominantly in all assessments. However, because most studies assessed cases in EU and UK contexts, there remains a need to “ground truth” this

framing for Canada.

3.2. Canadian Perspectives

Prior to this Project, MNAI undertook monitoring and analysis to determine the challenges that local governments face in implementing natural asset management projects. It is noteworthy that each analysis included British Columbia local governments, and that findings align with those of the current Project. Three project reports are reviewed below.

BC Local Government Needs

An investigation into early efforts to adopt natural assets management (Cairns & Hallsworth, 2021) found that local governments could take action in:

- Education and capacity building (internal and external)
- Strategy, policy, and bylaw development
- New programs and changes to operations
- Building third party support for natural assets management

Through interviews and a workshop, data was collected to determine high impact needs of local governments that, if met, would have the greatest potential for accelerating natural asset management implementation over the next five years as well as implementation strategies that could best support these priority needs. Several local governments in British Columbia were represented in this work: District of West Vancouver, City of Vancouver, Town of Gibsons, and the Comox Valley Regional District.

Cairns and Hallworth (2021) expressed the challenges faced by local governments as “needs” rather than barriers, but the meaning can be considered the same. For local governments, these can relate to official community plans (OCPs). The insights gained are summarized in Table 3, aligned with local government needs and details of the specific challenges faced.

TABLE 3: SUMMARY OF KEY NEEDS IDENTIFIED FOR IMPLEMENTATION ACTION (AFTER CAIRNS & HALLSWORTH, 2021).

KEY LOCAL GOVERNMENT NEEDS IDENTIFIED	CHALLENGES
<p>(A) Internal buy-in amongst key decision makers, particularly amongst traditional asset management staff</p> <p>(B) Overcoming silos within the local government</p>	<ul style="list-style-type: none"> • Key decision makers not always effectively engaged • Natural asset management (NAM) practices are not aligned with traditional asset management (AM) • AM teams are accustomed to working with proven systems, with clear inputs/outputs, with quantified/established metrics (while practice of NAM is still developing) • Need for collaboration internally between departments
<p>(C) Strong external relationships with neighbouring jurisdictions, other levels of government and other stakeholders</p>	<ul style="list-style-type: none"> • Collaboration, amongst neighbouring municipalities and other levels of government is necessary and there is often no mechanism for this • No shared/ common language/ goal around NAM • Municipalities with multiple layers of governance pose unique challenges as roles are split amongst different organizations • Provincial/Federal government engagement and support is critical to enable this work • Effective strategies to engage private landowners is needed
<p>(D) Institutionalize and operationalize NAM</p> <p>(E) Staff capacity (time, in particular)</p>	<ul style="list-style-type: none"> • Lack of integration into overarching policy (e.g., OCP etc.) and plans (e.g., Operational plans) • Poses a particular challenge with staff and council turnover/ Council turnover • Most municipalities do not have a dedicated staff person for this role • Competing interests for use of time • Many consultants do not have training on NAM approaches/ practices, further draining local government staff time
<p>(F) Financing / Funding</p>	<ul style="list-style-type: none"> • Lack of access to sufficient funding for program development and project implementation • Funding for a full range of NAM options, including rehabilitation, restoration
<p>(G) NAM Standards and a Common Language</p>	<ul style="list-style-type: none"> • Many plans/ objectives/ functions touch on NAM but are using different language (e.g., climate change, asset management, sustainability), a common language would help align these efforts and engage broadly (e.g. finance and senior leadership) • Language is not broadly accessible • Have not clearly demonstrated connection between intersecting frameworks (NAM; Nature based climate solutions; ecosystem services)

<p>(H) Regulatory framework to drive NAM agenda (Provincially and Federally)</p>	<ul style="list-style-type: none"> • Senior governments have a large role in influencing progress on NAM, in particular through policy, regulation and supports, without this, progress is slowed • Senior governments have a large role in influencing progress on NAM, in particular through policy, regulation and supports, without this, progress is slowed
<p>(I) Risk identification / methodology</p>	<ul style="list-style-type: none"> • Various forms of risk: legal, financial, liability, engineering • Understanding/addressing risk is a key challenge for those involved in the practicalities of implementation

Table 3: Summary of key needs identified for implementation action (after Cairns & Hallsworth, 2021)

Levels of Service Provided by Natural Assets

In 2021, MNAI led a separate initiative to look at issues faced by local governments across Canada when trying to integrate the management of natural assets into municipal planning and operations (MNAI, 2022). Three British Columbia entities, the City of Vancouver, Asset Management BC and the Town of Gibsons were amongst the 19 participating entities.

In managing municipal assets, local governments commit to provide levels of service (LOS) which define the expected performance of assets to inform asset management and financial plans. Different natural asset types contribute to service objectives of relevance to local governments and can be incorporated in asset management assessment and planning.

The opportunities shown in Table 4 were identified in the planning stages of the Levels of Service project, which ultimately led to the development and mobilization of a guidebook on levels of service (MNAI, 2022).

TABLE 4: OPPORTUNITIES IDENTIFIED IN THE 2021 LEVELS OF SERVICE PROJECT

- 1/ Better integrate natural asset management into asset management policies, plans and processes.
- 2/ Integrate natural asset management into land use plans, policies, zoning, by-laws.
- 3/ Make stronger linkages between natural asset management and climate change mitigation and adaptation.
- 4/ Build capacity of local government staff in natural asset management.
- 5/ Build awareness/support for natural asset management among key decision-makers.
- 6/ Support local governments to work with other jurisdictions, stakeholders, or levels of government to achieve natural asset management objectives.

Table 4: Local government opportunities to apply NAM to achieve levels of service and relevant categories. After MNAI (2022).

Municipal Challenges to Employing Natural Assets

Over the course of 2021, the University of Waterloo developed a natural assets management reporting framework, reviewed progress on MNAI's first five watershed projects and developed a comprehensive monitoring report (Mollame & Drescher, 2021). The report showed that most of the local governments — including two from British Columbia — were progressing well in areas including education, awareness, and capacity outcomes as well as implementation outcomes, but, that progress was much slower towards ecosystem rehabilitation and restoration outcomes and service delivery outcomes. The key challenges noted are shown in Table 5.

TABLE 5: IDENTIFIED CHALLENGES

- Slow uptake of a municipal natural asset management approach from managerial staff in municipalities studied
- Limited natural asset management policies
- A lack of ecosystem services monitoring metrics

Table 5: Challenges to employ natural assets in municipal service delivery. After Mollome & Drescher, (2021).

4 Methodology

There are four main components to The Project. The first component is the literature review detailed above, which formed the foundation for the second component, a framework to scope, list, and organize possible barriers, and types of barriers, to the use of natural asset infrastructure in British Columbia. The framework component also identified barriers that are out of scope. In the third component, data was collected through stakeholder interviews to better understand the B.C. context. In the final component, this data was validated through a stakeholder workshop.

Framework Development

The framework used for the Project built on the work of Sarabi et al. (2020). Their study identified 15 political, institutional and knowledge-related factors as the most dominant barriers to NBS, as shown in Figure 1. In the data gathering process, MNAI organised information guided by the related groupings presented by Deely (2020). In distinguishing between barriers, including Socio-Cultural barriers, and what is termed here as “operating context”, MNAI was informed by Dorst (2022), addressing structural conditions behind the barriers.

Data Collection and Analysis

Data was gathered through 26 semi-structured interviews and supplemented by a review of academic publications and quality grey literature from governmental and institutional reports. Each interviewee was provided with an interview guide and consent form. The interview guide provided background on the Project, the barrier categories proposed by Deely (2020) and two overarching questions:

- What barriers to implementing natural infrastructure (NI) projects have you observed?
- What actions by the provincial government might serve to reduce or remove such barriers?

The interviewees were also provided with a list of possible related questions, including whether they found the barrier categories by Deely (2020) relevant.

The data was then analyzed, guided by Sarabi et al. (2020); Dorst (2020) and Deely (2020) to aid in categorization of barriers, and potential solutions. To identify potential solutions, the authors relied both on the interviewees input, and their own professional insights.

Validation

All interviewees were invited to a virtual workshop on September 29, 2022. The workshop purpose was to report back to participants on the data analysis, including the barriers and potential solutions. Interviewees were provided with a background presentation and the following overarching questions:

- Based on your experience, is the list of barriers accurate? What are the major gaps?
- Based on your experience, are the potential solutions relevant? Are they helpful? What are the major gaps?

Overall, the virtual workshop validated the findings of this report, and participants indicated that the characterization of both barriers and solutions was apt. Comments received were generally elaborations, or points of emphasis. For example, some participants felt that the description of the types of training required, needed expansion in the solutions section. This feedback has been integrated into this document.

5 Identified Barriers

5.1. Introduction

This section provides an overview of barriers to natural infrastructure adoption based on stakeholder interviews. Responses have been sorted and labelled as follows:

- **B.C. Barriers:** While responses of all types were encouraged from interviewees, the focus of discussions was on barriers and solutions where the Province of British Columbia has agency, or the ability to act, and more specifically where its legislation, regulations, policy and programming gives rise to barriers or presents potential solutions in addressing them.
- **Structural or Functional:** Where possible, the data was organized according to whether they constitute a barrier that blocks or impedes the use of natural assets, or a structural condition that underpins or gives rise to the barrier, and thus represents the context that gives rise to the barrier.
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- **Prohibitive, Ambiguous or Absent:** distinction is drawn between barriers that are: prohibitive in nature; result from ambiguity/confusion; or from silence.
- **Context Framework:** A note is made regarding which number (B1-B14) of the 6-layer Sarabi et al (2020) framework the barrier aligns with, or whether it lies outside this construct.

There is a degree of subjectivity in sorting structural or functional roles however, this distinction can help ensure results are meaningful to the Province of British Columbia. Simply stating that there is a “lack of resources” for the uptake of natural infrastructure, for example, may have little meaning without additional analysis. As Dorst (2020) notes, a lack of resources can be caused by internal competition for resources within a municipality. In turn, this can have its origin in institutional policy silos or through short-termism in public and private decision-making that can hamper longer-term planning required to reap benefits of natural infrastructure.

Not all respondents commented on all items and responses are attributed generally to “respondents” as a group unless otherwise noted. It was noted where diametrically opposed comments were received. Unattributed quotes are used where they summarize a point or issue particularly well.

5.2. British Columbia's Operating Context

General Observations: Dominant Operating Context

Before considering individual barriers, it is helpful to make a few overarching observations about the dominant operating context for natural assets in British Columbia. “Operating context” can be understood in part as the cultural values and guiding principles identified in Dorst (2022). Understanding this can help to define the scale of the challenge faced by the Province of British Columbia to meet its Roadmap to 2030 meaningfully.

Responses characterized the dominant operating context in British Columbia as follows.

- 1/ The dominant worldview or cultural understanding (excepting in Indigenous communities) is that nature and natural assets are either the property of humans or primarily something that can be used or extracted. By definition, this dominant understanding tends to exclude mainstream considerations of other worldviews – for example, those of First Nations, who may have very different conceptualizations of nature.
- 2/ There is an overall understanding (again, excepting Indigenous communities) that property owners should be able to do as they wish with their property, subject to regulation. Even natural infrastructure discourse can have strong overtones of “using” nature to meet near-term needs, as opposed to concepts of reciprocity, regeneration or multi-generational stewardship.
- 3/ The foregoing worldview is rooted in law. There is no standing in law in British Columbia for nature or natural assets, and the existing legal system generally favors individual property rights rather than the preservation of nature and the services that it provides.
- 4/ The laws that govern local governments in British Columbia, principally the *Local Government Act* and *Community Charter*, are permissive and enabling for development, without specific legal or policy direction to local governments or principles regarding the preservation or protection of nature and its services. Thus, local governments tend to err on the side of favouring development rather than the preservation of services from nature.
- 5/ Overwhelmingly, provincial legal, policy and political frameworks are not conceptualized, structured, organized or coordinated at the scale of watersheds, catchment basins or other meaningful ecological units.

One participant summarized the overall operating context as one that “allows people to degrade the environment for money.”

It is important to emphasize also that not all First Nations may agree with considering nature an “asset” or “infrastructure” or with terms that correspond

with these concepts¹. To begin to address this issue on a national basis, MNAI is involved in an initiative with Manitoba Treaty 1 First Nations to create a common understanding of acceptable terms, and possible connections between natural assets management and First Nations worldviews, knowledge and perspectives. MNAI will begin extending the work to other provinces in late 2022.

Implications for Level of Effort Required

Within this dominant operating context, nature-based solutions, natural infrastructure and natural assets management have been introduced relatively recently, and at local and smaller scales. They do not align readily with the dominant operating context. It can be inferred that the scale of the challenge for the Province of British Columbia to ensure the uptake of natural assets management is substantial and that efforts will need to be significant, sustained and systemic.

Changes in the dominant operating context

However, this operating context is beginning to change, in particular in response to climate change concerns. Several participants noted the increased number and severity of extreme weather events in 2021 (e.g., the heat dome event, large scale wildfires and extensive flooding) and their impacts (e.g., devastation of communities such as Lytton and Abbotsford). This has led to growing and increasingly explicit understandings that measures to build resilience to climate change, including protection of nature and biodiversity, are essential.

It is important to stress that, based on the interviews with First Nations, the dominant values and priorities — perhaps by definition — are not shared by many Indigenous people. Indigenous cultural values and principles, in contrast with the dominant Western ones, tend to be closely aligned with nature, the natural world and its preservation. Interviews reflected long-term concerns for the loss of traditional uses of the land, and efforts to regain these. Interests in development do not dominate but are moderated by a value system focused on the preservation of nature. Some First Nations interviewees noted that significant factors threatening aspects of their communities' stem from the focus within many local governments on development and the extraction of resources on Crown land, combined with a lack of meaningful inclusion in decision-making both in local governments and the Province of British Columbia.

¹ MNAI is involved in an initiative with Manitoba Treaty 1 First Nations to create, in that context, a common understanding of acceptable terms, and possible connections between natural assets management and First Nations worldviews, knowledge and perspectives.

5.3. Institutional and Governance Barriers

Overwhelmingly, respondents identified *Institutional and Governance* barriers as the main impediment to the uptake of natural infrastructure in British Columbia. These barriers can be subdivided into three inter-related areas:

- a lack of policy and legislative direction in the legislation governing local governments.
- a lack of watershed approaches; and,
- specific legislative or regulatory barriers.

Lack of Provincial Policy Direction

Overall, there is no perceived direction, mandate, driver or impetus from the Province of British Columbia advising local governments, and others, to integrate nature into decision-making, to preserve and protect the services that it provides, or to pursue natural assets infrastructure solutions.

Respondents placed particular emphasis on the *Community Charter* and *Local Government Act*, which provide most authorizations for local governments². Overall, these statutes were identified as creating substantial barriers through their silence on natural assets when considered in the context of the Province of British Columbia's operating context, and the other barriers identified in the project.

More specifically, the *Local Government Act* and *Community Charter*, while broadly enabling of a wide range of local government activities, provide no affirmative direction regarding natural assets. The *Community Charter* does note that local governments can provide any service that the council considers necessary or desirable and identifies that the protection of the natural environment is an area for which requirements can be imposed. However, local governments tend, overwhelmingly, not to use or explore these powers in relation to protecting nature for the services that it provides.

Many mechanisms permitted or mandated by the *Local Government Act*, *Community Charter* or *Vancouver Charter*, such as the creation of Official Community Plans and Regional Growth Strategies, also lack strong direction regarding natural infrastructure. In addition, municipalities and regional districts levy development cost charges (DCCs) on new development to pay for new or expanded infrastructure which may not benefit NBS options.

² *The City of Vancouver, including the Vancouver Park Board, is regulated under the Vancouver Charter, a provincial statute.*

Examples cited include:

- **OCPs (Part 14 of the Local Government Act)**³ tend to: focus on facilitating property development; consider nature only narrowly as a “green” amenity; and lack meaningful or ambitious actions to support natural infrastructure. Furthermore, it was noted that local governments can easily come up with reasons why almost any action or inaction aligns with OCPs, with the implication that thus align with the status quo rather than support strong natural asset efforts. One respondent noted that if the importance of natural infrastructure is not in OCPs the “communities are setting themselves up for problems down the road.” One notable exception is from the City of Courtenay (see Case Example 1)⁴.
- **Regional Growth Strategies (Part 13 of the Local Government Act)**⁵ were similarly understood to establish targets relative to greenhouse gas emissions (GHGs) but not to make connections between GHGs, or any other services, and nature.
- **Section 506 of the Local Government Act**, which enables subdivision bylaws, is silent on natural infrastructure. Resulting bylaws are also typically silent on the topic of natural infrastructure in the context of development even where there is a requirement for developers to reduce the rate of post development site runoff to predevelopment levels.
- **Division 19 of the Local Government Act** allows local governments to impose DCCs by way of bylaw.⁶ There is a single, oft-cited example in which the Town of Gibsons has developed a DCC bylaw that applies natural assets where they provide an eligible service. This tends to be seen as a positive development as, in principle, it creates a funding stream for the protection of natural assets. However, it is perceived to remain an isolated example because Division 19 is worded in a way that is “not very encouraging,” in terms of application to natural assets, according to one respondent. This limits the application of DCCs to very specific projects attributable to growth, and to local governments that are willing to explore their powers and take risks. This may mean that the preservation and protection of natural assets receives less funding and support from the DCC regime than it could, even where they provide DCC-eligible services.

Outcomes of the Local Government Act and Community Charter being largely silent on natural infrastructure include:

3 www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/r15001_14#division_d0e43604

4 *The City of Courtenay was part of a series of MNAI projects*

5 www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/r15001_13#part13

6 www2.gov.bc.ca/gov/content/governments/local-governments/finance/local-government-development-financing/development-costcharges

- Most local governments are unwilling to exercise the powers that they do have or push the boundaries of these. “Few local governments will exercise their power in the presence of cultural norms and absence of direction,” stated one respondent.
- Relationships between local governments and First Nations are significantly varied, as yet without comprehensive efforts to uphold rights enumerated in Declaration on the Rights of Indigenous Peoples Act (UNDRIPA).
- Local governments are dissuaded from action since any approach is almost necessarily piecemeal rather than resulting from Province-wide direction.
- Local governments are stalled by vested or competing development interests in efforts they might initiate to develop natural infrastructure.
- There is an over-reliance on individual leaders and personalities who may succeed despite absence of specific direction in the *Local Government Act and Community Charter*.
- Decision-making that favours development over the preservation of nature’s services; specifically, the protection of nature, is unlikely to proceed in cases where it takes away from space that can otherwise be developed.
- Most local governments taking no action beyond the bare minimum because they have no obligation to do so.

Again, these barriers are not prohibitive in nature, but the effect may be the same when the silence of key legislation is considered in the context of multiple other barriers, an operating context, and the inertia these create.

CASE EXAMPLE 1:

City of Courtenay: Could stronger Provincial direction help integrate natural assets in OCPs?

Community Plans in BC tend to consider nature narrowly as a “green” or recreational amenity, but there are a few clear exceptions. The City of Courtenay’s new OCP, passed July 2022, integrates natural assets throughout. More specifically it:

- **Sets goals:** “Natural assets will be recognized as powerful allies in climate action and essential to citizen quality of life and will therefore be protected, reclaimed, and expanded throughout Courtenay. Nature will be invited into our neighbourhoods by making space for it, increasing opportunity for residents to recharge and connect. “
- **Sets objectives,** including the “integration of natural and engineered forms of green infrastructure to manage rainwater resources, protect water and air quality, maintain ecosystem function, provide flood control, and address and adapt to climate impacts.”

- **Creates new policies**, including to make “infrastructure planning, investment and operations and maintenance decisions with a long- term life-cycle full cost accounting asset management perspective for the design, maintenance, and renewal of infrastructure and utilities, including natural assets; and to “utilize ecological services provided by natural systems wherever practical. This means applying and integrating natural capital in the City’s Asset Management Plan to provide for their maintenance and regular support alongside traditional capital assets including reclamation and restoration of degraded natural assets.”
- **Draws clear links** between addressing climate change and protecting natural assets.

Source: pub-courtenay.escribemeetings.com/filestream.ashx?DocumentId=2762

First Nations, Natural Assets and Land Use

Historically, land use decisions in British Columbia, with their attendant effects on natural assets, have proceeded with limited engagement of First Nations or integration of Indigenous worldviews, perspectives and knowledge. Respondents noted that, overall:

- Land use decision-making processes are not currently based on a nation-to-nation relationship with First Nations.
- Integrating First Nations worldviews, perspectives and knowledge, and reconciling different conceptualizations of nature in the context of land-use is challenging at best, and there are limited mechanisms to enable such efforts.
- Local and regional land use decisions that demonstrably uphold all aspects of UNDRIPA are not commonplace.
- Provincial reconciliation efforts and the passing of UNDRIPA⁷ was not felt to have resulted in meaningful change yet with respect to natural infrastructure or natural assets.

Some respondents also noted that Reconciliation efforts add to local government capacity burdens without any corresponding increase in funding, which can increase their challenges, including those related to natural assets infrastructure.

One respondent noted that Ministry staff with responsibilities towards First Nations rotate frequently and that this creates an additional impediment.

It should be noted that this context is evolving. DRIPA requires the province, in consultation and cooperation with Indigenous Peoples, to take all measures necessary to ensure the laws of B.C. are consistent with the UN Declaration. The Province of British Columbia is determining how to make this legal commitment operational. In May 2022, it released the Declaration on the Rights of Indigenous Peoples Act Action Plan. This document builds on priorities brought forward

7 www2.gov.bc.ca/gov/content/governments/indigenous-people/new-relationship/united-nations-declaration-on-the-rights-of-indigenous-peoples

by Indigenous Peoples and places emphasis on some of the issues raised by respondents including, for example, implementing “government-to-government agreements that recognize Indigenous self-government and self-determination” (Province of B.C., 2022). The February 2022 Ministerial mandate letter reflects these priorities and emphasizes partnership around “regional land and resource use allocation through evolving shared decision making.”⁸

Lack of watershed approaches

Overall, respondents felt that there is no perceived recognition from the Province of British Columbia that: (a) natural systems are interconnected, and that cross ownership and jurisdictional boundaries (b) decision-making should accordingly be integrated and holistic at the level of a watershed, catchment basin or other meaningful ecological unit or that (c) political commitments, regulatory and policy frameworks should align with watershed scales.

Issues in watershed approaches include:

- Decision-making at a local government level for one natural asset may involve several provincial Ministries, each with different mandates, perspectives, objectives and data sets. For example, several Ministries may have responsibilities in a single aquifer that crosses jurisdictional boundaries, which makes any holistic effort for its protection challenging. In some cases, it is unclear to local governments which Ministry is responsible for what.
- Sustained disconnects between local governments and First Nations within the same watershed.
- A lack of coherent, watershed-level datasets to support decision-making at that scale. This, in turn, can mean that there is no clear understanding of priorities or optimal ways to spend the money, which may favour projects or activities supported by the most vocal or politically adept proponents.
- Mismatched action, implementation, monitoring and priorities of local governments in the same watershed – for example, assessments that start and end at different times and with different objectives, in different parts of the same watershed.
- Mismatched actions, implementation, monitoring and priorities of Ministries in the same watershed or region; one respondent provided a local example of clearcuts adjacent to a salmon restoration project.
- Misalignments between incentives and costs. For example, resources allocated to natural asset stewardship by one local government may end up benefitting another community downstream, thus lessening local support for action. “Local governments feel constrained in taking actions that benefit others,” noted one respondent. “There is no

8 www2.gov.bc.ca/assets/gov/government/ministries-organizations/premier-cabinet-mlas/minister-letter/irr-rankin-mandate_2022_-_secured.pdf

incentive if benefits accrue elsewhere” noted another.

- Unfulfilled promise in the 2016 *Water Sustainability Act* (WSA), which contains a variety of aspects that have yet to be implemented. For example, Simms et al. (2022) discuss the untapped opportunities of the WSA to consider and address a variety of impacts at a watershed scale through setting Water Objectives.

A related point is that land under provincial jurisdiction is typically managed with objectives and outcomes other than the preservation of nature, and that these objectives are not consistent across legislation. It was noted, for example, the land in the Agricultural Land Reserve was managed with only agricultural objectives in mind.

Management of coastal areas could be considered as a subset of this issue. The Province of British Columbia has jurisdiction over numerous coastal areas and foreshore, but these are not managed in a strategic way for environmental values unless there is a specific, additional designation such as protected status. Respondents noted that there are numerous policies that apply to different tenures, and no holistic or cumulative analysis of these. The Province of British Columbia has a mandate to develop a coastal strategy together with coastal Indigenous nations that may address some of these issues.

First Nations rights, title and the BC Treaty Process also interweave in this complex situation in many watersheds, as illustrated in Case Example 2.

CASE EXAMPLE 2:

Comox Lake Watershed and the complexities of watershed governance

The Comox Lake watershed on Vancouver Island is the drinking water source for over 45,000 people in the City of Courtenay, the Town of Comox, and the Comox Valley Regional District electoral areas, as well as over part of the Village of Cumberland's population. The area illustrates the complexities of managing natural assets at a watershed scale.

The watershed is multi-use, multi-owner and multi-jurisdiction. Along the Comox Lake shoreline, there are nine different categories of landowners or responsible jurisdictions. The lands and waterways in the watershed are popular recreational destinations for swimming, boating, fishing and hiking. There is active logging throughout much of the watershed.

The K'ómoks First Nation (KFN) is based within the Comox Valley, which forms part of the KFN's traditional territory. Many areas in the Comox Valley are under discussion as part of KFN's involvement in the British Columbia Treaty Process.

In 2018, the K'ómoks First Nation (KFN) signed a Mutual Benefit Agreement confirming cooperation and collaboration in the management of water resources in the region. The agreement includes plans to extend water services to KFN lands and greater participation by KFN in the management of regional water resources.

Policy related to the administration and operation of the Comox Valley water system is determined by the Comox Valley water committee, and comprises directors from Electoral Areas A, B, and C of the CVRD, as well as from the City of Courtenay and the Town of Comox. The water committee provides advice and recommendations to the CVRD board for actions such as adopting bylaws or entering contracts. Voting is weighted based on the water consumed in each participant area.

Municipal administrators, engineering and operations staff as well as KFN serve as non-voting members of the water committee. Policy for the administration of the Village of Cumberland water system is determined by the Council from the Village of Cumberland.

■ **Extracted from 2018 internal report on an MNAI project in the Comox Valley**

Outcomes of these complex situations include: challenges for local government to advance natural asset management efforts of any meaningful scope and scale (e.g., beyond "pilots"); a tendency for local governments to act in their own interest, without sustained or meaningful collaboration at a watershed scale or any broader concern for the "bigger picture" of the watershed; and, local governments feeling constrained in allocating their resources to address issues where benefits flow to others outside their jurisdiction.

A related point is that the province does not have clearly established, codified, or shared linkages between their diverse goals related to climate change adaptation, mitigation, biodiversity, forestry management, parks, Crown land, infrastructure and now, natural assets.

Again, these barriers are not prohibitive, but arise from ambiguity or silence, although the effect may be the same.

Specific Legislative and Regulatory Barriers

Respondents provided numerous comments on legislation or regulation beyond the *Local Government Act* and *Community Charters* that may create barriers. They are best considered in light of the following 4 comments.

- 1/ The legislation and regulations are noted individually below. However, their cumulative relevance or effect must also be considered since natural infrastructure project proponents will in most cases be affected by several or possibly all of the following.
- 2/ Natural infrastructure projects may face the same provincial (and federal) scrutiny as a grey infrastructure project, notwithstanding very different objectives, methods and impacts. Thus, a project to restore nature, which is already challenging, starts back “even further on its heels” by not having appropriately calibrated levels of scrutiny. Furthermore, the levels of scrutiny do not account for the fact that in many urban areas, natural systems are already heavily disturbed, and need receive proactive management to provide and services at all above the status quo.
- 3/ Legislative and regulatory regimes rarely align with watershed scales and realities. This can inhibit natural infrastructure efforts from extending beyond small-scale, disconnected initiatives.
- 4/ Finally, the existing regulatory regime can contribute to capacity challenges, for example, where a local government must produce a parks master plan, asset development plan and recreation plan for the same place, rather than having one single, holistic plan for the site or for a suite of services which can then be planned and managed in more detail.

Municipal Wastewater Regulation

The Municipal Wastewater Regulation⁹, along with the Integrated Wastewater Management Plan as a tool to implement them, were identified as a challenge for natural assets as they do not mandate performance targets and have uneven implementation, monitoring, and accountability. This was perceived by respondents as removing a driver that local governments could otherwise use to ensure cleaner effluent being discharged into waterways and natural assets as one means to achieve this. The US Environmental Protection Agency Municipal Separate Storm Sewer System (MS4) permitting system¹⁰ was identified by respondents as an example of a more rigorous regulatory system that could drive performance outcomes, and natural assets. Respondents emphasised that in B.C., municipal stormwater, which can collect pollutants such as oils, chemicals, pathogens, and other sediments, can be toxic.

9 www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/87_2012

10 www.epa.gov/tx/municipal-separate-storm-sewer-system-ms4-storm-water-management-program-swmp

Riparian Area Protection Regulation

The Riparian Area Protection Regulation¹¹ (RAPR), enabled by the Riparian Areas Protection Act,

was identified as another barrier to natural assets. RAPR requires local governments to protect riparian areas through the development approval process. Specifically, development activities within a given distance from a riparian high-water mark trigger the completion of an assessment using a RAPR assessment methodology. RAPR was seen as a potentially powerful tool that falls short of its potential to protect nature and its services, for several reasons:

- Overall, local discussions about the use of RAPR do not focus on the question of how to sustain and maximize services. Rather, they tend to focus on how to minimize the area assessed by RAPR and thus protected, particularly in high-growth communities.
- Specifically, RAPR provides for detailed and simple assessments. The former provides for 10m Streamside Protection and Enhancement Areas (or setbacks) and the latter for 30m setbacks. There is constant pressure to use detailed assessments and thus have a smaller assessment area, and thus less protection.
- RAPR enforcement is the purview of the Province of B.C. However, provincial compliance and enforcement officials are, according to respondents, unlikely to have the capacity or interest to investigate most concerns or complaints regarding RAPR application. Local governments, which may have a stronger interest in enforcement, have no authority to do so. Thus, if for example soil is moved in a riparian area without a permit, in practice little is done about it.

BC Environmental Assessment Act

The *BC Environmental Assessment Act*¹² was identified as a potential impediment to natural assets infrastructure projects. Specifically, Section 9 of the Act, which defines applicability to projects, is broad, focuses on mitigating impacts of human development, and makes no distinction between a development project and one that is intended to restore nature.

Dike Maintenance Act and the Drainage Ditch and Dike Act

Several challenges were identified by respondents in the context of the *Dike Maintenance Act and the Drainage Ditch and Dike Act*¹³. Overall, the legislation, regulatory process, guidelines and inspections were all identified as heavily favouring very strongly conventional, engineered dikes, and strongly

11 www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/fish/aquatic-habitat-management/riparian-areas-regulation

12 www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/18051#section6

13 www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management

discouraging “living dikes¹⁴” or even hybrid solutions, which require many more permits. For example, the design and construction guidelines prohibit vegetation as erosion control¹⁵. This, in turn, necessitates considerably more study, cost and effort for non-engineered dikes, which may be a prohibitive barrier. Importantly, respondents also noted that dike maintenance under the *Drainage, Ditch and Dike Act*¹⁶ is being devolved to local governments by the Province of British Columbia, with cost implications, including to keep up with evolving standards. This tended to reinforce an unwillingness to test living dike models, which are harder to design and implement.

Respondents noted that in consequence, there are few examples of living dikes in the Province of British Columbia, which reinforces the lack of awareness and material to draw upon. Respondents were generally of the view that other jurisdictions, including the Netherlands, had considerable experience with living dikes that could be drawn upon.

The devolution of dike management was identified as leading to piecemeal and uncoordinated approaches, for many of the reasons identified above in *Lack of Watershed Approaches*.

Health Authorities Act

Vancouver Coastal Health (VCH), governed by the *Health Authorities Act*¹⁷, was identified by respondents as administering its authority in ways that may be insufficiently informed by rigorous risk analysis, thus creating needless prohibitive barriers to natural assets. Specifically, VCH considers that green infrastructure, such as rain gardens and bioswales, pose the same risk to drinking water supplies as sanitary sewers and require that it be no closer to a water main than 3 m. According to respondents, the stated objective is to reduce to zero the risk that, in the event of a water main depressurization, water from a green infrastructure site (for example, rainwater percolated through a bioswale) enters the watermain. Several concerns were raised with this interpretation:

- Practically, it reduces by approximately half the available area on any given city street that can be used for green infrastructure.
- The decision or approach is not sufficiently supported by evidence on the actual risk posed by green infrastructure, relative to sanitary sewers.
- Risk assessments are unevenly applied by VCH in that zero risk is sought in the case of green infrastructure in the context of stormwater management, but high risk is accepted in the context of urban heat

14 *These can involve, for example, estuaries, salt marshes wetlands, and other natural barriers holding back water.*

15 www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management/design-construction

16 www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96102_01

17 www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96180_01

island, which killed an estimated 700 people in Vancouver in the Lower Mainland during the 2021 heat dome, notwithstanding evidence that green infrastructure can reduce urban heat.

Wildlife Management Areas

Provincial Wildlife Management Areas¹⁸ were identified as potential barrier insofar as natural infrastructure proponents may be unclear of whether natural infrastructure is compatible with these areas, and if so, under what circumstances. While these questions can be answered through dialogue with the relevant Ministries and subsequent agreements such as an MOU, they may add time and costs and thus act as a disincentive.

Heritage Conservation Act

The Heritage Conservation Act was noted as being significantly out of alignment with Indigenous values. The challenge is recognized by the Province of B.C. and addressing it has been prioritized through UNDRIPA implementation, but it was noted that changes will not occur for several years.

Private Managed Forest Lands Act

Respondents from Indigenous communities noted that in B.C., land was taken away from First Nations and given to forest companies, meaning that in effect, the Crown gave away land rights that were not theirs. They noted that the *Private Managed Forest Lands Act* allows logging in riparian areas, which can impact on salmon, and that for Coastal First Nations, for example, there is no culture without salmon.

National Building Code

The National Building Code, while not provincial, was identified as creating a statutory barrier to green infrastructure on smaller lots due to an offset requirement from building foundations, notwithstanding success in other jurisdictions allowing water infiltration within 5 m of a private building. This was noted in particular in the context of Vancouver although its relevance may be broader.

Socio-cultural Barriers

Respondents noted both general and specific socio-cultural barriers.

At an overarching level, one respondent drew an analogy to the evolution of thinking regarding highway building: 50 years ago, they noted, the prevailing orthodoxy was to build major highways that bypassed cities. With time, experience and evidence, new concepts of modern urbanism, “complete streets” and active transportation are gaining acceptance. Infrastructure, the respondent posited, is undergoing a similar evolution, away from understanding engineered

¹⁸ www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/wildlife/wildlife-habitats/conservation-lands/wma

solutions as a panacea and natural infrastructure as valuable only for aesthetic purposes, to a more nuanced view.

Another respondent observed that, “it is not that green infrastructure is unaccepted, it is that local governments are more comfortable with the traditional ways that they have been doing since contact.”

A third respondent noted that, at a general level, there is a challenge of fragmented thinking in local governments. “People are dealing with climate, resilience, nature, as separate issues when they are one, and thus doing three times the work,” they observed.

In the context of Indigenous communities, it was noted that First Nations are likely to have a more inherent understanding and acceptance of the benefits provided by nature, but that this does not necessarily translate into practical activities because the communities are subject to similar intuitional, governance and other barriers as local governments, plus the demands of Reconciliation efforts and constraints of low capacity.

Engineering professionals were singled out for commentary regarding socio-cultural norms.

In general terms, it was noted that the provincial legal system relies heavily on professional advice, in particular, advice from engineers. It is thus the responsibility of engineers to understand natural infrastructure if it is to advance effectively. However, respondents noted that many engineers are more comfortable with traditional engineered approaches and are hard to convince about the merits of natural infrastructure based on inherent conservatism in the profession. Respondents noted a predisposition in the profession to create engineered assets for new services than to protect natural assets for the services already provided.

The perception of engineers by others was also noted as a potential barrier. Respondents noted that engineers are accorded particular respect in a local government context, and have perceived legitimacy to block natural infrastructure projects, even in cases where they do not have the requisite detailed knowledge.

Another respondent drew a comparison to the adage that “no-one was ever fired for hiring IBM”. They posited that if a project based on engineering advice fails, the failure is accepted on the basis that best efforts were made; but, if a project based on ecological advice fails, the error is not easily forgiven as it is “risky and novel”.

A broader, related issue was cited that natural assets infrastructure solutions are perceived to be riskier, even when the evidence does not support this view. This is related to the lack of training noted in the next section.

Areas of disagreement

Some respondents felt that barriers posed by a lack of engineering guidance is greatly exaggerated, and that in fact, only a few areas of engineering such as buildings have very strict prescriptions and that others such as mining rely heavily on professional judgement. This would suggest an additional Socio-Cultural barrier rather than an actual Knowledge barrier.

It is also worth noting that notwithstanding these potentially negative comments, Engineers and Geoscientists BC is the only professional regulator in the Canada that has to date developed professional guidelines related specifically to natural assets management.

Knowledge Barriers

A variety of knowledge barriers were cited by respondents.

An overarching barrier was the perceived, widespread lack of awareness that natural assets can or do provide benefits and services that local governments should be aware of and consider.

Other knowledge barriers related more to technical knowledge for advancing natural infrastructure projects. Respondents noted that these are more significant for smaller local governments and for Indigenous communities, who typically have fewer resources overall, and fewer specialists. One respondent underscored the exceptional pressure being put on the resources of Indigenous communities as a result of Reconciliation efforts, which they felt was a “double-edged sword”. Identified barriers include:

- Basic data on natural assets and their condition is often poor. One respondent noted that man-made wetlands are well-mapped but that natural wetlands are poorly mapped, “except for the ones that are too big to ignore.”
- There are no accepted or meaningful ways to interweave Traditional Environmental Knowledge from Indigenous communities with local government knowledge and perspectives, nor any mechanism by which progress could be made.
- Nomenclature may be confusing in some cases, with different terms used interchangeably.
- A lack of a detailed understanding of what natural assets relate to what services.
- Instances where local governments are unclear as to what they should do with information on natural assets, for example, natural asset inventories.
- A perception that local government knowledge of services provided by natural assets “creates” new government liabilities so it is “safer” to not understand services that they can and do provide.

- A perception or understanding that “water is bad” and that its infiltration on property should be discouraged where possible.
- A sense that the incremental costs of natural infrastructure projects are readily known, but the value of co-benefits, potential long-term savings and lower replacement costs, are not.

Some knowledge barriers may be self-reinforcing. For example, barriers related to the *Dike Management Act* (see above) result in few living dikes; this, in turn, results in little local knowledge that could be used as an evidence base to change the status quo.

A lack of training was also emphasized in this discussion, as was the need for sustained instruction of a variety of types.

Technical and Biophysical Barriers

A broad set of barriers identified by respondents is the real or perceived absence of space for natural assets, and the fear that natural infrastructure will cause a loss of usable or developable areas. This barrier links to a range of other barrier areas, including specific limitations due to Vancouver Coastal Health or the National Building Code offset requirements; a general lack of awareness or understanding of why natural assets should be accommodated at all; and a preoccupation with property rights.

The Living Dike project in Surrey was offered as an example of a project that faces not only regulatory and capacity challenges, but also issues related to a perceived lack of space.

Other points raised include:

- Retention tanks may be favoured over natural or constructed wetlands because they take up less space and the area can still be developed. They can also be cleaned at any time of year whereas constructed wetlands, for example, can often only be maintained at specific times.
- In developments with a requirement to save a percentage of land for parks, there is often a desire for the undeveloped space to be used for active purposes. “If you save a forest, you do not get playground,” noted one respondent.

Funding and Markets

Funding emerged as a multi-faceted topic. Aspects included: the way in which local governments are funded; the amount of funding actually available to local governments for natural infrastructure; sunk costs; funding criteria; and the way in which program funding is made available.

Local governments are substantially funded through development and redevelopment processes and thus depend on these revenue streams to develop their other services. Notwithstanding growing evidence that natural

infrastructure provides many services upon which local governments rely, this, combined with the high cost of land in many communities, creates a strong incentive to develop and receive revenues, even where this is at the expense of nature. This challenge must be understood in light of knowledge and awareness issues; many local governments may not even understand the business case for managing natural assets.

The amount of funding, and specifically, that lack of it was frequently cited as a reason why local governments do not design or build natural infrastructure projects. This can be disaggregated further:

- Smaller local governments may most challenged by funding issues.
- First Nations and Indigenous communities face even more funding challenges than small local governments.
- Perhaps perversely, some local governments in fact acquire natural assets (e.g., forested land), destroy it, and then put in engineered assets to get the services they want because it is cheaper to build new habitat to get specific services than the ones nature is already providing.
- In some instances, local governments, when faced with a need for more engineered assets, will choose to use public land because it is simpler and cheaper than encumbering private land.
- Some local governments do not have the capacity (staff) to work on, or even think about, natural asset infrastructure issues, or develop funding proposals.

Area of disagreement

Some respondents felt that a lack of funding was an excuse more than a reason, with one saying, “you cannot afford not to do this work.”

Sunk costs were noted as a barrier; once there is a given level of investment in engineered assets, it may be cost prohibitive in some cases to switch to, or complement with, natural infrastructure, particularly in highly urbanized settings.

Funding criteria can be both enabling and disabling of natural infrastructure. The federal Disaster Mitigation and Adaptation Fund was identified by one participant as a helpful funding model to consider as it encourages partnership, innovation, and has sufficiently long-time frames to allow project proponents to go beyond pilot stages into scale-up of natural infrastructure.

Programme funding for flood management and disaster mitigation was noted as a potential barrier. The regulatory framework that triggers decisions is controlled by Emergency Management BC, as is funding made available for related projects. By contrast, the day-to-day work of local governments occurs within the context of the *Local Government Act* and *Community Charter*. This mean that, unless collaboration between Ministries is exceptional, there may be

disconnects whereby flood mitigation and natural infrastructure initiatives are pursued in silos, according to different objectives and with differing tools and success metrics.

Furthermore, it was noted that Emergency Management BC can only fund infrastructure at risk, and that nature related projects that could reduce risk are not eligible for funding and that this is a misalignment of funding.

The Public Sector Accounting Board Handbook¹⁹ prohibition on considering natural assets to be tangible capital assets is increasingly regarded as being out of step with current local government practice. It also makes it difficult to demonstrate the financial return on investment in nature-based solutions and may disadvantage the borrowing ability of public sector entities who are proactively managing their natural assets (Eyquem et al., 2022). The prohibition was cited as a barrier by respondents and although the Public Sector Accounting Board itself is outside the jurisdiction of the Province of British Columbia, there may be ways the latter can influence the debate, as noted below.

¹⁹ Accounting standards are the primary source of generally accepted accounting principles (GAAP). The CPA Canada Public Sector Accounting (PSA) Handbook contains accounting standards that apply to all public sector entities (governments, government components, government organizations and certain government partnerships) that issue general purpose financial statements unless specifically directed or permitted to use alternative standards by PSAB.
Source: www.frascanada.ca/en/psab/about/what-are-public-sector-standards

6 Possible Solutions

Solutions are organized according to general considerations, followed by the categories of Deely (2020) used above. In some cases, the solutions can be readily inferred from the barrier; in other cases, it is less straightforward.

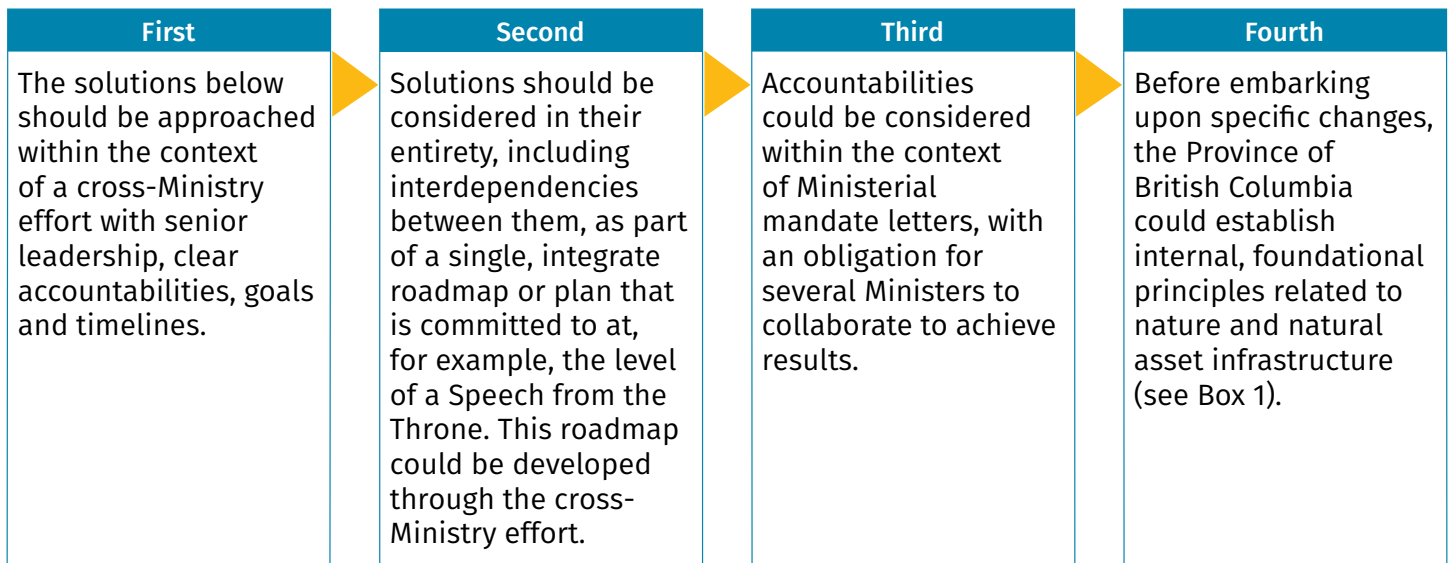
General Considerations

Foundational Priorities

While items in this section should be considered holistically, there are several items that could be considered foundation priorities, that is, initial steps that would set the stage for long term success. These are noted as such.

WAYS TO APPROACH CHANGE

It is important at the outset to consider not only the content of possible solutions but also of *how* changes are made. Based on the research for this Project, optimal results, defined as the widespread or mainstream adoption of effective natural infrastructure solutions across all B.C. local governments, are unlikely to be achieved if potential solutions are simply assigned to individual Ministries without considering the linkages between efforts and the effectiveness of the whole. Effective solutions will require a systemic approach, which in turn could have several components.



Box 1: Foundational Principles

The Province of British Columbia could develop foundational principles for natural assets management efforts, with principles defined here as propositions that serve as the *foundation for a system of belief, actions, behaviour, or chain of reasoning*. These principles would answer questions such as:

- Is nature to be used in the short-term, or preserved for the long-term, and if so, to what end?
- Does the Province espouse the concept of regeneration, or damage reduction?
- What time frames is the province concerned with in terms of natural assets infrastructure?
- What comprises a “good” or “well-designed” natural assets infrastructure initiative?
- What is the degree of emphasis placed on available evidence on sound ecosystem and biodiversity science when considering natural assets infrastructure?
- How should the province be guided in considering potential trade-offs and synergies between desired outcomes such as mitigating and adapting to climate change, protecting biodiversity, and ensuring human well-being?

The output could be an agreed-upon statement of principles that can be considered in the context of funding, regulatory, policy and other decisions.

Institutional and Governance Barriers

CLEAR DIRECTION FROM THE PROVINCE

A consistent view of respondents is that, if Province of British Columbia wants to see an uptake in natural infrastructure, then it must not rely on the generally enabling nature of existing legislation. Instead, it must give consistent, strong, coherent “affirmative direction” at legislative, regulatory, funding and program levels regarding the importance of understanding, considering and protecting nature and its services in local government and Indigenous community contexts.

There are many aspects to this but overall, this requires:

- ensuring strong, affirmative direction of the need to recognize and protect nature and its services in the *Local Government Act* and *Community Charter*.
- reviewing and addressing a wide range of statutory barriers and opportunities, not only in the *Local Government Act* and *Community Charter* but in many other statutes, and.
- ensuring that the foregoing is fully consistent with DRIPA.

Any “affirmative direction” must be sufficiently strong and clear that it can:

- withstand legal challenges,
- overcome existing inertia,
- overcome existing biases including the existing strong focus on property and development rights alone.

This likely necessitates a full and thorough review of key legislation including the *Local Government Act* and *Community Charter*. However, statutes cannot be considered in isolation. Specifically, changes need to be considered in the context of UNDRIPA, with Indigenous legal frameworks being understood as being of equal importance.

More specific measures in support of an overall affirmative direction could include:

- A requirement for all local governments to develop, publish and maintain of asset inventories (including natural assets) to foster and communicate an understanding of the natural assets they own and rely upon, and publish this within a registry. See Box 2 for details.
- Creating positive obligations in the *Local Government Act* and *Community Charter* to require local governments to take into considerations the health of nature and ecosystems within their boundaries, and strong, permissive language about what they can do to protect it. As examples:
 - Amend Section 7 of the Community Charter (Municipal Purposes) to make it clear that “public assets” include natural assets and that “services” includes those from nature.
 - Create, in the Local Government Act and Community Charter, an obligation to consider whether the delivery of certain services (e.g., stormwater management) can be achieved in whole or in part through the protection and management of natural infrastructure.
 - Affirm in Section 14 of the Local Government Act that OCPs must contemplate the protection of nature and its services.
 - Affirm in Section 13 of the Local Government Act that regional growth plans must protect nature and its services, and potentially include requirements similar to those to establish greenhouse gas targets and activities
 - Require in Part 11 of the *Local Government Act* and Part 6 of the *Community Charter* that 5-year financial plans must contemplate the understanding and protecting of nature and its services
 - Allow in section 482 and 491 of the *Local Government Act* density benefits in return for protecting nature and its services
 - Require in Section 506 of the *Local Government Act* that subdivision bylaws create a requirement to ensure no net increase in post-development water flow, using natural infrastructure solutions

An interim step towards these measures could be articulating and disseminating a Provincial document that articulates how the province already interprets the legislation and the extent to which they believe it creates an onus on local governments to consider natural assets.

- Amend Division 19 of the *Local Government Act* to make it explicitly enabling of applying DCCs to natural infrastructure Review emerging jurisprudence regarding the rights of non-human entities (e.g., Magpie River decision) to determine its relevance in the context of other entities' rights could need to be considered

Respondents noted that opportunities for “quick wins” to advance natural assets infrastructure should be explored even as legislation is discussed.

The multi-stakeholder Kus-Kus-Sum purchase and restoration project in the Comox Valley was cited as an example.

Details are available here: projectwatershed.ca/2020/01/27/kus-kus-sum

Box 2:

Foundational step: natural assets inventories

Natural assets inventories provide details on the type of natural assets a local government relies upon, their condition, and the risks they face. By itself, an inventory will not result in the effective management of natural assets; but, without an inventory it is difficult to take any subsequent step.

British Columbia already has partial or preliminary inventories completed in 27 local governments in partnership with MNAI (City of Cranbrook, City of Rossland, Colwood, Comox, Comox Valley Regional District, Courtenay, Cumberland, Gibsons, Grand Forks, Kelowna, Kent District

Nanaimo, New Westminster, Prince George; Regional District of Central Okanagan (inclusive of Kelowna, West Kelowna, Peachland and Lake Country + 2 unincorporated area); Regional District of Central Kootenay; Regional District of East Kootenay; Regional District of Kootenay Boundary; Resort Municipality of Whistler; Sparwood; Surrey; Town of Golden; Township of Langley; West Kelowna; West Vancouver.

At the same time, the CSA Group, an accredited national standard setter, is developing a national standard for the development of inventories, while undertaking a discovery phase to determine the type of registry that could be store these. A draft standard went through public review in fall of 2022 and will be presented to the Committee in February of 2023.

mnai.ca/natural-asset-inventories-standard-now-out-for-public-review/

Foundational steps in British Columbia could include:

- A requirement for each local government to develop a natural asset inventory by 2024 that at least meets the forthcoming CSA standard. The requirement could be regulatory or tied to funding.
- Provision of funding support to ensure that all local governments can undertake an inventory
- A requirement that the inventory be made available through a public registry by 2024.

This would begin to address several barriers, at least in part:

- Knowledge gaps, including the lack of standardized data, when inventories are completed according to the forthcoming standard
- The lack of watershed data, when all local governments publish inventory results in a public registry that can be searched at regional, watershed or local government scales; and this, in turn, could support more coherent watershed scale efforts.
- Funding and financing constraints, as a comparable body of data that can be expanded nationally

Based on experience in the United States with the Toxic Release Inventory, data availability might also lead to some positive, unintended consequence.

Watershed-scale Planning and Governance

Another strong and consistent view of respondents is that if Province of British Columbia wants to see an uptake in natural infrastructure, it must enable this at a meaningful scale such as a watershed or other eco-region.

A thorough review of Provincial data, planning, permitting and other processes to ensure alignment at a watershed scale is an obvious starting place. Beyond this, the Province of British Columbia would need a holistic, cross-Ministry effort that includes the following at a minimum.

Systems level thinking and coordination. The province would need to forego traditional Ministry-by-Ministry approaches that tend to parse watershed areas along smaller geographic or accountability lines, and instead conceptualize watershed as an integrated whole. This might include adopting some aspects of a cross-functional management matrix to ensure efforts are aligned “horizontally” in terms of their geographic application and with a view to protecting nature and the services it provides — watershed by watershed. It could also clarify the extent to which various Provincial designations, for example Wildlife Management Areas, are consistent with natural infrastructure.

Watershed-scale knowledge. The province would need to take a leading role in overcoming traditional Ministry-by-Ministry and local government-by-local government approaches to knowledge and instead require, enable or fund watershed scale risk and vulnerability assessments, natural asset data gathering and dissemination, reporting and disclosure. A requirement, perhaps tied to future funding, that local governments must complete natural asset inventories would provide another useful input into watershed-scale knowledge.

Watershed-scale governance and programming. The ability to collaborate, set priorities and undertake programming at a watershed scale is essential to effective natural asset management efforts, given that many local governments receive services from natural assets that they do not own and/or are outside their jurisdiction. Efforts would need to have as their goal understanding, protecting and managing natural assets across jurisdictional boundaries. They would also need to recognize fully Indigenous rights and title and be aligned with UNDRIPA.

Fundamentally, coherent, watershed-scale assessment, planning, implementation and monitoring requires that either a new governance structure is created, or that existing governance structures are enabled differently. An example of the former is the Ontario Conservation Authorities. In Ontario, the *Conservation Authorities Act* established 36 Conservation Authorities as watershed management agencies that are responsible for the delivery of programs and services that further the conservation, restoration, development and management of natural resources. An example of the latter could be reinforcing and providing additional mandates to regional districts and water districts.

British Columbia’s emerging Watershed Security Strategy and Fund²⁰ (the Strategy) may provide one means to achieve this. The current version of the discussion paper notes that the province “may” create a framework for watershed governance that “could:”

- Clarify and coordinate the roles and responsibilities of different actors within a watershed (e.g., all levels of government, water users, thought leaders, environmental non-governmental organizations),
- Prioritize transparent and accountable decision-making,
- Acknowledge all uses, interests and values associated with water in the watershed,
- Provide options for the structure, composition, and procedures of watershed governance initiatives,
- Support coordination and collaboration across all levels of government (federal, provincial, local and First Nations) to achieve shared water management goals, and
- Strengthen First Nations’ capacity to govern and advance shared decision making.

This language is aligned with, and enabling of, many solutions to the challenges identified by participants; the province would need to determine whether the Strategy is indeed an appropriate mechanism and, if so, then determine specifically how the next version of the document reflects the barriers and opportunities identified here²¹.

Fulfilling the mandate to develop a coastal strategy could provide an immediate opportunity to fulfil some of these objectives.

The *Water Sustainability Act* was noted as an important potential mechanism in this context. As illustrated in Case Example 3 (See Box 3) the Town of Gibsons illustrates where and how watershed governance innovations could be tested.

20/21 engage.gov.bc.ca/app/uploads/sites/722/2022/01/Watershed-Security-Strategy-Discussion-Paper_04.pdf

Case example 3:

Natural asset management at the crossroads in the Town of Gibsons, BC

Experience in the Town of Gibsons' highlights the current limitations for natural asset management in BC and illustrates its promise to deliver services.

Gibsons was the first local government in Canada to put natural assets at the core of its infrastructure system strategy, planning and operations through a fusion of asset management, ecological accounting and ecosystem services methods.

In 2014 Gibsons' Town Council deemed nature its most asset, directing staff to begin incorporating low-carbon resilience into decision-making, including financial planning, using principles of asset management, ecological economics and ecology. Their efforts as a 'living lab' have inspired work in many other local governments.

Governance systems are fragmented and overlapping, and different entities in the region are at different stages in terms of planning, monitoring, and implementation that affect natural assets. The Province of BC has several Ministries with responsibilities for the Aquifer, each with a different mandate. There is no plan to ensure the sustainability of the ecosystem in which the Town of Gibsons is located, notwithstanding the increased urgency created by climate change. Combined, this means there is little the Town can do about, for example, activities in the aquifer recharge area. More specifically:

- **Institutions, governance and collaboration.** There are few institutional or governance mechanisms that require or even facilitate dialogue across jurisdictional boundaries; and the Town of Gibsons must also deal with a complex array of regulatory requirements and bodies, none of which are aligned around protecting natural asset infrastructure.
- **Operating context.** In general, the actions of others are not driven by any overarching imperative to preserve and enhance nature and the services it provides.
- **Data.** There are no mechanisms that enable the Town of Gibsons to access coherent watershed-scale data that extends beyond its jurisdiction.
- **Funding.** The Town of Gibsons has received funding for natural asset infrastructure efforts, but only within its narrow jurisdictional confines.

Today, the Town of Gibsons is at a crossroads. On its current trajectory, it will continue to make outstanding progress in natural asset management, but the *outcomes* will always fall short because they will end at its borders.

WATERSHED ALIGNMENT ON THE SUNSHINE COAST

Regrettably, much of the Gibsons' success ends at its jurisdictional boundary, for many of the reasons identified in this Report.

Overall, there is a misalignment between ecosystem and watershed realities, and local and regional structures. The natural assets upon which Gibsons relies — for example, the Gibsons Aquifer, which is the Town's sole source of drinking water supply — extend beyond Town boundaries. They are thus affected by actions elsewhere, including on private property. For example, there is increased industrial, commercial, and residential development occurring outside Gibsons boundaries but within the Aquifer's recharge area.

A concerted effort by the Province of BC to implement the solutions identified in this report would help to ensure that the Town of Gibsons' efforts can achieve their potential at a watershed scale. A specific opportunity is for the Province of BC to support the emergence of a watershed management framework on the Sunshine Coast.

Beginning in 2018, local governments on the Sunshine Coast began to collaborate on a regional water governance approach and agreed to work together on:

- The development of an integrated, regional watershed management approach, with supporting management strategies, programs, projects, bylaws, policies and tools; and
- The examination of models for regional watershed governance that would provide an opportunity for collaboration.

The Province of B.C. could ensure the success of this effort by:

- 1/ Playing a coordination and convening role in the development of a watershed management framework ensuring that it:
 - aligns with national and global best practice.
 - places the preservation of nature and natural assets at the core of its mandate for climate resiliency broadly, and watershed security specifically, and.
 - has appropriate statutory backing, consistent with DRIPA, to ensure its success.
- 2/ This could include issuing a Water Sustainability Plan under the provisions of the Water Sustainability Act (2016) and implementing tools from the emerging Watershed Security Strategy (e.g., watershed planning, regional water management and watershed governance).
- 3/ Providing, where needed, funding from the Watershed Security Fund to ensure that local governments can commit fully to the development of a watershed governance framework.
- 4/ Aligning Provincial line department efforts, including permitting and data consolidation, behind the watershed management model.
- 5/ Ensuring the federal government is engaged where federal Crown land is at issue.

This effort should extend beyond the Sunshine Coast if the province wants widespread uptake of natural asset infrastructure in B.C. Therefore, it would be equally important to ensure that the Sunshine Coast *watershed management framework* provides a basis for consistent, strong watershed governance across B.C. The Province of B.C could facilitate this by:

- Embodying best practice and the full use of existing statutory authority in the Sunshine Coast *watershed management model*, with a deliberate intention to replicate the effort; and

- Reviewing existing watershed governance mechanism in BC (e.g., regional governments, Okanagan Water Board and Cowichan Watershed Board, and areas with limited or no watershed governance) to see how these can be refined or strengthened consistently across the province, using the full provisions of the *Watershed Sustainability Act* (2016) and emerging Watershed Security Strategy.

Instead of viewing cross-jurisdictional complexity as an issue or a barrier, local governments could benefit from the power of a collaborative approach. Greater access to funding, increased data availability, more regulatory authority, and the development of a consistent framework for natural asset management could be achieved through a *watershed management model framework*.

Specific Regulatory Opportunities

Within the context of an overall review of legislation and regulations, the following could be explored.

- For local project approvals, distinguish between projects that have development as their primary aim and those with ecosystem rehabilitation as the goal; and streamline and expedite regulatory approvals and permitting for the latter. This should be done in conjunction with efforts to ensure watershed scale coherence.
- Explore options to amend the Municipal Wastewater Regulation to create best in class performance targets for pollutant discharge and determine the extent to which natural assets infrastructure could be encouraged to meet these targets. The US Environmental Protection Agency system for municipal sewer systems, noted above, could provide one example. Municipal Separate Sewer Systems (MS4) require a National Pollution Discharge Elimination System permit that requires, for example: establishment of a stormwater pollution prevention program; achievement of performance targets for pollutants, which are codified in permits; and implementation of minimum control measures²².
- Ensure that decision-making under the *Health Authorities Act* demonstrably implements a risk and evidence-based approach, commensurate with good practice, with respect to setbacks from natural infrastructure. Such decision-making should take into consideration countervailing risks such as increased human health risks from heat where natural infrastructure is not present.
- Review *RAPR* to ensure that: its application considers cumulative and watershed impacts; it is consistent with the protection of nature and its services; compliance and enforcement is augmented at provincial level or additional powers are devolved to local governments; results are monitored and available at a watershed scale.

22 See for example www.epa.gov/npdes/stormwater-discharges-municipal-sources

- Review the *Dike Maintenance Act and the Drainage Ditch and Dike Act* to ensure that natural asset infrastructure and vegetation are excluded from consideration only insofar as there is a sound evidence based for doing so, and that their use is enabled wherever appropriate.

Socio-Cultural Barriers

The Province of British Columbia cannot change worldviews or socio-cultural context by itself. However, implementing the proposed solutions will impact worldviews over time by normalizing natural assets infrastructure; and, by contrast, failing to do so will help perpetuate status quo approaches and incremental change. The province can also address Socio-Cultural barriers in other, specific ways including:

- Leading by example by normalizing and prioritizing natural infrastructure in its own activities. This could entail taking strong action to understand and protect the services from nature on the lands that it owns (e.g., B.C. Parks, coastal areas); prioritizing natural infrastructure in its own operations, for example, procurement; and disseminating the results.
- Considering how it incorporates other worldviews relating to nature, especially those of Indigenous people, in its legislation, regulations and programming.
- Training, awareness and capacity within its own staff around the concepts and fundamentals of natural assets management

Knowledge Barriers

There are several ways in which the Province of British Columbia could address knowledge barriers.

TERMS AND ENGAGEMENT

A first step could be to adopt a single set of terminology and use it consistently. A framework developed by the Canadian Council of Ministers of the Environment (2021) has been subjected to federal, provincial and territorial scrutiny, and provides a useful basis. This would not, of course, address all barriers related to terminology. For example, terms such as “value” and “valuation” will be a point of debate in the context of natural assets infrastructure for the foreseeable future. There is no single remedy to this; rather, the province would have to determine the extent to which it wants to engage in discussions related to, for example, national standards, professional norms, and accounting concepts and practices.

INTEGRATED EFFORTS TO ADDRESS KNOWLEDGE BARRIERS

Second, consideration of knowledge barriers could be an integrated component of efforts to address other barriers. For example:

- In reviewing legislation and regulation, the Province of British Columbia could develop a compelling rationale for why it is important to consider natural assets infrastructure and disseminate corresponding communications material.
- In considering Socio-Cultural barriers, staff in the Government Communications and Public Engagement Ministry could be requested to take training so that they have familiarity with the concepts and fundamentals of natural infrastructure, and the linkages to UNDRIPA and Indigenous rights.

SPECIFIC MEASURES

Additional measures include the following.

- Develop a strategy for disseminating information on the evolving and growing evidence base related to natural assets infrastructure.
- Respondents identified the development of meaningful watershed-scale datasets that cross Ministry and jurisdictional boundaries as vital, including creating a central repository. This implies effective data coordination and dissemination by either the province or a designate, at a watershed scale, so that any requirement for watershed scale assessments or inventories does not simply produce data that languishes, and that collected data can support decision-making effectively.
- A requirement for local governments to report on efforts to inventory, protect and manage natural assets would add substantially to the knowledge base.
- As noted, the Engineers and Geoscientists of BC has voluntarily created a professional practice guideline that begins to address natural infrastructure. The Province of British Columbia could support efforts in other professions to explore and develop guidelines, and standards and specifications related to natural infrastructure. The province could consider creating in Section 57 of the *Professional Governance Act*²³ an obligation on the part of regulated entities to develop bylaws relating to understanding and mitigating the effects of registrants on nature.

Training, broadly defined, was cited as an important element of addressing awareness barriers. This, however, is not something the Province of B.C. can tackle in isolation. Indeed, there are other multi-stakeholder efforts such as a “Challenge Dialogue” led by Royal Roads University, MNAI and others to define national knowledge, curriculum, training, competency and capacity needs to advance natural assets management; Provincial efforts could link to and/or support a multi-stakeholder effort of this nature.

²³ www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/18047#section22

Technical and Biophysical Barriers

The Province of B.C. can indirectly address technical and biophysical barriers through action on many of the other barriers in this report. For example, better knowledge and training could reduce a reflexive reliance on engineered options.

Funding and Markets

Simply providing “more funding” in the absence of addressing other barriers may create more individual examples of effective natural infrastructure but is unlikely to bring widespread, mainstream change across all B.C. local governments and First Nations. For example, effective funding presupposes watershed scale data so that funders know whether resources are being applied to priorities from the perspective of ecosystem health, connectivity and functioning. As another example, watershed scale governance and programming would overcome the current report misalignment between costs and benefits of action and could encourage more investment in natural assets on the part of local governments.

Therefore, funding should be considered as part of a holistic effort. Additional considerations include:

- Province of British Columbia support for effective engagement between First Nations and local governments on natural infrastructure.
- Require, in any future infrastructure funding programs, consideration of whether natural infrastructure could in whole or part provide services. This could include both provincial funding programs and federal-provincial programs²⁴.

Cost sharing on the Sunshine Coast

Cost sharing can evidently stretch available resources.

An example of a mutually beneficial cost-sharing opportunity exists in Gibsons BC. Here, the Province can help with the cost of purchasing hydrometric equipment and provide training, and the Town can undertake the field work; singly, neither could complete the purchase installation and monitoring.

The resulting data will benefit a wide array of partners and help to address known barriers.

Such examples can be replicated.

²⁴ See, for example, the 6 July 2017 letter from a multi-stakeholder group to Premier Horgan regarding ways to ensure that the Investing in Canada Plan, including the Integrated Bilateral Agreements, considers natural assets infrastructure. Available at: mnai.ca/media/2022/08/Letter-on-Infrastructure-Bilaterals_MinisterTrevena_BC.pdf

- Funding programs that consider learning from, for example, the federal Disaster Mitigation and Adaptation Fund regarding timeframes, requirements, and adequate funding for concept design.
- Additional funding for smaller local governments and First Nations that may not have adequate internal capacity to consider, conceptualise and design natural infrastructure projects.
- Participation in emerging efforts to identify ways to harness capital markets financing for the acquisition, preservation and maintenance of healthy natural infrastructure (see for example Eyquem et al., (2022)).
- Underwriting and de-risking major natural infrastructure projects.
- Engagement in ongoing efforts to clarify Public Sector Accounting Board Handbook rules²⁵, which currently prohibit considering natural assets to be tangible capital assets and thus create potential financing challenges since natural assets may this only appear as expenses in accounting frameworks. The Province of B.C. could, for example, support multi-stakeholder efforts to inform a change to the guidelines, or, for its own assets, experiment with accounting practices that extend beyond historical cost and considerations including natural infrastructure.
- Explore solutions to cited issues in which Emergency Management BC funding focuses only on infrastructure at risk, rather than taking a risk-based approach where the best way to address the risk (including natural infrastructure) is considered.

Related to funding, some respondents felt that the province, singly or in collaboration with others, should fund natural assets staff capacity. Precedents from BC Hydro and the Rockefeller Foundation were cited. Some respondents felt that this support should be permanent in nature, precisely because local governments are affected by, and addressing, issues related to natural assets outside their ownership, area and jurisdiction.

²⁵ See for example this effort, signed by all of Canada's largest cities: mnai.ca/natural-assets-be-included-in-canadas-financial-statements

7 Conclusion

The following conclusions may be drawn from this project.

First, the barriers to natural infrastructure in British Columbia will not be overcome with piecemeal efforts; sustained, comprehensive effort is required on the part of the Province of British Columbia.

Second, and despite the scale of the challenge, many solutions are readily apparent. Some, like legislative change, are longer term in nature, however, this should not obscure the fact there are multiple “foundational priorities,” noted above, that can and should be seized. Furthermore, it is vital to note that the Province of B.C. already has multiple policy foundations for the solutions identified here, including the *Water Sustainability Act*, Coastal Strategy and Watershed Security Strategy and DRIPA.

Third, the timing to tackle to barriers appears to be optimal. This because the “dominant operating context” may be shifting due to climate change such that there is greater understanding of the need to take action to protect nature and secure the services it provides. Action on the part of the Province of B.C. to support natural infrastructure may therefore be better received today than even a few years ago. The growing litany of disastrous floods, fires and heat waves in B.C. that appears to be changing the operating context also means, however, that delayed action may lead to risks of public frustration, litigation, and reduced options.

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