



Green Shores 2020: Impact, Value and Lessons Learned

Final Project Report

July 31, 2020



Green Shores “gold” rated project: New Brighton Park, Burrard Inlet, British Columbia (Photo credit: Vancouver Fraser Port Authority BC)

Prepared for: the Stewardship Centre for BC

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Acronyms

BCR	Benefit cost ratio
BC	British Columbia
EAB	Equivalent annualized benefit
EAC	Equivalent annualized cost
GS	Green Shores
GSCD	Green Shores for Coastal Development
GSSD	Green Shores for Shoreline Development
LEED	Leadership in Energy and Environmental Design
NRCan	Natural Resources Canada
NBS	Nature-Based Solutions
NAB	Net annualized benefit
PV	Present value
PVB	Present value benefits
PVC	Present value costs
SLR	Sea level rise
SCBC	Stewardship Centre for British Columbia
TEV	Total Economic Value
TBL	Triple Bottom Line
TBL	Triple Bottom Line
WTP	Willingness to Pay

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Executive Summary

Development impacts, including habitat loss and pollution, combined with climate change challenges are affecting the health of shoreline ecosystems and the ecological services flowing from them. The benefits of incorporating natural ecosystem functions into shoreline management, including hybrid options that combine engineered structures and natural features or “soft” shore armoured, have been studied over the past decades, with practical guidance on the topic increasingly available. Several programs are actively promoting the implementation of natural shorelines in developed areas. These programs include the Nature Edge, Living Shorelines, Shore Friendly, Blue Flag and Grey to Green Shorelines, the Municipal Natural Assets Initiative (MNAI), and, notably the Stewardship Centre for BC’s Green Shores®.

Interest in nature-based solutions that address development pressures on coastal ecosystems and climate change together is growing in Canada. Relative to built and hybrid coastal protection, strengths of nature-based coastal protection include the flow of co-benefits (e.g., water quality improvements and recreational use), the potential for self-recovery or repair after storms and an ability to keep pace with sea-level rise. However, compared to the decades of implementation experience with engineered protective structures, applications of natural solutions remain limited on Canada’s shorelines. Data on the performance and cost-benefit ratio of these projects (relative to conventional built approaches) are scarce, there is still a relatively small pool of applicable expertise among coastal development professionals and regulatory barriers present challenges to widespread adoption.

Focused on Green Shores, this report draws from multiple lines of evidence to address this issue. Currently, functioning in BC, Green Shores is a voluntary incentive program that encourages soft shoreline development through a combination of capacity building, tools and best practice standards for planning, design and construction professionals, local government staff and property owners. This report presents qualitative and quantitative information on the impact and social, environmental and economic value of Green Shores programming for communities in BC and provides recommendations to improve Green Shores’ reach in Canada.

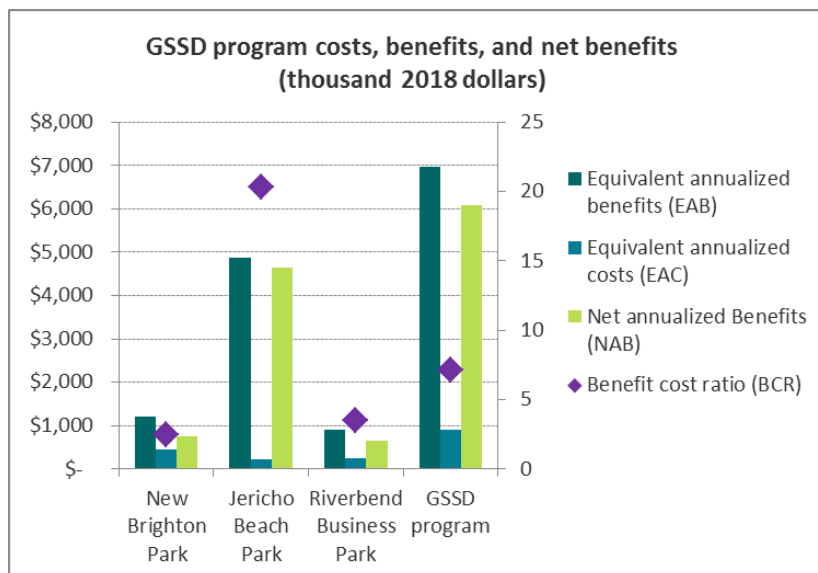
We used two approaches to understand the impact and value of the Green Shores program in BC: social impact analysis and triple bottom line evaluation (also referred to as extended social cost-benefit analysis). Literature reviews and qualitative research with 13 stakeholders, including representatives from local governments, shoreline professionals and funders, informed a “theory of change” for Green Shores in BC that lays out the hypothesis for achieving social impact, using a framework that links activities and inputs to outputs, outcomes and impact. To understand the benefits the Green Shores approach to shoreline development provides to society using monetary metrics we developed a methodology grounded in the valuation of ecosystem goods and services and applied it to three Green Shores for Shoreline Development¹ (GSSD) case study sites: New Brighton Park, Jericho Beach Park and Riverbend Business Park. We monetize these case study sites’ improvements in generating habitat services, cultural services (mainly recreation) and regulatory services (nutrient cycling, waste processing, carbon storage and flood protection) and assess the wider impacts of Green Shores program expenditures on BC’s economy. To do this we employed two different economic tools: cost-benefit analysis (CBA) and economic impact assessment (EIA). CBA helps

¹ The original Green Shores for Coastal Development programs expanded to include both marine and freshwater lake shorelines and, consequently, the program name changed to Green Shores for Shoreline Development.

understand whether the program makes people better-off by increasing social welfare. EIA is concerned with net changes to the economy attributable to the program.

The theory of change of Green Shores programming in BC developed for this project points to a number of social and environmental outcomes valued by stakeholders. The theory of change suggests that if *awareness* of Green Shores approaches and their benefits among municipal staff, local government decision makers, stewardship groups and shoreline professionals as well as *knowledge, skills and confidence* to explain and implement Green Shores practices are built and access to *funding and expertise* on where and when to apply Green Shores are in place then *mainstreaming* of Green Shores concepts and requirements into existing regulatory and planning instruments as well as university curricula will increase, as will *trust and collaboration* across disciplines. With an enabling institutional environment, *enhanced capacity* to support adoption of Green Shores and *active Green Shores champions* operating at the community level, the uptake of Green Shores will increase. Widespread *uptake* of Green Shores approaches in BC leads to *demonstrable benefits for waterfront property owners and coastal environments*, including protection from erosion, flooding and sea-level rise; enhanced status and reputation; improved functioning of coastal processes, decreased coastal pollution and reduced cumulative impacts on shoreline ecosystems.

Economic analysis further supports the merits of investing in Green Shores. The figure below summarizes the results from cost-benefit analyses of individual GSSD projects and for Green Shores programming overall. The net annualized benefits (NAB) of the program are about \$6.1 million (2018 dollars), with improved provision of habitat services and cultural services accounting for over 90% these benefits. The corresponding benefit-cost ratio (BCR) is about 7.1 (shown in the secondary y axis). Both indicators suggest investments by the GSSD program represent an economically efficient use of scarce resources. Over the three restoration and development projects, social welfare was increased by about \$7.10 for each \$1 invested by the Green Shores program. Even allowing for errors in our valuation as high as +172% across all ecosystem service benefits, social welfare would still be increased by about \$2.60 for each \$1 invested by the Green Shores program. The complementary economic impact assessment highlights the contribution of program expenditures on the BC economy. Investments (excluding annual recurring costs) as part of the Green Shores program have contributed \$5.9-6.9 million to provincial gross domestic product, generating \$0.5-0.7 million in tax revenues and supporting roughly 80 jobs. These values represent upper bound estimates of potential impacts on the economy, since they do not account for the opportunity costs of alternative uses of program funds.



This report also explores strategies and actions to accelerate uptake of Green Shores at scale. Interviews, focus groups, workshop discussions and results from a web-based survey informed our analysis of i) challenges in increasing adoption of Green Shores in BC and opportunities to address them and ii) the potential need and demand for aspects of Green Shores programming in Atlantic Canada. In BC, technical resources, partnerships, practitioner networks, champions and delivery capacity have been created. We suggest that radically increasing penetration of Green Shores in the province will require a renewed examination of incentive structures faced by Green Shores user groups and designing interventions to address misalignments. This may include forging new partnerships, such as with the Municipal Natural Assets Initiative. As demonstrated through our economic analysis and other evidence, Green Shores projects achieve returns on investment and provide important societal benefits, so policy, regulatory and planning frameworks should help not hinder making these economically-efficient decisions.

Atlantic stakeholders are enthusiastic about the prospect of extending aspects of Green Shores to the region. Coastal development challenges around accelerated erosion, biodiversity losses, storm surge flooding and climate change combined with socio-demographic trends (e.g., aging populations, rural outmigration, foreign ownership of second homes) provide a degree of urgency in seeking sustainable solutions for shorelines that do not rely on engineered structures alone. Taking Green Shores to Atlantic Canada does not simply involve reproducing BC's Green Shores model, however. Lessons from implementation in BC and ambitions of Atlantic stakeholders can inform a region-specific model for Green Shores that is grounded in current assets, capacities and momentum. This report proposes a five-year roadmap for extending Green Shores to Nova Scotia, New Brunswick and Prince Edward Island, identifying broad strategies to foster enabling conditions in next one to three years before investing in activities that support scaling up in the next three to five years. An important next step for SCBC and partners is to identify an organization based in the region with the convening capacity and organizational skills to guide collaboration around the common purpose of advancing adoption of Green Shores.

This report adds to the mounting evidence on the socio-economic merits of applying nature-based solutions to promote more sustainable and resilient shoreline management and sheds light on the specific value communities in BC attach to the Green Shores program. It also highlights strategies to address challenges with Green Shores uptake in BC and support smart scaling of the program into Atlantic Canada. The findings in this report and the analytical tools left behind (Excel workbooks for site-level valuation) can help the Stewardship Centre for BC focus future outreach, advocacy and research in their pursuit of promoting healthy shorelines and habitats in BC and beyond.

1. Introduction

This section introduces the project and its objectives. It also includes key concepts that we use in subsequent sections of the report.

1.1 Project Context

Development impacts, including habitat loss and pollution, combined with climate change challenges are affecting the health of shoreline ecosystems and the ecological services flowing from them. In the early 2000s, the State of Washington and others led seminal work on the benefits of incorporating natural ecosystem functions into shoreline management. Since then, published research and practical guidance on the topic has increased significantly. For example, scientists have looked at the wave-attenuation capacity of differing plants (e.g., Vuik *et al.* 2016), modelled the effectiveness of alternative conservation and restoration approaches under a range of storm conditions and sea levels (e.g., Reddy *et al.* 2016) and explored hybrid options that combine engineered structures and natural features or “soft” shore armouring (e.g., Sutton-Grier *et al.* 2015).

The scientific basis has improved and interest in nature-based solutions²—including incorporating natural features in shoreline management—is growing. Several programs are actively promoting the implementation of natural shorelines in developed areas. These programs include the Nature Edge, Living Shorelines, Shore Friendly, Blue Flag and Grey to Green Shorelines, the Municipal Natural Assets Initiative (MNAI), and, notably the Stewardship Centre for BC’s Green Shores. Pilot applications of Green Shores and MNAI, in particular, are contributing to the proof of concept needed to demonstrate the effectiveness of nature-based solutions to address development pressures on coastal ecosystems and climate change together. Nevertheless, “on the ground” implementation relative to conventional engineered structures remains limited.

Box 1: What is Green Shores?

Green Shores® (GS) is a voluntary incentive program launched by the Stewardship Centre for British Columbia (SCBC) in 2010. It is similar to green building rating programs such as Built Green™ and LEED™ and consists of two credits and ratings systems: Green Shores for Shoreline Development (for commercial, multi-family residential, subdivision, park, and institutional waterfront development) and Green Shores for Homes (for residential properties). The GS program encourages methods of shoreline development (both for marine and lake environments) that protect the land from flooding and erosion (including projected sea-level rise of one metre or more by 2100 for coastal shorelines), that increase the ability to access shorelines for recreation, and that protect and restore natural habitats. It does so through the provision of capacity building, tools and best practice standards for planning, design and construction professionals, local government staff and property owners.

The Stewardship Centre for BC (SCBC) is interested in identifying improvements to Green Shores’ (Box 1) application in British Columbia and exploring the scaling potential of the Green Shores model to Atlantic Canada. Since its origins in 2010, Green Shores has advanced to a point where program managers, supporters, participants in program activities, and the wider communities involved have an appreciation for what works and does not work in encouraging the sustainable use of shoreline ecosystems. In April 2018 the SCBC engaged ESSA Technologies Ltd. (ESSA) to assist the organization in understanding and documenting the impact, value and scaling potential of SCBC’s services related to

² <https://gca.org/global-commission-on-adaptation/action-tracks/natural-environment>

Green Shores.

Project objectives were as follows:

Box 2: Project objectives

- Develop and apply an evaluation framework that incorporates the social, environmental, economic value of Green Shores
- Identify potential improvements to current Green Shores offerings
- Assess the potential to replicate Green Shores in the Atlantic region
- Make recommendations for future action

1.2 About this Report

This report compiles the main results of project activities undertaken between April 2018 and April 2020, which were rolled out as illustrated in Figure 1. We used two approaches to understand the impact and value of the Green Shores program in BC: social impact analysis and triple bottom line evaluation (also referred to as an extended social cost-benefit analysis). This work focused on Green Shores for Coastal Development³ because of i) the likely “public good” nature of these applications of Green Shores (e.g., parks, multifunctional community uses) and ii) the increased requirements for site-level data collection compared to Green Shores for Homes.

This report is for shoreline practitioners, stewardship groups, communities and funders seeking information on i) the benefits SCBC’s service offerings as related to Green Shores, ii) the value Green Shores brings to BC and iii) opportunities to broaden Green Shores’ reach. Target audiences are as follows: SCBC, members of the Green Shores Local Government Working Group, funders (e.g., Natural Resources Canada, BC Real Estate Foundation, Sitka Foundation) and Atlantic governments and coastal stewardship organizations.

The report starts by explaining key concepts used throughout the project. Section 2 summarizes our approach to the social impact analysis and related findings. Section 3 summarizes our work on monetizing the value Green Shores for Coastal Development brings for communities in BC. Section 4 contains a situational analysis of the scaling potential of Green Shores programming to the Atlantic region, including demand for this approach and conditions to facilitate Green Shores’ uptake. Finally, Section 5 presents our recommended next steps for improving Green Shores’ application in BC and extending Green Shores to New Brunswick, Nova Scotia and Prince Edward Island.

³ The original Green Shores for Coastal Development programs expanded to include both marine and freshwater lake shorelines and, consequently, the program name changed to Green Shores for Shoreline Development.



Figure 1: The Green Shores project undertaken by ESSA comprised four inter-related activities: scoping, social impact analysis, triple bottom line evaluation and an assessment of the scaling potential of Green Shores to the Atlantic region. This diagram also shows the timing and sequencing of project activities.

1.3 Key Concepts

Social Impact Analysis

Increasingly, funding agencies, such as philanthropic organizations and other grant funders, want to understand the social or environmental effect of the interventions they support (So & Capanyola 2016). Social impact analysis is a “catch-all” term for measurement techniques that elucidate significant or lasting changes in people’s lives / the environment brought about by series of actions. These techniques can be qualitative and quantitative and include the following:

- Methods focused on **expected returns** (i.e., anticipated benefits relative to costs);
- **Theory of change** methods that lay out the hypothesis for achieving social impact, using a framework that links activities and inputs to outputs, outcomes and impact;
- **Experimental or quasi-experimental** methods that use randomized control trials or other rigorous approaches to understand the difference in results with and without the intervention.

In this project we used the theory of change method, building on program documentation and stakeholder interviews and focus groups.

Triple Bottom Line Evaluation

Decision-makers (e.g., local government planners, landscape architects, construction professionals and property owners) must make development choices that are characterized by a wide range of—often competing—political, social, economic, and environment impacts. Balancing conservation and development requires consideration of all these impacts when choosing among alternative courses of actions and what

investments to make. However, impacts are typically expressed in incommensurable units, whether qualitatively, in physical terms, or in monetary terms.

Triple bottom line evaluation or extended social cost benefit analysis consists of a framework for measuring and accounting for a much broader concept of value than streams of financial costs and benefits (i.e., it incorporates social, environmental and economic costs and benefits). This enables decision-makers to determine if certain investments are worthwhile when looking at the economic value those investments provide the wider society. This measurement technique can be applied at the start of the development (planning) process to provide a prospective appraisal in support of future decisions to invest in a Green Shores project or to renew or expand existing Green Shores projects. It can also be applied after a Green Shores project has been implemented – to provide a retrospective evaluation of the project’s outcomes and implementation process.

Two economic decision-support tools are used to provide information relating to the TBL performance of the GSSD program: **cost-benefit analysis** and **economic impact analysis**.

Cost–benefit analysis (CBA) entails a formal economic appraisal of a program’s impacts, based on the principles of welfare economics, designed to determine whether the advantages of that program are greater than its disadvantages, and by how much. The net social benefits may be positive or negative. If the net social benefits are positive, the program is described as “economically efficient”—i.e., there is a net increase in the welfare of those affected by the program. Conversely, if the net social effect is negative, then the program is characterized as “economically inefficient”, since implementing it results in a net reduction in welfare.

We additionally use economic impact analysis (EIA) to complement the findings of the CBA. Expenditures attributable to GS developments will have wider—though marginal—impacts on the economy, through direct, indirect and induced effects. EIA can be used to measure these impacts, typically using input-output analysis. Input-output analysis proceeds by first identifying goods and services used in a project (e.g., expenditures on landscape designers) and subsequently linking all the stages involved their production to measure the total extent to which the BC economy will be impacted by project expenditures.

CBA and EIA address different questions. CBA is concerned with whether the program makes people better-off by increasing social welfare, whereas EIA is concerned with net changes to the economy attributable to the program. As such, estimated results from both types of analyses should not be added together.

Ecosystem Goods and Services

For the purpose of this study we adopted the TEEB (The Economics of Ecosystem and Biodiversity) framework for valuing the services provided to humans by healthy shoreline ecosystems. TEEB (2010) defines ecosystem services as the direct and indirect contributions of ecosystems to human well-being and distinguishes between four broad groups of ecosystem goods and services: provisioning, regulating, habitat and cultural (see Table 1).

By definition ecosystem goods and services bring a range of benefits or values to human communities and so the notion of economic value is important to explain as well. Economists use a concept called “Total Economic Value” (TEV) to define and categorize different values important to society according to the type of use (see Figure 2). TEV comprises of use values and non-use values. Use values are benefits that are derived from physical use of a private or quasi-private good provided by the development, for which market prices typically exist. Use values can be disaggregated into direct use and indirect use. As the term implies, direct use values are derived from on-site extraction (and consumption) of resources (e.g., fish, shellfish, wood, etc.), or non-consumptive activities at the development (e.g., recreation, visual amenity, etc.). Indirect use values are derived from regulatory services related to the development (e.g., flood control, air, climate and water regulation, pollination, etc.), which provide public benefits not typically

captured by market transactions. Option value reflects people’s preference—or Willingness to Pay (WTP)—to maintain the option to use an ecosystem service in the future for personal benefit.

Non-use values are derived from the knowledge that an ecosystem service(s) is maintained without regard to any current or future personal use. They reflect the satisfaction people derive from knowing that others alive today will have access to the benefits of the ecosystem services (altruistic values), that future generations will have access to the benefits of the ecosystem services (bequest values), and that a habitat or species continues to exist unrelated to any use by current or future generations (existence values). Non-use values are related to ethical, cultural, spiritual or aesthetic properties, for which markets usually do not exist.

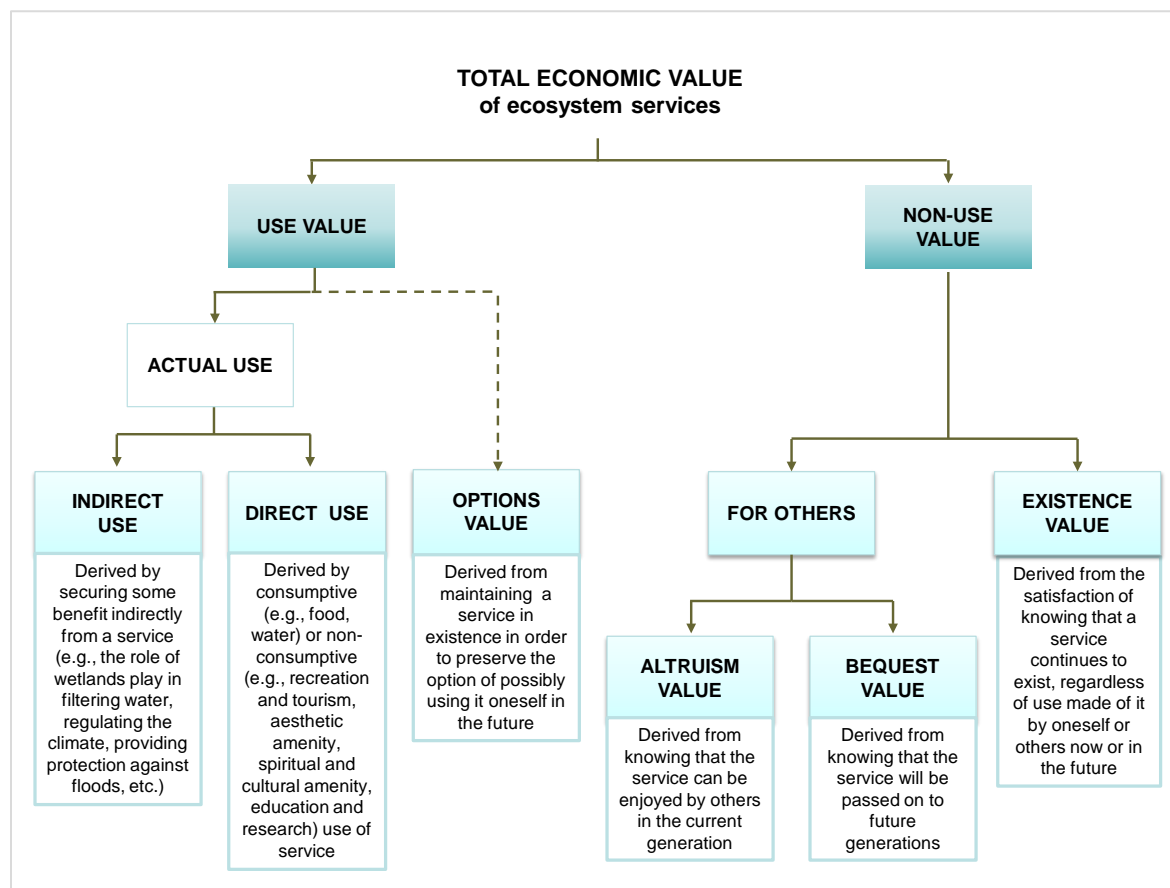


Figure 2: Framework for valuation of ecosystem services: Total Economic Value

The correspondence between the main four categories of ecosystem goods and services and components of TEV are shown in Table 1.

Table 1: Ecosystem goods and services and components of Total Economic Value (Adapted from TEEB 2010)

Ecosystem service	Contribution to human well-being	Source of economic benefits
Provisioning	Material or energy outputs from ecosystems, such as food, water, medicine and raw materials	Direct use (consumptive); maintain option for future use
Regulating	The moderating and regulating benefits that ecosystems provide relating to air quality, nutrient cycling, carbon sequestration and storage, wastewater treatment, and moderation of extreme events like flooding	Indirect use; option value
Habitat	Habitat refugium and nursery for wild plants and animals,	Direct use (consumptive); option

	including the maintenance of genetic diversity	value; non-use value
Cultural	Benefits that humans gain from interacting with the environment, including visual amenity, recreation, tourism, education, and spiritual and heritage value	Direct use (non-consumptive); option value; non-use value

2. Social Impact Analysis of Green Shores

This section discusses summarizes lessons on Green Shores' implementation in BC, including challenges and opportunities, and presents a conceptual model describing how SCBC activities related to Green Shores lead to broader social and environmental impact.

2.1 Summary of Engagement Activities in BC

Listening to stakeholders is core to understanding the social impact of an intervention such as Green Shores since they hold critical information on its value and on potential improvements. Stakeholders are individuals, groups or organizations that experience change as a result of Green Shores or affect Green Shores, whether positively or negatively. Because of the wide range of groups and individuals engaged with Green Shores in different capacities, a first consideration was deciding who to talk to and how, given project resources. Through discussion with DG Blair, Executive Director of the SCBC, we determined that a focus on Green Shores programming available to local governments in BC provided a good launching point for stakeholder discussions. Planning and preparations for stakeholder engagement took place jointly with DG Blair between August and December 2018, which included:

- Delivery of a brief introductory presentation to the Green Shores Local Government Working Group (LGWG) in August;
- Clarifying the Green Shores activities of most relevance to BC local governments;
- Compiling a list of stakeholders of diverse representation;
- Recruiting stakeholders to participate in either focus groups or interviews; and,
- Preparing discussion guides.

Table 2 below lists the stakeholders ESSA spoke with in winter 2019. Each stakeholder session lasted between 45 minutes and one hour, and followed a similar structure. It opened with a brief overview of the project and objectives of the session, participants then had the opportunity to describe their involvement with Green Shores, subsequently participants were asked to give perspectives on the main results or changes observed as a result of access to Green Shores programming and resources, concluding with sharing of perspectives on the future of Green Shores. ESSA took detailed notes during interviews and recorded focus group discussions. Detailed notes and transcriptions were provided to SCBC.

Table 2: Green Shores stakeholders consulted by ESSA. These sessions provided an opportunity for data collection for the social impact analysis and helped inform the scope of the Triple Bottom Line evaluation

Stakeholder group	Names	Comments	Engagement format	Date
Large community-member of LGWG	Natalie Bandringa, Capital Regional District	CRD joined group in 2015. Natalie started in the summer 2018	Focus Group Discussion #1	January 9, 2019
Small community-member of LGWG	Luke Sales, Qualicum Beach	Luke is a long-term supporter of GS and Qualicum Beach joined group in 2017		
Medium community-member of LGWG	Alana Mullaly, Comox Valley Regional District	Alana joined the group in 2018		
Member of LGWG	Nicole Faghin, University of Washington	Member of GSH Steering Committee, involved since concept of GSH originated	Interview	January 18, 2019
Elected Official from RD Member of LGWG	Sandy McCormick, qathet Regional District	Councillor qathet Regional District (formerly Powell River Regional District)	Written response	January 16-17, 2019

Stakeholder group	Names	Comments	Engagement format	Date
Elected Official	Sue Ellen Fast, Bowen Island Municipality	Councillor at Bowen Island municipality and on the Executive Committee of Islands Trust	Interview	January 17, 2019
Elected Official	Fred Haynes, District of Saanich	Mayor of Saanich; his shoreline property is enrolled in GSH	Interview	January 18, 2019
Shoreline professional	Darryl Arsenault, Arsenault Environmental Services Ltd.	Darryl has 2 GS projects on the go Has taken GS Level 2 training	Interview	January 18, 2019
Green Shores Technical Advisory Committee	Brian Emmett, Archipelago Marine Research	Brian is a biologist, chair of the Tech Advisory Committee, GS instructor and member of GSH steering committee	Focus Group Discussion #2	January 28, 2019
	Paul DeGreef, Murdoch de Greeff Inc. Landscape Architects	Paul is a landscape architect, Tech Advisory Committee member and involved in the GSCD update		
	Val Schaefer, University of Victoria	Val is a biologist, chair of the Restoration of Natural Systems at UVic, SCBC Board member and co-lead on much of SCBC GS research		
Funder	Leanne Sexsmith, Real Estate Foundation of BC	Project manager for 3 cycles of grants to SCBC for Green Shores	Interview	January 22, 2019
Funder	MaryAnn Wilson & John Somerville, Natural Resources Canada	Managers for 3 cycles of grants to SCBC for Green Shores. Lead the Coastal Management Working Group under Canada's Adaptation Platform	Interview	February 5, 2019

ESSA performed content analysis of the qualitative data stemming from focus group discussions and interviews by identifying recurrent themes across groups (triangulation), while retaining feedback that was distinct and unique. Findings from this analysis appear in the following sections.

2.2 Challenges and Opportunities

Conversations with stakeholders highlighted a range of challenges in implementing Green Shores as well as opportunities for widening its reach in BC.

Local Government & Elected Officials

Challenges relate to finances, complexities of coastal ecosystems and misalignment in goals. For smaller local governments or those early in their awareness of Green Shores the perception exists that there are high costs to implement Green Shores as a remediation approach. The following quote captures this sentiment: *“Without access to additional funding to do the projects Green Shores is just a wonderful concept we can’t benefit from.”* Additionally, because application of Green Shores can bring benefits beyond those accrued to owners or operators of coastal property, some stakeholders can adopt the attitude that “someone else” should subsidize workshop delivery, promotion of Green Shores and its implementation.

Coastlines are complex, dynamic and part of larger systems. It can be challenging to pinpoint the problems that Green Shores can help address. For example, in building the case to Council that the beach is in trouble, a number of drivers and pressures can act synergistically (e.g., development uplands 30 years ago, changes in slope, a series of King Tides, sea level rise). Also, once implemented, King Tides can rearrange the configuration of natural shoreline features so changes attributable to Green Shores can be hard to detect.

Differences in knowledge of and attitudes toward soft shorelines solutions to address erosion and other problems can also present challenges. Within one level of government practitioners in different departments can have conflicting or varying approaches to coastal development and protection, based on domain expertise and academic backgrounds. One stakeholder, for example, contrasted the mindsets and

expertise related to nature-based solutions of parks managers with those in the public works department. Another issue has to do with (mis) appropriation of Green Shores concepts by contractors. Local government staff have observed, in conversations with them, readiness by homeowners to adopt Green Shores approaches but an implementation gap is evident once the project goes to the contractor. Awareness and education are part of the response, in this case.

One distinct benefit of Green Shores is the ability of related concepts and techniques to mobilize people to come together on a new way of managing shoreline development. Green Shores takes a holistic approach to shoreline restoration. It takes into account broader context in which the site occurs, broader community impact of site-level changes. Green Shores also takes into account services that the shoreline provides, such as flood control. Along the same lines Green Shores concepts have also been applied in engaging citizens in coastal conservation – Green Shores is a tool for conservation education.

Noted opportunities to enhance uptake of Green Shores relate to “mainstreaming” and provision of broad-based baseline information. Some local governments have included prohibitions around hardening in official community plans, declared Green Shores as a preferred way of dealing with foreshore applications and have designated shoreline development permit areas in place, with development permits for hardening only issued under extenuating circumstances. In these contexts, homeowner and developer access to in-kind technical support by coastal planners and engineering staff is particularly key. At the same time, it’s important to pair restrictions and changes in development norms with information and tools that enable compliance. For example, introducing language about not interrupting coastal processes as a condition for permitting means that homeowners need to know what natural processes are supposed to be present. Local governments can undertake baseline assessment work so that homeowners can gain access to high-quality information, forgoing the need to engage coastal ecologists / engineers to study their particular coastal segment.

Technical Advisors & Shoreline Professionals

According to the stakeholder group, the biggest challenges in enhancing the effectiveness and uptake of Green Shores relate to missing or misaligned incentives. A current weakness is that the lack of a direct link between Green Shores implementation, regulations and incentives (e.g., grants, deferral of fees, accelerated permitting). The public good of having a naturalized shoreline (e.g., reduced risk transfer, water quality) goes unrecognized in government fiscal frameworks (e.g., tax reduction as % of property value). This group of stakeholders’ view is that a mismatch between municipal or local government support and enabling conditions by the BC province. One hypothesis is that provincial staff may be concerned about liability issues. If a development change is required for erosion protection then it triggers a review by engineers who may, in turn, be reluctant to sign off on a biologist’s design. The upshot is that the lack of incentives makes it difficult for homeowners to implement Green Shores, unless they are wealthy. Coastal developers face a different set of incentives to pursue Green Shores approaches (e.g., reputation, permitting expediency) than do homeowners and so the situation as it is currently poses less of an impediment.

An additional challenge raised by this stakeholder group reinforces messages heard from local government stakeholders: there is still a limited history of implementation success and government and the public are still gaining awareness of the benefits of the soft shoreline approach compared to hard shorelines. The following quote illustrates the challenge of demonstrating the value of Green Shores approaches: “[t]he thing about ecological restoration is that if it’s done right it looks like you didn’t do anything...in contrast, people can relate to putting up a wall... Green Shores systems don’t always work the first time. They need to be tweaked over time, revising the design.” Table 3 highlights strengths and weakness of nature-based approaches to shoreline protection relative to engineered structures and hybrid approaches, emphasizing some of the challenges raised by this stakeholder group in improving acceptance of Green Shores.

Table 3: Comparison of strengths and weaknesses of built, natural and hybrid infrastructure for coastal protection (Reproduced from: Sutton-Grier et al. 2015)

Infrastructure type	Strengths	Weaknesses
Built (seawalls, levees, bulkheads, etc.)	<ul style="list-style-type: none"> Expertise already exist on how to design and build these approaches Decades of implementation experience Excellent understanding of the functioning and effectiveness of different structures corresponding to specific engineering standards Can withstand storm events upon construction 	<ul style="list-style-type: none"> Does not adapt with changing conditions such as SLR Weakens with time and has a built-in lifetime Can cause coastal habitat loss and negatively affect the flow of ecosystem services Can create a sense of complacency and lull communities into thinking they are safe from all disasters Only provides storm protection benefits when a storm occurs; no co-benefits accrue in good weather
Natural (salt marsh, beach, dune, oyster and coral reefs, etc.)	<ul style="list-style-type: none"> Aside from coastal protection provides co-benefits, such as fishery habitat, water quality improvements, carbon sequestration and storage, and recreational use. These are available to communities all the time not just during storm events In the case of ecosystem restoration, the ecosystem grows stronger with time as it gets established Has the potential to self-recover or self-repair after a storm or forcing event Can keep pace with sea-level rise Can be cheaper to construct 	<ul style="list-style-type: none"> Best practices in ecosystem restoration are still required Levels of coastal protection are not linear and it can be difficult to predict what level It can take many years for ecosystems to get established and provide the necessary level of coastal protection It can require a substantial amount of space to implement natural approaches Data on the cost to benefit ratio for projects are scarce Permitting for natural projects can be a more difficult process than for built projects A growing but still limited expertise in the coastal planning and development community on which approaches to use where and when
Hybrid (combination of built and natural)	<ul style="list-style-type: none"> Capitalizes on best characteristics of built and natural approaches Provides some co-benefits besides coastal protection Can provide a greater level of confidence than natural approaches alone Can be used in areas where there is little space to implement natural approaches alone 	<ul style="list-style-type: none"> Data on the performance and effectiveness of these systems is yet limited More research is required to design the best hybrid systems Growing but still limited expertise in the coastal planning and development community on which approaches to use where and when Hybrid systems, due to the built part of them, can still have some negative impacts on species diversity Data on the cost to benefit ratio for projects are scarce Permitting for hybrid projects can be a more difficult process than for built projects

Key opportunities to scale up Green Shores include climate change and sea-level rise (SLR), understanding and managing cumulative effects and contractors as “vectors”. There is a growing awareness on the part of planners, government, homeowners, on issues of increased storm severity coupled with SLR so that gets people thinking about shoreline and shore protection. However, with 1 m of SLR projected for the end of the century nearshore environments will change significantly and the best shoreline stewardship option may be to retreat. In the view of one representative of this stakeholder group, Green Shores’ education, outreach, credit & rating should reflect these long-term scenarios.

On the issue of cumulative effects, the opportunity exists for SCBC – with university partners – to adopt this lens and promote shoreline restoration at the right scale (drift cell, regional application of beach nourishment). There’s a degree of pessimism of the effect of one individual homeowner in terms of improvements in the shoreline ecosystem. Drawing attention to their impact on the ecosystem in combination with that of other waterfront homeowners and coastal developers could be powerful.

The third opportunity has to do with contractors. Most of the Green Shores for Homes certifications that exist on mid Vancouver Island are attributable to a single contractor who has taken the Level 2 Green Shores course and is an advocate for Green Shores approaches. Homeowners trust contractors and,

therefore, growing the cadre of trained contractors with positive attitudes toward Green Shores implementation can influence the level of uptake significantly.

Two other opportunities raised by stakeholders are worth mentioning:

- Ecologists and ecosystem biologists at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development could be allies in the implementation of Green Shores. However, the need exists to strengthen planning processes to recognize Green Shores certified projects are meeting existing best management practices (BMPs).
- In contrast to the situation in the U.S. where robust education programs exist and multiple shoreline management programs compete for attention and government funding, the shoreline management space in BC (and likely elsewhere in Canada) is not as crowded. This means that the SCBC can position itself to be a leader in promoting coastal nature-based solutions and continued to attract attention from a diverse portfolio of funders, especially as the evidence base on the performance and return on investment of Green Shores increases.

Funders

Funders noted two key challenges: the need for financial incentives and confusion over terminology. One funder emphasized the importance of providing financial support to communities and waterfront homeowners to apply Green Shores techniques since they are creating or restoring a public good by way of a healthy and functional shorelines. This same stakeholder drew parallels with payment for ecosystem services schemes to encourage farmers to adopt environmental BMPs.

The second challenge relates to ambiguity and confusion due to the use of different terms to sometimes describe the same types of projects and approaches (e.g., green shores, natural shorelines, green infrastructure, nature-based solutions and natural assets). Inconsistent terminology can pose problems or inefficiencies in establishing partnerships and identifying and securing funding. It can also be a threat to the Green Shores brand, if concepts are misapplied. The Canadian Council of Ministers of the Environment supported a project to develop a framework for natural infrastructure terminology as a way of facilitating a common understanding of these terms and their meaning in practice.⁴ The output of this project is not publicly available yet but the expectation is that the framework will confer a degree of standardization in the use of terms and, therefore, clarity on the benefits of the different types of systems among decision makers and communities of practice.

Funders touched on other opportunities for further uptake of Green Shores, including the following:

- Compared to five years ago there is greater public awareness of climate change and its impacts, including in coastal areas.
- The application of Green Shores in Vancouver (New Brighton Park, on the south side of Burrard Inlet) Vancouver) is a platform for showcasing natural shoreline solutions in a large urban centre.
- Communities of practice focused on natural solutions to support climate resilience are getting established and the SCBC is well positioned in this constellation. For example, Coastal Zone Canada launched a bi-national (Canada/U.S.) Cold Regions Living Shorelines Community of Practice and the SCBC is a member. Integration of U.S. expertise and experience into the development and

⁴ See the Request for Proposals here: https://www.ccme.ca/files/Resources/fr_climate_change/RfP%20Natural%20Infrastructure%202.0.pdf

implementation of Green Shores adds to SCBC's credibility. SCBC is also a member of NRCan's Coastal Management Working Group.

2.3 Impact Hypothesis and Results Chain

Information on outcomes gleaned from stakeholder interview and focus groups, as well as a review of Green Shores documentation were inputs into the high-level results map shown in Figure 3, illustrating the chain of results related to Green Shores, from inputs and assets to ultimate impact.

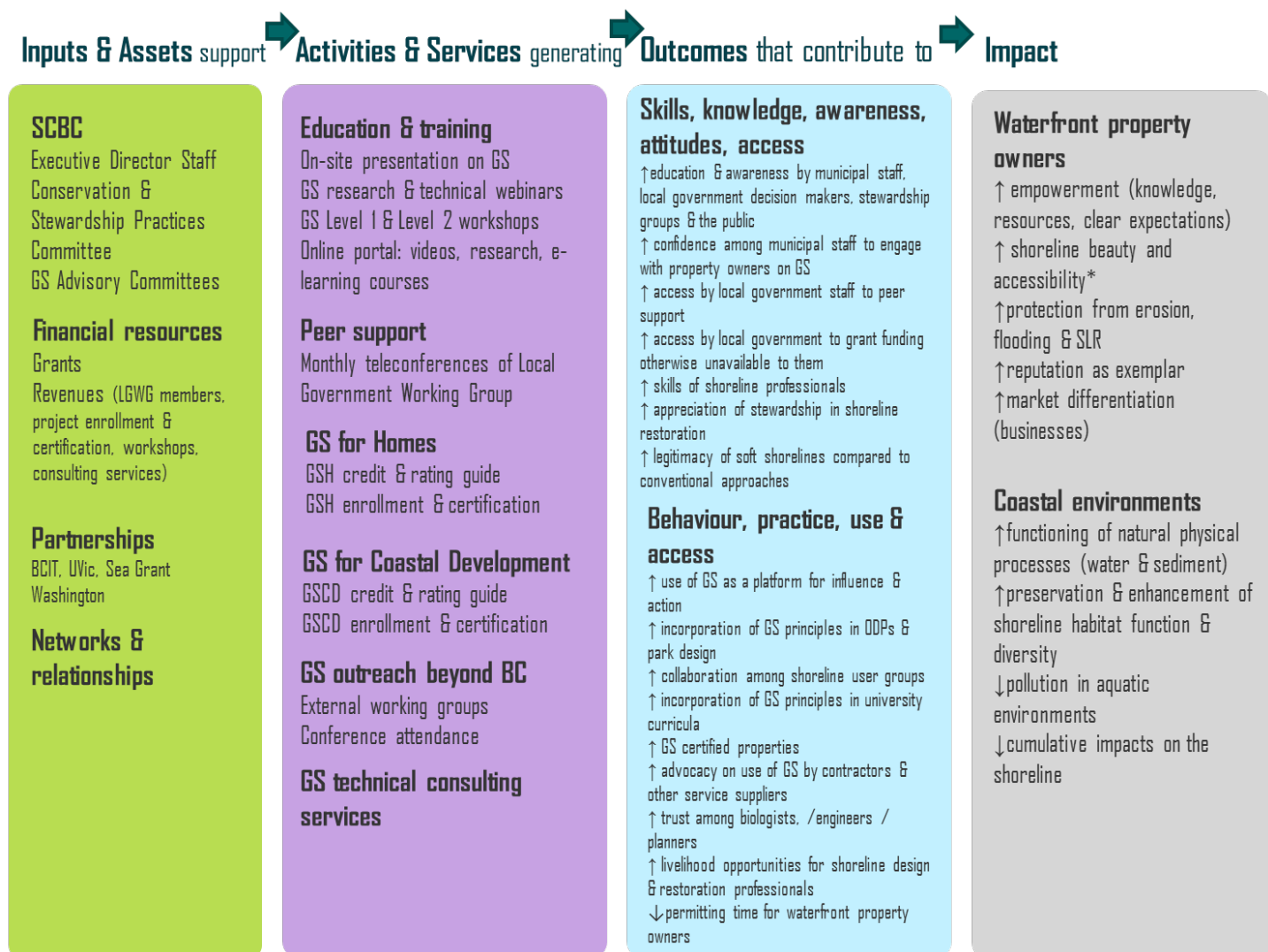


Figure 3: Green Shores results chain developed from a review of Green Shores documentation and stakeholder feedback (* indicates that there is some uncertainty in the direction of this result, since homeowners may perceive the loss of flat lawn to the wall in the foreshore as a loss)

Implicit in this results chain are hypothesis about the impact of Green Shores programming in BC. It suggests that if *awareness* of Green Shores approaches and their benefits among municipal staff, local government decision makers, stewardship groups and shoreline professionals as well as *knowledge, skills and confidence* to explain and implement Green Shores practices are built and *access to funding and expertise* on where and when to apply Green Shores are in place then *mainstreaming of Green Shores concepts and requirements* into existing regulatory and planning instruments as well as university curricula will increase, as will *trust and collaboration* across disciplines. With an *enabling institutional environment*,

enhanced capacity to support adoption of Green Shores and *active Green Shores champions* operating at the community level, the uptake of Green Shores will increase. Widespread uptake of Green Shores approaches in BC leads to *demonstrable benefits for waterfront property owners and coastal environments, including protection from erosion, flooding and sea-level rise; enhanced status and reputation; improved functioning of coastal processes, decreased coastal pollution and reduced cumulative impacts on shoreline ecosystems.*

3. Triple Bottom Line Evaluation

This section summarizes the results of an economic analysis of Green Shores for Shoreline Development (GSSD) program from a societal (or triple bottom line) perspective. It includes results for three case study sites (New Brighton Park, Jericho Beach Park and Riverbend Business Park) and for the programming associated with GSSD as a whole.

3.1 Approach

The objective of this study was to conduct an economic analysis of the Green Shores for Shoreline Development (GSSD)⁵ program from a societal (or triple bottom line) perspective. GSSD programming includes a rating and certification scheme for both coastal and freshwater lakeshores. To obtain a Green Shores for Shoreline Development Credit Rating, a site must meet five pre-requisites (see Box 3). Once those are met, a site will be awarded points based on its performance with respect to ten credits. A site can be designated as Bronze, Silver or Gold depending on how many points the site qualifies for (SCBC, 2019).

The study involved i) developing a methodology grounded in the valuation of ecosystem goods and services and an Excel spreadsheet tool for the analysis and ii) applying it to three case study sites: New Brighton Park, Jericho Beach Park and Riverbend Business Park. The goal with this study is to show the benefits the Green Shores approach to shoreline development provides to society using monetary metrics that are readily understood and used as the basis for many development decisions.

Valuation of ecosystem goods and services at the site level included the application of a procedure called “benefits transfer”. A benefit (or value) transfer occurs when an estimated value, based on an original (primary valuation) study, is transferred to a new application. The original study is referred to as the “study site” and the new application as the “policy site” (in our case, a Green Shores project). Benefit transfers typically involve transfers through time (e.g., from 2005 to 2019) and space (e.g., from the U.S. to Canada). The key feature is that study-site value(s) are essentially extrapolated to value a change—like the improvement in the provision of ecosystem services—at a new location or in different context. Figure 4 illustrates the steps we took in transferring values or benefits from primary studies to our three case study sites.

⁵ Formerly Green Shores for Coastal Development (GSCD). Note that the GSCD rating and certification scheme which was used as the basis for measuring ecosystem services in this study, has since been superseded by the GSSD 2020 edition.

Box 3: Overview of the Green Shores for Shoreline Development (GSSD) rating and certification scheme (2020 version)

Prerequisites regarding ...	
Prerequisite 1	Siting of permanent structures
Prerequisite 2	Conservation of shoreline sediment processes
Prerequisite 3	Conservation of critical or sensitive habitats
Prerequisite 4	Riparian zone protection
Prerequisite 5	On-site environmental management plan

Credits regarding ...		
Credit 1	Site design with conservation of shore zone	1-3 points
Credit 2	Shore friendly access	1-2 points
Credit 3	Redevelopment of contaminated sites	2 points
Credit 4	Restoration or enhancement of shoreline sediment and tidal processes	2-9 points
Credit 5	Restoration or enhancement of shoreline habitats	1-10 points
Credit 6	Enhanced riparian zone protection	1-3 points
Credit 7	Integrated stormwater planning and design	3-4 points
Credit 8	Climate change adaptation plan	2-5 points
Credit 9	Exceptional performance and innovation	1-2 points
Credit 10	Outreach and public education	1-2 points

GS Credit Designation	Non-park sites	Park sites
Bronze	All prerequisites + 8 points	All prerequisites + 12 points
Silver	All prerequisites + 13 points	All prerequisites + 17 points
Gold	All prerequisites + 20 points	All prerequisites + 24 points

Source: SCBC (2020)

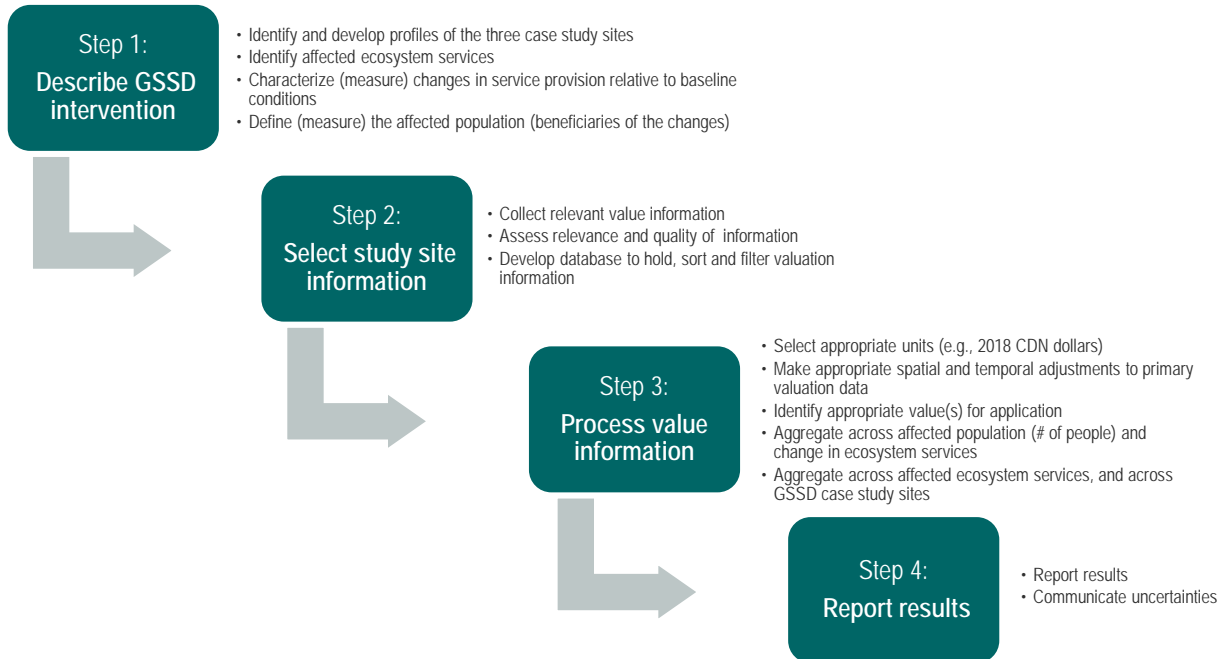


Figure 4: Main steps in the benefit transfer used in this study

Based on an extensive literature review and the value information collated, we determined it was possible to include the following impacts in the cost-benefit analyses:

- Habitat services
- Cultural services
- Regulatory services: nutrient cycling, waste processing, carbon storage and flood protection (i.e., disturbance regulation)

These services represent approximately 87 to 90% of the total annual monetary benefits provided by aquatic ecosystems of BC's lower mainland, as estimated by Molnar et al (2012). The main omission from our analysis relates to the filtering, retention and storage of freshwater, which largely takes place in streams, lakes and aquifers (a "provisioning service").

In addition to the valuation of the above listed ecosystem services, we assess the wider impacts of program expenditures on BC's economy.

A technical report provided to SCBC under separate cover provides detailed information on the sources of economic values used, the methods underlying the cost-benefit calculation for each ecosystem service in scope and the assumptions used in linking components of Total Economic Value to Green Shores sites via the Green Shores for Shoreline Development Credit Rating scheme.

3.2 Aggregating Results and Reporting Metrics

Cost-benefit analysis—as the term implies—compares the benefits and cost streams of a program or project to ascertain whether the allocation of scarce resources to that program or project are justified by the benefits generated. In this study, the benefit streams relate to a range of ecosystem services measured from a societal perspective.

As with any cost-benefit analysis, it is important that the appraisal of alternative development choices take account of the time when costs and benefits occur. The standard way to do this in economic analysis is to discount (or weight) future costs and benefits so that they are comparable to the value placed on present

day costs and benefits when decision-makers must choose between alternation courses of action. This is accomplished by discounting future costs and benefits to *present values*. When calculating present values in this study we use the Treasury Board of Canada' recommended *social discount rate* of 8% per annum (TBCS, 2007).

The present value (PV) of a stream of future (say) habitat service benefits over a number of years is the sum of all projected future annual habitat service benefits, with each future annual benefit discounted at the social discount rate to convert it into present value terms. The *PV benefits* are calculated for each ecosystem service individually, and subsequently summed across all six ecosystem services considered in this study to derive a measure of total PV benefits generated at a Green Shores development site. A single measure of total *PV costs* (inclusive of all relevant investment expenditures and recurring expenses) is similarly generated for each site.

Estimated PV costs and PV benefits are also expressed as equivalent annual values (*Equivalent Annual Ecosystem Benefit – EAB – and Equivalent Annual Ecosystem Costs – EAC*).

From the above metrics, two indicators are generated to assess the economic efficiency of the GSSD program, with respect to our three case study sites: the *net equivalent annual benefit (NAB)* and the *benefit-cost ratio (BCR)*. Each indicator is calculated as follows:

$$\text{NAB} = \text{EAB} - \text{EAC}$$

And

$$\text{BCR} = \text{PVB} \div \text{BPC}$$

Estimated results for the NAB give important information about the economic value of the project:

- If the NAB is less than zero, then the investor cannot expect to earn a rate of return on the investment equal to the discount rate. The welfare of society is expected to decrease; the annual decline in social welfare will be equal to the negative amount of the calculated NAB. A decision-maker is therefore not likely to allocate scarce resources to a project with a NAB less than zero.
- A NAB equal to zero implies that the investor can expect to recover their investment and earn a rate of return on invested capital equal to the discount rate. In this case, the welfare of society is unaffected; they are not worse off from allocating scarce resources to the project, nor are they better off.
- If the calculated NAB is greater than zero, then the investor can expect to accrue an improvement in social welfare, as well as recover the invested capital and earn a rate of return equal to the discount rate. The annual addition to social welfare will be equal to the positive amount of the NAB.

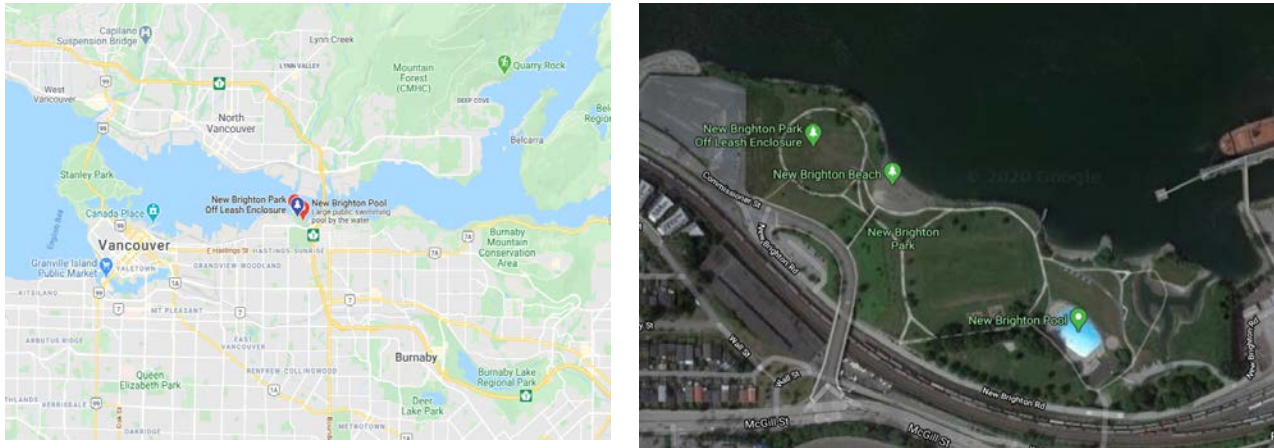
The interpretation of the BCR is like the NAB, in terms of whether the BCR is less than, equal to, or greater than one. If the BCR is greater than one, then the project generates an improvement in social welfare. The magnitude of the improvement in welfare for each dollar allocated to the project is given by the size of the BCR. For example, a BCR of 3.5 implies that each dollar invested in the project generates a \$3.50 improvement in social welfare.

The next few sections report results of the economic analysis at the three case study sites as well as for the SCBC's Green Shores for Shoreline Development programming overall, using CBA and economic impact assessment. *Excel spreadsheets for each of the case study sites containing input data and economic estimates have been created and are available under separate cover.*

3.3 New Brighton Park

New Brighton Park is a public park located within Vancouver, BC (see Figure 5). The site restoration project included the removal of rip rap and industrial fill, the creation and restoration of several types of habitat, and increased opportunities for several recreation opportunities. This site received a “Gold” GSCD.

Figure 5: Map and aerial photograph of New Brighton Park



New Brighton Park location and aerial photo (2020) Google Maps <https://www.google.com/maps>

Habitat size

Assumptions regarding the affected area of the site are shown in Table 4.

Population

The benefits of improvement to habitat and cultural services are a function of both the magnitude of improvements at the site, as well as the size of the local population. The population density of concentric rings surrounding the site was measured in 1 km increments up to 30 km from the site. Due to the site’s location within the City of Vancouver, many people live nearby; within a 10 km radius of the site, the average number of people living within each incremental kilometre of distance from the site is almost 87,000. The local census subdivision housing density is 2,691 dwellings per km². A total of 2.1 million individuals reside within 30 km of the site. This will have a strong bearing on the magnitude of benefits for both habitat and cultural services.

Table 4: Area of new, restored or enhanced habitat at New Brighton

Habitat type	Square metres	Hectares
Trees: coniferous	10,000	1.00
Trees: deciduous	10,000	1.00
Riparian buffer (shrubs, grasses)	10,000	1.00
Saltwater wetland: salt marsh, swamp, estuary	500	0.05
Freshwater wetland: bog, fen, marsh	0	0.00
Intertidal wetland: eelgrass	0	0.00

Habitat type	Square metres	Hectares
Total treed area	20,000	2.00
Total wetland	500	0.05
Total wetland and riparian buffer	10,500	1.05

Habitat services

The assessment of the change in habitat services provided at New Brighton Park was determined to be “small”, with a corresponding unit value is \$4.71 per person per year and the estimated equivalent annualized benefits (EAB) for habitat services at the site is \$962,990 per year (see Table 5).

Cultural services

The assessment of the change in cultural services provided at New Brighton Park was determined to be “small”. The corresponding unit value is \$2.95 per person per year and the estimated EAB for cultural services at the site is \$208,086 per year (see Table 6).

Climate regulation services

Climate regulation benefits will be obtained from both the coniferous and deciduous tree planting on site, as well as the planting of riparian buffer species. The estimated EAB for climate regulation services at the site is \$16,779 per year, based on the Social Cost of Carbon.

Waste treatment services

Waste treatment / processing benefits will be obtained from the treed area, riparian areas, and from the saltwater wetland areas on the site. The estimated EAB for waste treatment / processing services at the site is \$6,270 per year.

Nutrient cycling services

Nutrient cycling services are provided by the treed and wetland areas of the site. The estimated EAB for nutrient cycling services at the site is \$2,794.

Table 5: Assessment of level of improvement in habitat services: New Brighton Park

How many points have been awarded the site for each of the following "credits"		Points awarded
CREDIT 1 (max 3 pts): Site design with conservation of shore zone.		
1a:	Typical urban or community area with pathways, swimming beach, and/or other non-permanent human-use amenities; minimal outdoor lighting as needed for safety	
OR 1a:	Nature park with controlled access, minimal human use amenities; minimal outdoor lighting	2
OR 1a:	Conservation area with natural features, preservation and enhancement of native vegetation; no outdoor lighting	
CREDIT 3 (max 2 pts): Redevelopment of contaminated sites.		
3a:	Remediation of a contaminated site	2
CREDIT 4 (2-9 pts, sum of 4a, 4b and 4c): Restoration or enhancement of shoreline sediment and tidal flow processes.		
4a:	Sediment source bluff restoration (armour removal at the toe of sediment source bluffs) along 50-75% of the length of sediment source bluff on parcel	
OR 4a:	Sediment source bluff restoration (armor removal at sediment source bluffs) along 75% or more of the length of sediment source bluff on parcel	
AND 4b:	Remove or modify groynes or other longshore transport barriers affecting 50-75% of shore length	
OR 4b:	4b: Remove or modify groynes or other longshore transport barriers affecting 75% or more of shore length	
AND 4c:	Removal of tidal flow barriers (e.g., fill or tide gates) to create or restore lagoons or salt marshes (note: only points for ONE of 4c or 5d)	3
CREDIT 5 (max 10 pts, sum of 5a to 5d): Restoration or enhancement of coastal habitats.		
5a:	Including direct foreshore or backshore habitat enhancement adjacent 20-50 % of the site higher high water large tide (HHWLT) shore length	
OR 5a:	Including direct foreshore or backshore habitat enhancement adjacent to greater than 50% of the site HHWLT shore length	3
AND 5b:	Including direct lagoon or marsh habitat enhancement adjacent 20-50 % of the site HHWLT shore length	
OR 5b:	Including direct lagoon or marsh habitat enhancement adjacent to 50% or more of the site HHWLT shore length	
AND 5c:	Including creation of critical or sensitive habitat	1
AND 5d:	Including removal of a pre-existing armour (e.g., seawall, riprap) protection along 50% or more of the site HHWLT shore length (note: only points for ONE of 4c and 5d)	
CREDIT 6 (max 3 pts): Enhanced riparian zone protection.		
6a:	Extending the protected, restored and/or enhanced riparian zone to apply to 25-50% of the site shore length	
OR 6a:	Extending the protected, restored and/or enhanced riparian zone to apply to 50-75% of the site shore length	
OR 6a:	Extending the protected, restored and/or enhanced riparian zone to apply to 75% or more of the site shore length	3
CREDIT 7 (max 4 pts): Integrated stormwater planning and design.		
7a:	Developing and implementing a stormwater management plan for the project that keeps the Effective Impervious Area (EIA) <20%	
OR 7a:	Developing and implementing a stormwater management plan for the project that keeps the Effective Impervious Area (EIA) <10%	2
Total points		16
Magnitude in provision of habitat services		SMALL
Corresponding economic unit value (\$ 2018 per person per year)		\$4.71

Table 6: Assessment of level of improvement in cultural services: New Brighton Park

Relative to the status quo, does the new development site (if "yes", award available points):	Points awarded
Provide opportunities for viewing and watching wildlife (e.g., viewing decks, benches)?	1
Provide trails or pathways for public access and walking?	1
Provide an off-leash area for walking dogs?	1
Provide picnicking infrastructure for public use (e.g., tables, benches)?	1
Incorporate signs, fences and natural barriers (e.g., shrub thickets) to restrict access to ecologically sensitive areas?	1
Provide interpretive signage highlighting shoreline ecological and physical processes as they relate to the site design?	1
Preserve or protect significant cultural, spiritual, archaeological assets?	-
Provide interpretive signage highlighting significant cultural, spiritual, archaeological assets and connections?	1
Improve public safety for users?	1
Provide access and opportunities for beach sun-bathing and swimming in ocean?	1
Provide access and opportunities for kayaking, canoeing, paddle-boarding in ocean?	-
Provide access and opportunities for fishing?	-
Enhance aesthetics (visual amenity)?	1
Total points (maximum)	10
Magnitude of improvement for provision of cultural services	SMALL
Corresponding unit value (\$ 2018 per person per year)	\$2.95

Flood regulation services

The **disturbance risk potential** for the site was determined to be **'high'** based on the assumptions that:

- The site's shoreline is primarily barrier beach, sand beach, mud flat or delta.
- The site is <0.375 m above sea-level.
- The natural habitat of the site's shoreline is seagrass, eelgrass, or kelp (based on professional judgment).
- The site's shoreline faces north.

- The sites shoreline is not exposed to the open ocean and oceanic waves.
- The local housing density is >2,600 dwellings/km²

The **site resilience** to sea level rise was assessed as “**high**”, based on the assumption that the Green Shores submittal included documentation of the projected change in the location of the natural boundary on the site due to sea level rise over 50 years or the life of the project, as well as related setbacks, structure locations and designs to facilitate avoidance, accommodation and retreat.

The corresponding unit value for the potential flood / erosion risk mitigation potential offered by the site is \$5,944 per ha per year. When aggregated over the estimated 1.1 ha of wetlands and riparian area at the site, the estimated EAB for disturbance regulation services is \$6,578 per year.

Overall economic efficiency of the project

Table 7 provides a summary of the incremental ecosystem service benefits of the New Brighton Park site restoration. The total EAB is estimated at about \$1.2 million per year.

Table 7: Incremental ecosystem service benefits of New Brighton Park

Ecosystem services	EAB (\$ 2018)
Habitat services	\$962,990
Cultural services	\$208,086
Climate regulation services	\$16,779
Waste treatment services	\$6,270
Nutrient cycling services	\$2,794
Disturbance regulation services	\$6,578
Total	\$1,203,497

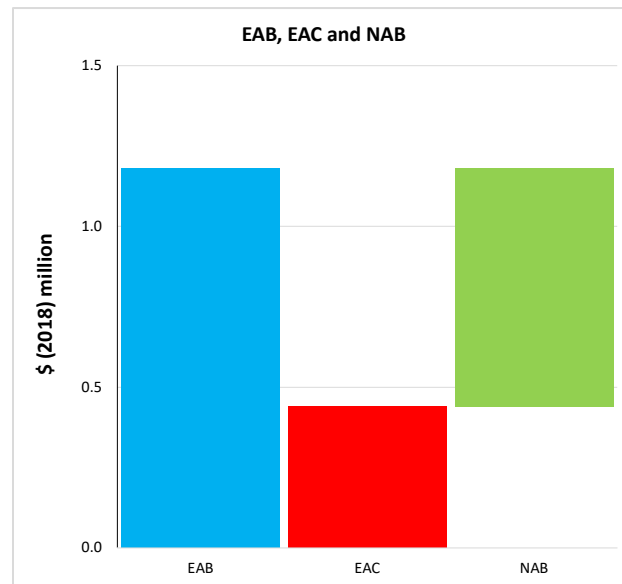
The costs of the New Brighton Park restoration are shown in Table 8. Total equivalent annualized costs amounted to about \$0.4 million per year.

Table 8 Cost for New Brighton Park restoration

Type of Cost	Input-Output Industry Classification category	Investment (upfront expenditures)	Recurring (annual) expenses
Construction Costs	Other civil engineering construction	\$2,000,000	-
Design and Permitting	Architectural, engineering and related services	\$415,000	-
Maintenance	Services to buildings and dwellings	-	\$250,000
Program costs	Non-profit organizations	\$34,000	-
	Sub-totals	\$2,449,000	\$250,000
	Equivalent annualized costs		\$438,355

The net annualized benefits (NAB) of the project are thus about \$0.8 million and the corresponding benefit-cost ratio (BCR) is about 2.5 (estimated EAB, EAC and NAB are shown in Figure 6). Both indicators suggest investment in the New Brighton Park restoration as part of the GSSD program represented an economically efficient use of resources. Social welfare was increased by about \$2.50 for each \$1 spent on the project.

Figure 6 EAB, EAC and NAB for the New Brighton Park restoration



Economic impact

As shown in Table 8, costs have been allocated to Input-Output Industry Classification categories to enable the estimation of the impact of these expenditures on the BC economy. The estimated contribution to the BC economy is summarized in Table 9. Low values reflect the capture of only direct plus indirect effects on the economy; high values also include induced effects.

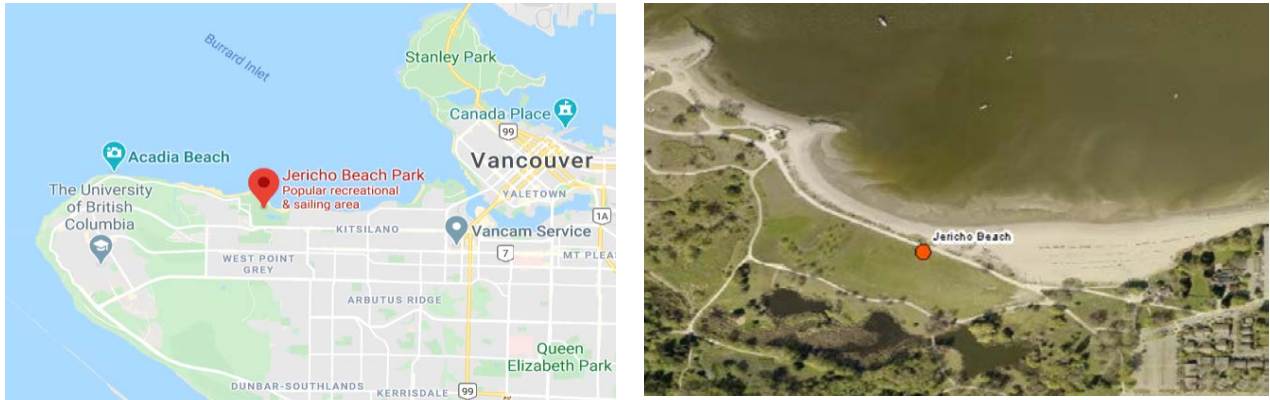
Table 9 Contribution of expenditures on the New Brighton Park restoration to the BC economy

Contribution from phase	Magnitude	Output	Labour income	GDP at basic prices	Tax revenue	Jobs
Construction	Low	\$2,927,051	\$932,414	\$1,931,528	\$190,347	15
	High	\$3,307,447	\$1,030,559	\$2,176,717	\$242,525	17
Operations	Low	\$326,000	\$143,250	\$189,750	\$8,500	5
	High	\$400,000	\$162,500	\$237,500	\$18,750	6

3.4 Jericho Beach

Jericho Beach is a well-known public beach area located in Vancouver, BC (see Figure 7). The beach restoration included the removal of potential contamination sources and hard structures, increased intertidal habitat, increased riparian area, shoreline stabilization, and increased visitor access, recreation, and visitor learning opportunities.

Figure 7: Map and Aerial photograph of Jericho Beach



Jericho Beach location and aerial photo (2020) Google Maps <https://www.google.com/maps>

Habitat Size

Assumptions regarding the affected area of the site are shown in Table 10.

Table 10: Area of new, restored or enhanced habitat at Jericho Beach

Habitat type	Square metres	Hectares
Trees: coniferous	1,310	0.13
Trees: deciduous	1,310	0.13
Riparian buffer (shrubs, grasses)	2,630	0.26
Saltwater wetland: salt marsh, swamp, estuary		
Freshwater wetland: bog, fen, marsh		
Intertidal wetland: eelgrass		
Total treed area	2,620	0.26
Total wetland		
Total wetland and riparian buffer	2,630	0.26

Population

The population density of concentric rings surrounding the site was measured in 1 km increments up to 30 km from the site. Due to the site's location within the City of Vancouver, many people live nearby; within a 10 km radius of the site, the average number of people living within each incremental kilometre of distance from the site is almost 54,930. The local census subdivision housing density is 2,691 dwellings per km². A total of 1.8 million individuals reside within 30 km of the site. This will have a strong bearing on the magnitude of benefits for both habitat and cultural services.

Habitat Services

The assessment of the change in habitat services provided at Jericho Beach was determined to be "moderate" (see Table 11). The corresponding unit value is \$18.46 per person per year and the estimated equivalent annualized benefits (EAB) for habitat services at the site is \$3,541,180 per year.

Table 11: Assessment of level of improvement in habitat services: Jericho Beach

How many points have been awarded the site for each of the following "credits"		Points awarded
CREDIT 1 (max 3 pts): Site design with conservation of shore zone.		
1a:	Typical urban or community area with pathways, swimming beach, and/or other non-permanent human-use amenities; minimal outdoor lighting as needed for safety	1
OR 1a:	Nature park with controlled access, minimal human use amenities; minimal outdoor lighting	
OR 1a:	Conservation area with natural features, preservation and enhancement of native vegetation; no outdoor lighting	
CREDIT 3 (max 2 pts): Redevelopment of contaminated sites.		
3a:	Remediation of a contaminated site	2
CREDIT 4 (2-9 pts, sum of 4a, 4b and 4c): Restoration or enhancement of shoreline sediment and tidal flow processes.		
4a:	Sediment source bluff restoration (armour removal at the toe of sediment source bluffs) along 50-75% of the length of sediment source bluff on parcel	2
OR 4a:	Sediment source bluff restoration (armor removal at sediment source bluffs) along 75% or more of the length of sediment source bluff on parcel	
AND 4b:	Remove or modify groynes or other longshore transport barriers affecting 50-75% of shore length	
OR 4b:	4b: Remove or modify groynes or other longshore transport barriers affecting 75% or more of shore length	3
AND 4c:	Removal of tidal flow barriers (e.g., fill or tide gates) to create or restore lagoons or salt marshes (note: only points for ONE of 4c or 5d)	
CREDIT 5 (max 10 pts, sum of 5a to 5d): Restoration or enhancement of coastal habitats.		
5a:	Including direct foreshore or backshore habitat enhancement adjacent 20-50 % of the site higher high water large tide (HHWLT) shore length	
OR 5a:	Including direct foreshore or backshore habitat enhancement adjacent to greater than 50% of the site HHWLT shore length	3
AND 5b:	Including direct lagoon or marsh habitat enhancement adjacent 20-50 % of the site HHWLT shore length	
OR 5b:	Including direct lagoon or marsh habitat enhancement adjacent to 50% or more of the site HHWLT shore length	3
AND 5c:	Including creation of critical or sensitive habitat	1
AND 5d:	Including removal of a pre-existing armour (e.g., seawall, riprap) protection along 50% or more of the site HHWLT shore length (note: only points for ONE of 4c and 5d)	3
CREDIT 6 (max 3 pts): Enhanced riparian zone protection.		
6a:	Extending the protected, restored and/or enhanced riparian zone to apply to 25-50% of the site shore length	
OR 6a:	Extending the protected, restored and/or enhanced riparian zone to apply to 50-75% of the site shore length	
OR 6a:	Extending the protected, restored and/or enhanced riparian zone to apply to 75% or more of the site shore length	3
CREDIT 7 (max 4 pts): Integrated stormwater planning and design.		
7a:	Developing and implementing a stormwater management plan for the project that keeps the Effective Impervious Area (EIA) <20%	3
OR 7a:	Developing and implementing a stormwater management plan for the project that keeps the Effective Impervious Area (EIA) <10%	
Total points		24
Magnitude in provision of habitat services		MODERATE
Corresponding economic unit value (\$ 2018 per person per year)		\$18.46

Table 12: Assessment of level of improvement in cultural services: Jericho Beach

Relative to the status quo, does the new development site (if "yes", award available points):	Points awarded
Provide opportunities for viewing and watching wildlife (e.g., viewing decks, benches)?	1
Provide trails or pathways for public access and walking?	1
Provide an off-leash area for walking dogs?	1
Provide picnicking infrastructure for public use (e.g., tables, benches)?	-
Incorporate signs, fences and natural barriers (e.g., shrub thickets) to restrict access to ecologically sensitive areas?	-
Provide interpretive signage highlighting shoreline ecological and physical processes as they relate to the site design?	1
Preserve or protect significant cultural, spiritual, archaeological assets?	-
Provide interpretive signage highlighting significant cultural, spiritual, archaeological assets and connections?	-
Improve public safety for users?	1
Provide access and opportunities for beach sun-bathing and swimming in ocean?	2
Provide access and opportunities for kayaking, canoeing, paddle-boarding in ocean?	3
Provide access and opportunities for fishing?	-
Enhance aesthetics (visual amenity)?	1
Total points (maximum)	11
Magnitude of improvement for provision of cultural services	MODERATE
Corresponding unit value (\$ 2018 per person per year)	\$19.98

Cultural Services

The assessment of the change in cultural services provided at Jericho Beach was determined to be “moderate” (see Table 12). The corresponding unit value is \$19.98 per person per year and the estimated EAB for cultural services at the site is \$1,322,810 per year.

Climate Regulation Services

Climate regulation benefits will be obtained from both the coniferous and deciduous tree planting on site, as well as the planting of riparian buffer species. The estimated EAB for climate regulation services at the site is \$3,887 per year, based on the Social Cost of Carbon.

Waste Treatment Services

Waste treatment / processing benefits will be obtained from the treed area and riparian areas on the site. The estimated EAB for waste treatment / processing services at the site is \$894 per year.

Nutrient Cycling Services

Nutrient cycling services are provided by the treed areas of the site. The estimated EAB for nutrient cycling services at the site is \$138.

Flood Regulation Services

The **disturbance risk potential** for the site was determined to be “**high**” based on the assumptions that:

- The site’s shoreline is primarily barrier beach, sand beach, mud flat or delta.
- The site is <0.375 m above sea-level.
- The natural habitat of the site’s shoreline is low dune (based on professional judgment).
- The site’s shoreline faces north.
- The site’s shoreline is mostly exposed to the open ocean and oceanic waves.
- The local housing density is >2,600 dwellings/km²

The **site resilience** to sea level rise was assessed as “**moderate**”. This was based on the assumption that the project did not incorporate strategies to avoid the need for protective measures to mitigate the impacts of sea level rise, although it did include other adaptation measures. These included the use of soft protection measures (beaches and planting), accommodation measures (ensuring that the viewing platform would be tolerant of sea level rise and storm surges), and retreat measures (removal of the wharf, and construction of only a small viewing platform within a 15 m setback distance of the natural boundary).

The corresponding unit value for the potential flood / erosion risk mitigation potential offered by the site is \$8,646 per ha per year. When aggregated over the estimated 0.3 ha of wetlands and riparian area at the site, the estimated EAB for disturbance regulation services is \$2,396 per year.

Overall Economic Efficiency of the Project

Table 13 provides a summary of the incremental ecosystem service benefits of the Jericho Beach site restoration. The total EAB is estimated at about \$4.9 million per year. The costs of the Jericho Beach restoration are shown in Table 14. Total equivalent annualized costs amounted to about \$0.2 million per year. Total equivalent annualized costs amounted to about \$0.2 million per year. Hence, the net annualized benefits (NAB) of the project are about \$4.6 million and the corresponding benefit-cost ratio (BCR) is about 20.3 (estimated EAB, EAC and NAB are shown in Figure 8). Both indicators suggest investment in the Jericho Beach restoration as part of the GSSD program represented a strong economically efficient use of resources. Social welfare was increased significantly by about \$20 for each \$1 spent on the project.

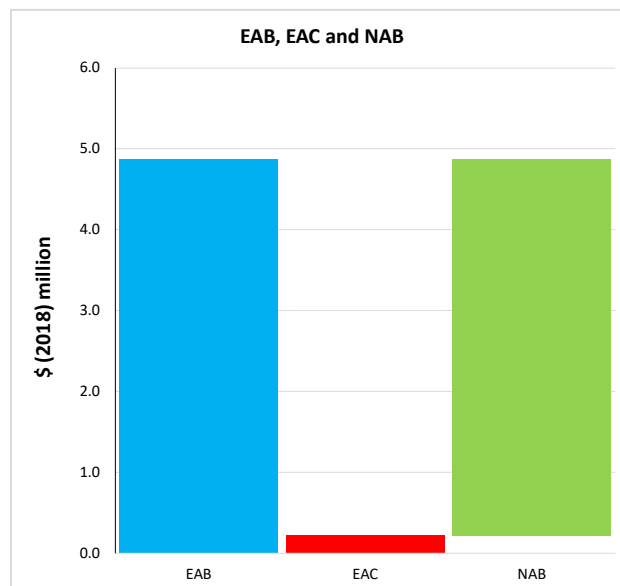
Table 13: Incremental ecosystem service benefits of Jericho Beach

Ecosystem services	EAB (\$ 2018)
Habitat services	\$3,541,180
Cultural services	\$1,322,810
Climate regulation services	\$3,887
Waste treatment services	\$894
Nutrient cycling services	\$128
Disturbance regulation services	\$2,396
Total	\$4,871,306

Table 14: Cost for Jericho Beach restoration

Type of Cost	Input-Output Industry Classification category	Investment (upfront expenditures)	Recurring (annual) expenses
Demolition & rough grading	Other civil engineering construction	\$1,351,000	-
Design and Permitting	Architectural, engineering and related services	\$325,000	-
Restoration & landscaping	Services to buildings and dwellings	\$851,000	-
Program costs	Non-profit organizations	\$34,000	-
	Sub-totals	\$2,561,000	-
	Equivalent annualized costs		\$219,362

Figure 8: EAB, EAC and NAB for the Jericho Beach restoration



Economic Impact

Project costs have been allocated to Input-Output Industry Classification categories to enable the estimation of the impact of these expenditures on the BC economy. The estimated impact to the BC economy is summarized in Table 15. Low values reflect the capture of only direct plus indirect effects on the economy; high values also include induced effects.

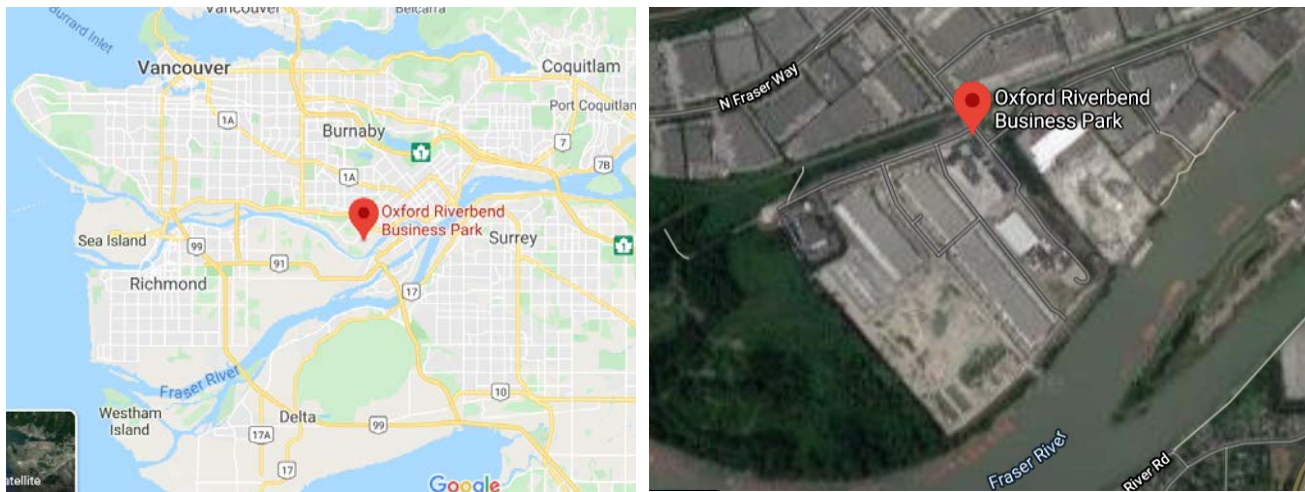
Table 15: Contribution of expenditures on the Jericho Beach restoration to the BC economy

Contribution from phase	Magnitude	Output	Labour income	GDP at basic prices	Tax revenue	Jobs
Construction	Low	\$3,161,633	\$1,151,147	\$1,995,181	\$158,981	28
	High	\$3,692,556	\$1,288,675	\$2,337,596	\$232,104	31
Operations	Low	-	-	-	-	-
	High	-	-	-	-	-

3.5 Riverbend Business Park

The Riverbend Business Park is in Burnaby, BC. In this flood-protection project, the banks were protected using a hybrid erosion protection approach that allowed for the development of a riparian zone. As well, contaminated material was removed from the site, and visitor pathways, interpretive signage, and a viewing deck were installed.

Figure 9: Map and aerial photograph of the Riverbend Business Park



Riverbend Business Park map and aerial photo (2020) Google Maps <https://www.google.com/maps>

Habitat Size

Assumptions regarding the affected area of the site are shown in Table 16.

Table 16: Area of new, restored or enhanced habitat at Riverbend Business Park

Habitat type	Square metres	Hectares
Trees: coniferous	0	0.00
Trees: deciduous	0	0.00
Riparian buffer (shrubs, grasses)	15,750	1.58
Saltwater wetland: salt marsh, swamp, estuary	0	0.00
Freshwater wetland: bog, fen, marsh	0	0.00
Intertidal wetland: eelgrass	0	0.00
Total treed area	0	0.00
Total wetland	0	0.00
Total wetland and riparian buffer	15,750	1.58

Population

The population density of concentric rings surrounding the site was measured in 1 km increments up to 30 km from the site. Due to the site's location within the City of Burnaby, many people live nearby; within a 10 km radius of the site, the average number of people living within each incremental kilometre of distance from the site is almost 66,571. The local census subdivision housing density is 1,082 dwellings per km². A total of 2.4 million individuals reside within 30 km of the site. This will have a strong bearing on the magnitude of benefits for both habitat and cultural services.

Habitat Services

The assessment of the change in habitat services provided at Riverbend Business Park was determined to be "small" (see Table 17). The corresponding unit value is \$4.71 per person per year and the estimated equivalent annualized benefits (EAB) for habitat services at the site is \$703,070 per year.

Cultural Services

The assessment of the change in cultural services provided at Riverbend Business Park was determined to be "small" (see Table 18). The corresponding unit value is \$2.95 per person per year and the estimated EAB for cultural services at the site is \$151,923 per year.

Climate Regulation Services

Climate regulation benefits will be obtained from the planting of riparian buffer species at the site. The estimated EAB for climate regulation services at the site is \$20,718 per year, based on the Social Cost of Carbon.

Waste Treatment Services

Waste treatment / processing benefits will be obtained from the riparian species plantings at the site. The estimated EAB for waste treatment / processing services at the site is \$1,511 per year.

Table 17: Assessment of level of improvement in habitat services: Riverbend Business Park

How many points have been awarded the site for each of the following "credits"		Points awarded
CREDIT 1 (max 3 pts): Site design with conservation of shore zone.		
1a:	Typical urban or community area with pathways, swimming beach, and/or other non-permanent human-use amenities; minimal outdoor lighting as needed for safety	
OR 1a:	Nature park with controlled access, minimal human use amenities; minimal outdoor lighting	2
OR 1a:	Conservation area with natural features, preservation and enhancement of native vegetation; no outdoor lighting	
CREDIT 3 (max 2 pts): Redevelopment of contaminated sites.		
3a:	Remediation of a contaminated site	2
CREDIT 4 (2-9 pts, sum of 4a, 4b and 4c): Restoration or enhancement of shoreline sediment and tidal flow processes.		
4a:	Sediment source bluff restoration (armour removal at the toe of sediment source bluffs) along 50-75% of the length of sediment source bluff on parcel	2
OR 4a:	Sediment source bluff restoration (armor removal at sediment source bluffs) along 75% or more of the length of sediment source bluff on parcel	
AND 4b:	Remove or modify groynes or other longshore transport barriers affecting 50-75% of shore length	
OR 4b:	4b: Remove or modify groynes or other longshore transport barriers affecting 75% or more of shore length	
AND 4c:	Removal of tidal flow barriers (e.g., fill or tide gates) to create or restore lagoons or salt marshes (note: only points for ONE of 4c or 5d)	
CREDIT 5 (max 10 pts, sum of 5a to 5d): Restoration or enhancement of coastal habitats.		
5a:	Including direct foreshore or backshore habitat enhancement adjacent 20-50 % of the site higher high water large tide (HHWLT) shore length	
OR 5a:	Including direct foreshore or backshore habitat enhancement adjacent to greater than 50% of the site HHWLT shore length	3
AND 5b:	Including direct lagoon or marsh habitat enhancement adjacent 20-50 % of the site HHWLT shore length	
OR 5b:	Including direct lagoon or marsh habitat enhancement adjacent to 50% or more of the site HHWLT shore length	
AND 5c:	Including creation of critical or sensitive habitat	
AND 5d:	Including removal of a pre-existing armour (e.g., seawall, riprap) protection along 50% or more of the site HHWLT shore length (note: only points for ONE of 4c and 5d)	
CREDIT 6 (max 3 pts): Enhanced riparian zone protection.		
6a:	Extending the protected, restored and/or enhanced riparian zone to apply to 25-50% of the site shore length	
OR 6a:	Extending the protected, restored and/or enhanced riparian zone to apply to 50-75% of the site shore length	
OR 6a:	Extending the protected, restored and/or enhanced riparian zone to apply to 75% or more of the site shore length	3
CREDIT 7 (max 4 pts): Integrated stormwater planning and design.		
7a:	Developing and implementing a stormwater management plan for the project that keeps the Effective Impervious Area (EIA) <20%	3
OR 7a:	Developing and implementing a stormwater management plan for the project that keeps the Effective Impervious Area (EIA) <10%	
Total points		15
Magnitude in provision of habitat services		SMALL
Corresponding economic unit value (\$ 2018 per person per year)		\$4.71

Table 18: Assessment of level of improvement in cultural services: Riverbend Business Park

Relative to the status quo, does the new development site (if "yes", award available points):	Points awarded
Provide opportunities for viewing and watching wildlife (e.g., viewing decks, benches)?	1
Provide trails or pathways for public access and walking?	1
Provide an off-leash area for walking dogs?	-
Provide picnicking infrastructure for public use (e.g., tables, benches)?	-
Incorporate signs, fences and natural barriers (e.g., shrub thickets) to restrict access to ecologically sensitive areas?	-
Provide interpretive signage highlighting shoreline ecological and physical processes as they relate to the site design?	1
Preserve or protect significant cultural, spiritual, archaeological assets?	-
Provide interpretive signage highlighting significant cultural, spiritual, archaeological assets and connections?	-
Improve public safety for users?	1
Provide access and opportunities for beach sun-bathing and swimming in ocean?	-
Provide access and opportunities for kayaking, canoeing, paddle-boarding in ocean?	-
Provide access and opportunities for fishing?	-
Enhance aesthetics (visual amenity)?	1
Total points (maximum)	5
Magnitude of improvement for provision of cultural services	SMALL
Corresponding unit value (\$ 2018 per person per year)	\$2.94

Nutrient Cycling Services

Nutrient cycling services are provided by riparian areas at the site. The estimated EAB for nutrient cycling services at the site is \$58.

Flood Regulation Services

The **disturbance risk potential** for the site was determined to be **"high"** based on the assumptions that:

- The site's shoreline is part of an estuary.
- The site is 0.375-0.730 m above sea-level.
- There is no natural habitat buffer on the site's shoreline.

- The site's shoreline faces southeast.
- The site's shoreline is not exposed to the open ocean and oceanic waves.
- The local housing density is 651-1,300 dwellings/km².

The **site resilience** to sea level rise was assessed as **"low"** based on the assumption that the Green Shores submittal included:

- Documentation of the projected change in the location of the natural boundary on the site due to sea level rise over 50 years or the life of the project.
- Adjustments to structures to accommodate the effects of projected sea level rise.
- The installation of soft measures to protect structures from projected sea level rise.
- The project did not include strategies to avoid the need for protective measures to mitigate the impacts of sea-level rise.

The corresponding unit value for the potential flood / erosion risk mitigation potential offered by the site is \$11,978 per ha per year. When aggregated over the estimated 1.6 ha of wetlands and riparian area at the site, the estimated EAB for disturbance regulation services is \$19,883 per year.

Overall Economic Efficiency of the Project

Table 19 provides a summary of the incremental ecosystem service benefits of the Riverbend Business Park project. The total EAB is estimated at about \$0.9 million per year.

Table 19: Incremental ecosystem service benefits of Riverbend Business Park

Ecosystem services	EAB (\$ 2018)
Habitat services	\$703,070
Cultural services	\$151,923
Climate regulation services	\$20,718
Waste treatment services	\$1,511
Nutrient cycling services	\$58
Disturbance regulation services	\$19,883
Total	\$897,162

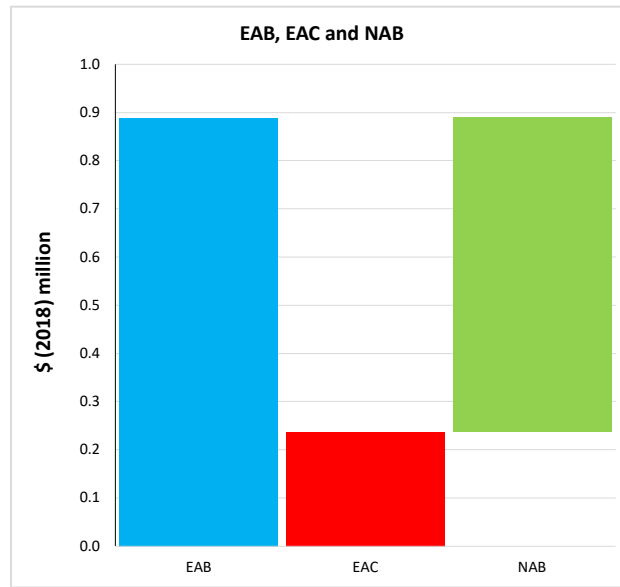
The costs of the Riverbend Business Park project are shown in Table 20. Total equivalent annualized costs amounted to about \$0.2 million per year.

Table 20 Cost for Riverbend Business Park project

Type of Cost	Input-Output Industry Classification category	Investment (upfront expenditures)	Recurring (annual) expenses
Construction Costs	Other civil engineering construction	\$1,000,000	-
Engineering, permitting, design	Architectural, engineering and related services	\$500,000	-
Monitoring and maintenance	Management, scientific and technical consulting services	\$20,000	\$20,000
Landscaping	Services to buildings and dwellings	\$1,000,000	-
Program costs	Non-profit organizations	\$34,000	-
	Sub-totals	\$2,554,000	\$20,000
	Equivalent annualized costs		\$237,049

The net annualized benefits (NAB) of the project are therefore about \$0.7 million and the corresponding benefit-cost ratio (BCR) is about 3.5 (estimated EAB, EAC and NAB are shown in Figure 10). Both indicators suggest investment in the Riverbend Business Park project as part of the GSSD program represented an economically efficient use of resources. Social welfare was increased by about \$3.50 for each \$1 spent on the project.

Figure 10: EAB, EAC and NAB for the Riverbend Business Park project



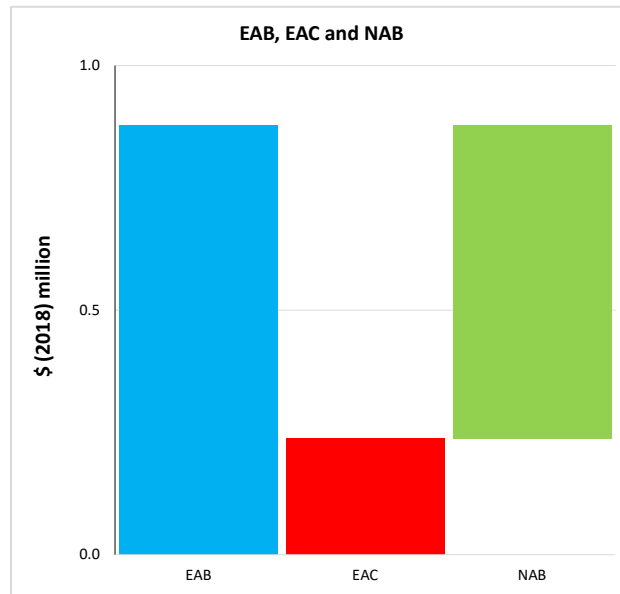
Economic Impact

Project costs have been allocated to Input-Output Industry Classification categories to enable the estimation of the impact of these expenditures on the BC economy. The estimated impact to the BC economy is summarized in Table 21. Low values reflect the capture of only direct plus indirect effects on the economy; high values also include induced effects.

Table 21 Contribution of expenditures on the Riverbend Business Park project to the BC economy

Contribution from phase	Magnitude	Output	Labour income	GDP at basic prices	Tax revenue	Jobs
Construction	Low	\$3,199,916	\$1,237,654	\$1,992,628	\$136,532	31
	High	\$3,814,902	\$1,397,034	\$2,389,382	\$221,080	35
Operations	Low	\$26,280	\$10,560	\$16,740	\$400	0
	High	\$32,040	\$12,040	\$20,460	\$1,180	0

Figure 11 EAB, EAC and NAB for the Riverbend Business Park project



3.6 Economic Analysis of GSSD Programming

Table 22 summarizes the results from above cost-benefit analyses of individual GSSD projects. The aggregate results provide an insight into the economic case for the GSSD program, from a societal perspective. The net annualized benefits (NAB) of the program are about \$6.1 million (2018 dollars) and the corresponding benefit-cost ratio (BCR) is about 7.1. Both indicators suggest investments by the GSSD program (inclusive of program development, delivery and administration) represent an economically efficient use of scarce resources. Over the three restoration and development projects, social welfare was increased by about \$7.10 for each \$1 invested by the GSSD program.

Equivalent annualized program benefits amount to just under \$7.0 million. Improved provision of habitat services and cultural services account for, respectively, 74% and 24% of these benefits. We relied on value transfer methods to monetize incremental ecosystem service benefits attributable to the GSSD program. The accuracy of these methods been studied extensively in the literature, with estimated transfer errors ranging between 0% and 172%. Even allowing for value transfer errors as high as +172% across all ecosystem service benefits, social welfare would still be increased by about \$2.60 for each \$1 invested by the GSSD program (with NAB reduced to about just under \$2.6 million).

In addition to cost-benefit analysis of the GSSD program, we undertook a complementary economic impact assessment to highlight the contribution of program expenditures on the BC economy. Table 23 shows that investments (excluding annual recurring costs) as part of the GSSD program have made notable contributions to the BC economy: contributing \$5.9-6.9 million to GDP, generating \$0.5-0.7 million in tax revenues, and supporting roughly 80 jobs. These values represent upper bound estimates of potential impacts on the economy, since they do not account for the opportunity costs of alternative uses of program funds.

Table 22: GSSD program costs, benefits, and net benefits (thousand 2018 dollars)

Metric	New Brighton Park	Jericho Beach Park	Riverbend Business Park	GSSD program
Equivalent annualized benefits (EAB)	\$1,203	\$4,871	\$897	\$6,971
Equivalent annualized costs (EAC)	\$438	\$219	\$237	\$894
Net annualized Benefits (NAB)	\$765	\$4,652	\$660	\$6,077
Benefit cost ratio (BCR)	2.5	20.3	3.5	7.1

Table 23: Contribution of GSSD program (construction phase) to BC economy (million 2018 dollars)

	Output	Labour income	GDP at basic prices	Tax revenue	Jobs
Low	\$9.3	\$3.3	\$5.9	\$0.5	74
High	\$10.8	\$3.7	\$6.9	\$0.7	83

3.7 Study Limitations

The following limitations of our approach are worth noting:

- We adopt an economic perspective to assess the value of the GSSD program, which measures the value of Green Shores development and restoration projects “to people”. We do not attempt to measure the intrinsic value of nature in its own right.
- Estimates of values over time are based on the assumption that people in the future will be similar to the those of today—i.e., preferences that people hold today will stay consistent over time. We have accounted for rising valuations due to growth in real incomes over time, but we have made no adjustments for changing preferences.
- Benefit transfer works most accurately for sites, policy changes and cultures that are as similar as possible. We have adjusted values in a number of ways to take into account socio-economic differences between study populations and our case study sites. However, every affected habitat and population is unique, as are the policy-induced improvements at sites, so benefit transfer can never truly provide precisely accurate estimates of program benefits; there will always be a transfer error in practice.
- For practical reasons—both reflecting the available literature and our goal to produce a transferrable decision-support tool for future applications—we have not attempted to establish and match specific criteria at study sites in the literature to each of our case study sites with respect to both habitat services and cultural services. Instead, we have transferred measures of central tendency calculated over a large number of primary study observations with respect to each service. In effect, we are presuming that the monetary value of a small (large) improvement in the provision of services at our case study sites is *indicative* of relatively low (high) valuations for those services generally in the literature.

4. Situational Assessment in Atlantic Canada

This section provides a situational assessment of the demand and potential opportunities for extending Green Shores programming to Atlantic Canada.

4.1 Summary of Data Sources

This section of the report draws from two main data sources: i) a summary of discussions from a workshop in the Atlantic region convened by the Stewardship Centre for BC and the New Brunswick Environmental Network with thanks to funding, in part, by Natural Resources Canada (NRCan) and New Brunswick Department of Environment and Local Government (NB DELG) and ii) responses to an online survey deployed by ESSA.

On October 29, 2019, SCBC convened a workshop in New Brunswick (NB) with 23 participants from NB, Nova Scotia (NS) and Prince Edward Island (PEI) in attendance, representing universities, stewardship groups, provincial departments and federal funders. Workshop objectives were as follows:

1. Develop a common understanding about Green Shores as it currently applies to British Columbia (its purpose, components, and examples of success);
2. Understand demand / needs for a Green Shores Program in Atlantic Canada;
3. Understand the enabling conditions required for the successful implementation of Green Shores in Atlantic Canada; and
4. Identify a broad set of next steps (of a roadmap) to support implementation of Green Shores in Atlantic Canada in the next 1-5 years.

We deployed an online survey targeting waterfront property owners (homeowners) and shoreline professionals in the Atlantic region between February 13 and March 6, 2020. In total, we received 66 completed surveys from waterfront property owners and 23 from shoreline professionals. We relied on a group of representatives from the PEI government, Ecology Action Centre (NS), New Brunswick Environmental Network and Dalhousie University to distribute the survey link to their networks. There is an over-representation of respondents from PEI.

Figure 12 characterizes survey respondents by jurisdiction. Half of property owners in our sample own property in PEI, a quarter in NS and NB, respectively. Most (87%) property owners own property in rural areas, far fewer in urban (9%) areas and in both locales (4%).

Over a third (37%) of shoreline professionals work in PEI, the next highest proportion in NB (27%). Half (50%) of the group of shoreline professionals work in rural areas, a quarter in urban areas and a quarter in both urban and rural areas.

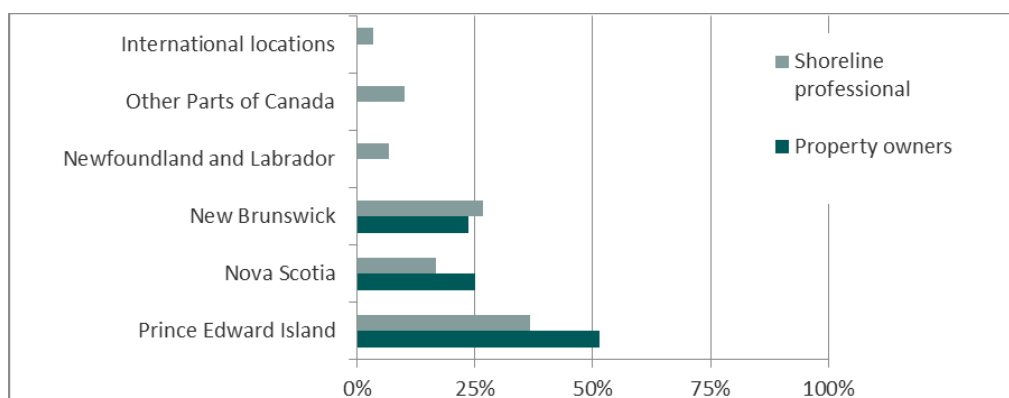


Figure 12: Jurisdictions in which respondents own property or work on shorelines (property owners n=66; shoreline professionals n=23)

4.2 Readiness for Green Shores in Atlantic Canada

Workshop discussions and survey results suggest at least four reasons to pursue opportunities to scale Green Shores to the Atlantic region at present. First, conventional approaches to coastal protection using hard structures are proving insufficient in some locales and will likely become increasingly so as the climate changes. Instead of controlling nature and taming complexity awareness of the need to work with nature is increasing, as is the recognition of the co-benefits that soft shoreline approaches bring (in comparison to hard infrastructure).

Second, soft shorelines can address habitat degradation and protection from erosion and storm surge flooding and these are issues of concern for Atlantic Canadians. Coastal erosion in PEI has been severe (5,000 acres lost to the sea between 1968 and 2010), unprecedented coastal flooding and opportunities to adopt natural shoreline approaches to river systems are compelling reasons to promote Green Shores.

Third, feedback from workshop participants indicates a degree of political will present at the provincial level and an expanding community of practice; attitudes and norms regarding natural infrastructure are shifting. Over the past few years, there has been significant interest in the restoration of living or green shorelines as a natural intervention for climate-related erosion (Schauffler 2014, EAC 2016), and local non-profits are actively providing resources and field support to help waterfront property owners naturalize their own stretch of coastline, particularly in Nova Scotia (EAC 2016). Most recently, a new multi-stakeholder centre for nature-based solutions was launched at Saint Mary's University (TransCoastal Adaptations).

Finally, the region can capitalize on federal funding available and attention on advancing nature-based solutions to climate change adaptation. The Government of Canada is a key partner in delivering the action track to mobilize national, local and private-sector leadership for nature-based solutions under the Global Commission on Adaptation.⁶

Feedback compiled during the workshop helps shed light on barriers that could hinder implementation of Green Shores, as well as ideas on ways to reduce barriers (Table 24). Barriers in New Brunswick range from positive attitudes toward conventional hard protection, coastal diversity (biophysical, population density, economic make up), policy and regulatory gaps and a lack of trained professionals in coastal planning and

⁶ <https://gca.org/global-commission-on-adaptation/action-tracks/natural-environment>

engineering. Demonstration sites, mobilization of NGOs and watershed agencies and strategic communications to emphasize the economic benefits of Green Shores are among the enablers mentioned. Barriers cited by Nova Scotians are similar to those listed for New Brunswick; they also raised issues related to land tenure and ownership of waterfront properties by foreigners. Ideas on enablers include incentives (e.g., low interest loans), demonstration sites for each coastline type and tailoring of Green Shores guidelines to incorporate local and traditional knowledge. Barriers mentioned by representatives from PEI are the most generic, including lack of funding, local expertise, a regulatory framework to accommodate Green Shores and low awareness of the dynamic nature of coastlines. Enablers are similar to those mentioned by stakeholders from NB and NS; additional ones included monitoring and performance evaluation and the strategy of combining hard and soft shoreline approaches in all projects.

Table 24: Barriers and enablers to implementation of Green Shores in New Brunswick, Nova Scotia and Prince Edward Island, as noted by workshop participants

	Barriers	Enablers
New Brunswick	<ul style="list-style-type: none"> • Mindset-If they see a wall they think they are more protected. They think wall is prettier. • People not aware how effective green approaches are. • Climate, physical and topographic differences between west and east. • Economic-Coastline in west is more populated in one area, overall population is spread out. • Prioritization of sites-what should be done where. • No policy, regulatory framework needs to recognize green infrastructure, not enough enforcement resources. • Professionals- Designations, no natural infrastructure component in engineering education. 	<ul style="list-style-type: none"> • Demonstration/pilot sites in key areas which are very visible. • For climate differences-include case studies • NGOs and watershed groups as intermediate trust between government and public. • Regulations-will help with conflicting land uses • Partnership opportunities for communication across provinces-insurance money, getting them to understand it provides economic benefits.
Nova Scotia	<ul style="list-style-type: none"> • Lack of sustained funding for GS administration here • Political will or education/awareness gap within government • Have fewer professional designations. Many of the NS NB experts are not members of prof associations • International homeowners and coastal property owners • Land rights holders • Default is hard structures • Diverse coastlines, how to deal with ice 	<ul style="list-style-type: none"> • Solar city model of incentives • Low interest loans like energy audits • Visible case studies-promotion in each coastline type • Publically-funded workshops • Finding firsts-mayors, Chief Administrative Officer, MLA • Regional/provincial group meeting working together on projects • Inclusive process with First Nation groups and incorporating traditional knowledge. • Revising GS guidelines to allow local experts without designations and include local expertise • Look at wetland system
Prince Edward Island	<ul style="list-style-type: none"> • Lack of understanding of naturally dynamic nature of coastlines • Lack of expertise locally-no capacity to implement • Funding • Lack of demonstration success (living shorelines) • Lack of readiness of regulatory framework to accommodate green shores 	<ul style="list-style-type: none"> • Demonstration site-Willingness for trial/error • Monitoring and evaluation-data gathering. Analysis and writing • Access to PhD student to conduct work • Training of local practitioners • Develop messaging on what / when / how to protect shorelines • Leverage regional desire to implement-federal pot of funding • Combine hard and soft engineering approaches to all projects

In the workshop participants were asked to suggest action worth taking in the next 1 to 3 years to make progress in promoting Green Shores' uptake (see Table 25). Workshop participants representing NS and PEI see customized training as immediate next step. Stakeholders from NB and PEI emphasize the importance of consultation and attention to cultural differences (language, integration of Indigenous Knowledge) in undertaking the customization process overall, including guidelines focused on riverfronts. Finally, stakeholders from NS also highlighted administrative capabilities needed to run a regional entity dedicated to Green Shores programming (e.g., an organizational structure and project registration database).

Table 25: Specific and immediate next steps suggested by workshop participants to support progress in the next 1 to 3 years

Nova Scotia	New Brunswick	Prince Edward Island
<ul style="list-style-type: none"> • Accessible training L1,L2 and L3-specific to Atlantic Canada • Firm up educational partnerships-MOU • Radio and media info sharing re N-B Adaptation • Real estate industry engagement • Regional organization structure • Regional project registration database • Forum to display/showcase projects-regional expertise 	<ul style="list-style-type: none"> • Has to be in both languages • Engage Francophones • First Nations knowledge incorporation • Recognize and explore rivers 	<ul style="list-style-type: none"> • Implement training • Convert provincial government minds • Involve in consultation and development of regional guidebook/framework • Ensure community and smaller group buy in

The following three sections present summary results from analysis of survey responses.

4.3 Challenges and Opportunities— Waterfront Property Owners

Challenges	Opportunities
<ul style="list-style-type: none"> • Levels of awareness of the range of soft shoreline techniques available are relatively low. Therefore a significant education / outreach efforts might be required. This could also be an opportunity to form positive attitudes toward Green Shores and the benefits implementation can provide. 	<ul style="list-style-type: none"> • Green Shores can help alleviate shoreline development issues waterfront property owners are concerned about • Penetration of programs promoting soft shoreline techniques is relatively low (using awareness as a proxy) so Green Shores would not be entering a crowded space

Figure 13 summarizes waterfront property owners' views on the importance of a range of shoreline development concerns. Respondents rated 12 of 13 shoreline development concerns as important or extremely important, with a greater proportion of respondents rating shoreline erosion, water quality and pollution as extremely important. Waterfront insurance rates are the one issue that about a third of respondents were ambivalent about. About one in five respondents see saltwater intrusion in wells as either unimportant or extremely unimportant, which is reasonable since the issue is highly localized. Stated attitudes such as those revealed through answers to this survey question can help guide communications and outreach efforts in promoting Green Shores.

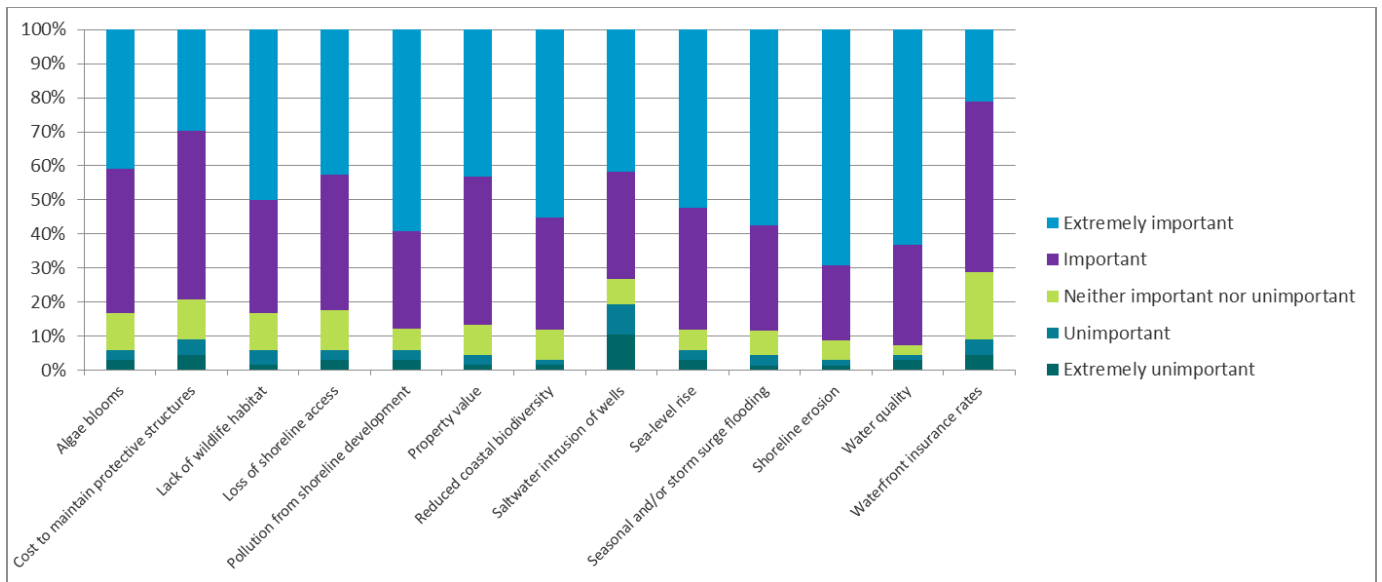


Figure 13: How important to you are the following shoreline-development concerns? (Waterfront property owners, n=66)

Waterfront property owners are most familiar with the use and preservation of vegetation as protective and landscape features and with boardwalks over ecologically-sensitive areas (Figure 14). An important proportion of this group (about 50%) has no to little familiarity with beach nourishment and techniques to improve sediment transfer. These findings shed light on the concepts and techniques that merits greater attention in communication and outreach material, both targeting homeowners directly as well as indirectly through contractors and shoreline professionals.

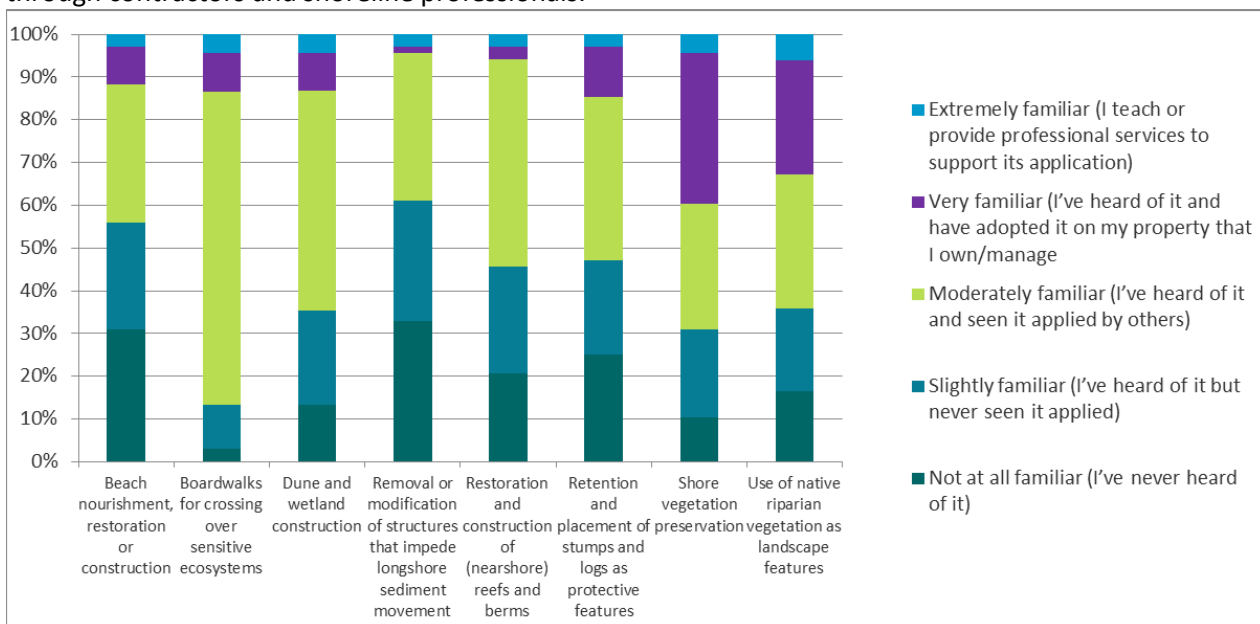


Figure 14: How familiar are you with the following soft shoreline techniques for shore development? (Waterfront property owners, n=66)

Awareness and knowledge of different programs encouraging the application of soft shoreline techniques is low among waterfront property owners (Figure 15). Individuals in this group are most familiar with Living Shorelines, followed by Green Shores. But even in this case, 60% or more of this group is not at all familiar

with these programs. These results suggest that the Green Shores brand might not face steep competition in gaining recognition / visibility. Living Shorelines is likely to be the main competition.

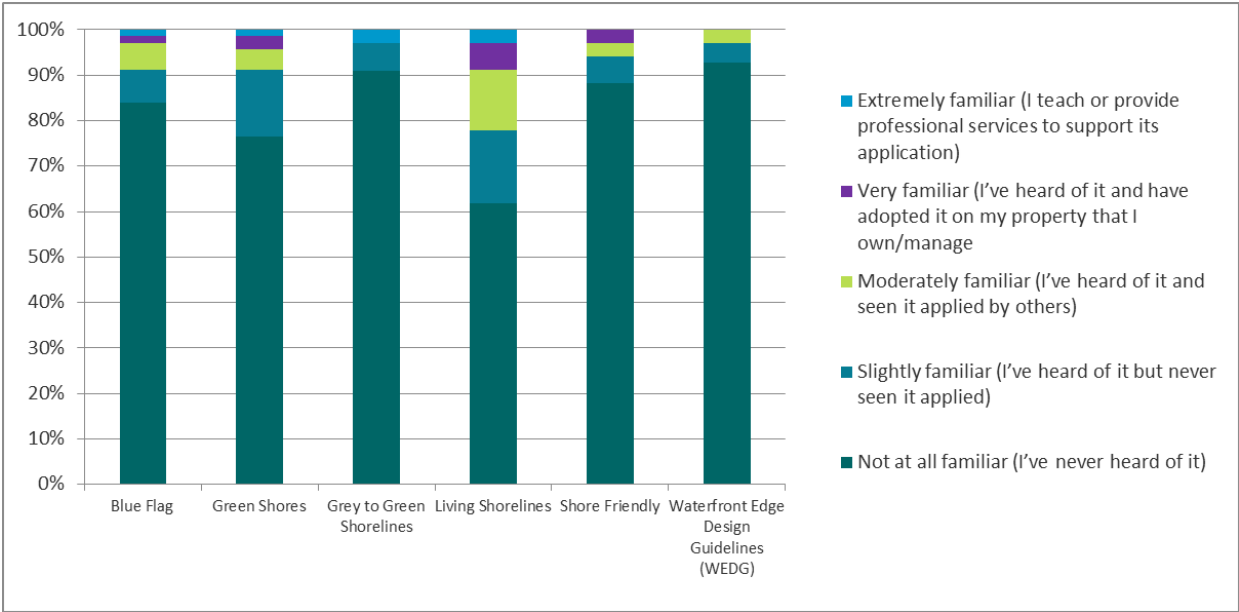


Figure 15: There are a number of existing programs that promote sustainable shoreline development. How familiar are you with the following programs? (Waterfront property owners, n=66)

4.4 Challenges and Opportunities – Shoreline Professionals

Challenges	Opportunities
<ul style="list-style-type: none"> Levels of awareness of the range of soft shoreline techniques available are relatively low. Therefore a significant education / outreach efforts might be required. This could also be an opportunity to form positive attitudes toward Green Shores and build the knowledge and skills to support promotion of Green Shores. 	<ul style="list-style-type: none"> Green Shores can help alleviate shoreline development issues that shoreline professionals consider important Penetration of programs promoting soft shoreline techniques is relatively low (using awareness as a proxy) so Green Shores would not be entering a crowded space There is some convergence on the type of organization best suited to coordinate / oversee delivery of Green Shores in the region Shoreline professionals have shed light on the types of developments with most potential to take up Green Shores techniques (both GSSD and GSH) and this information can guide decision on target users

Shoreline professionals are primarily contractors, environmental consultants and staff from local governments and NGOs (Table 26). The majority of shoreline professionals work with private homeowners and public developers (e.g., government, community) (Table 27). Over half (14 of 23 or 61%) of shoreline professionals have less than ten years of related experience.

Table 26: Affiliation of shoreline professionals who responded to the survey

Shoreline professionals are from:	Count
Private sector (e.g., contractor, consultant)	7
Local government/ municipality / community	6
Non-governmental organization	5
Provincial government	3
Academia	2
Federal government	0
Indigenous community or organization	0
N	23

Table 27: Main clients / collaborators that shoreline professionals work with

Shoreline professionals work with:	Count
Private homeowner	16
Public developer (e.g., government or community)	16
Private developer	13
Non-governmental organization (e.g., land trust)	8
Indigenous community or organization	6
N	23

Figure 16 summarizes shoreline professionals' views on the importance of a range of shoreline development concerns. More than 80% of respondents rated 10 of 13 shoreline development concerns as important or extremely important, with a greater proportion of respondents rating shoreline erosion, water quality and seasonal storm surge flooding as extremely important. As was the case with property owners, waterfront insurance rates stand out as an issue that about a third of shoreline professionals were ambivalent about or consider unimportant. About a third of shoreline professionals also rated property value as "neither important nor unimportant", "unimportant" or "extremely unimportant". Stated attitudes such as those revealed through answers to this survey question can help guide communications and outreach efforts in promoting Green Shores to this stakeholder group.

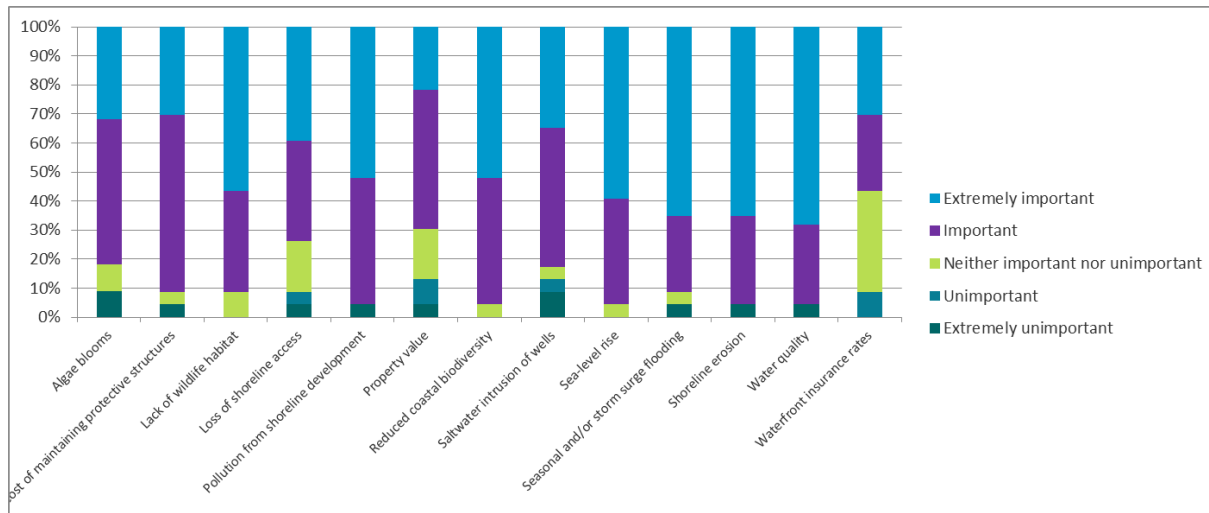


Figure 16: How important to you are the following shoreline-development concerns? (Shoreline professionals, n=23)

A majority of shoreline professionals are at least moderately familiar with the range of techniques included in the survey question (Figure 17). This group is most familiar with the use and preservation of vegetation as protective and landscape features. This group is least familiar with techniques to improve sediment transfer and with construction / restoration of nearshore berms.

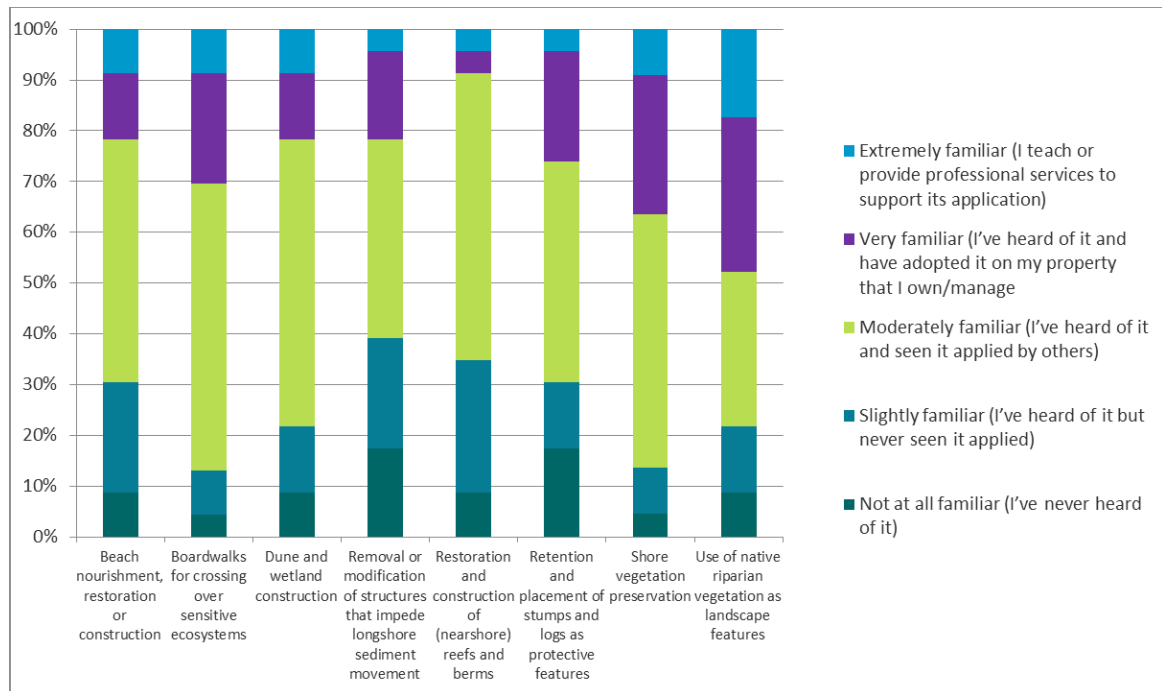


Figure 17: How familiar are you with the following soft shoreline techniques for shore development? (Shoreline professionals, n=23)

About half of shoreline professionals are at least moderately familiar with Living Shorelines (Figure 18). Familiarity with Green Shores is most broadly based – with almost 80% of the group at least slightly familiar with this program. This suggests a potential opportunity to increase Green Shores’ visibility with relative ease. However, it is also possible that respondents see green shores as a generic term not the copyrighted brand and program associated with SCBC.

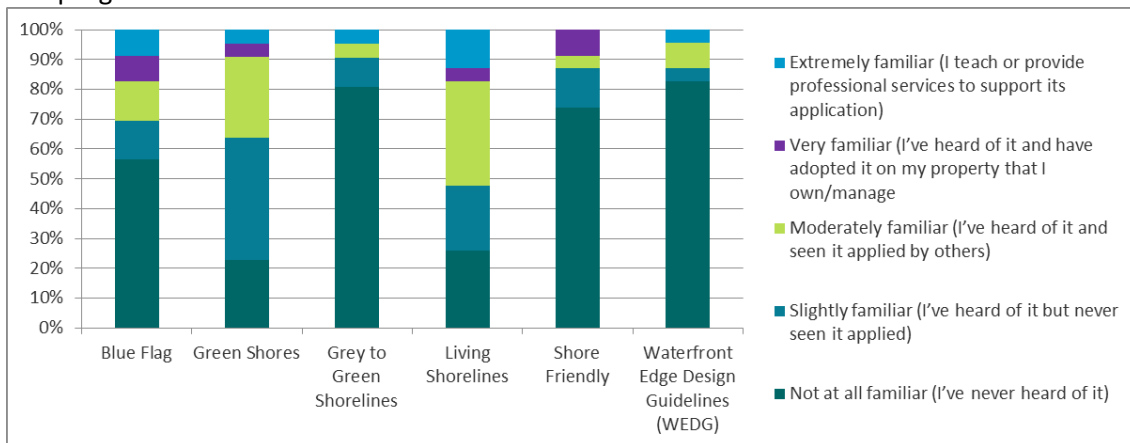


Figure 18: There are a number of existing programs that promote sustainable shoreline development. How familiar are you with the following programs? (Shoreline professionals, n=23)

We asked shoreline professionals for their views on the types of development with most potential to take up Green Shores approaches (Table 28). The top three opportunities are not surprising given the decision context around these three development types. These are waterfront property homes with no pre-existing hard shoreline structures, shore protection in parks and recreational areas and private residential developments. With the first type of development there isn’t a need to remove or decommission engineered structures like seawalls, thereby homeowners would not perceive these as sunk costs. Parks

and recreational areas are logical candidates for applying Green Shores, given the public good aspect of these projects and mission to connect people with nature. Private residential developments can likely absorb the costs of adopting Green Shores techniques, especially when comparing against a scenario of constructing hard structures, and may even benefit from a boost in reputation.

Table 28: Shoreline professionals' perspective on the types of developments with the most potential to adopt Green Shores® approaches (n=23)

Types of development	Count	Percentage
Waterfront property homes with no pre-existing hard protection structures	20	18%
Shore protection works in public spaces (parks and recreational areas)	19	17%
Private residential (subdivisions and multi-family residential) development	18	16%
Waterfront infrastructure enhancement (such as public walkways)	17	15%
Waterfront property homes with pre-existing hard protection structures	14	13%
Marshlands and dykeland realignment	12	11%
Commercial waterfront development projects	11	10%

We asked shoreline professionals about the suitability of different types of organizations to deliver soft shoreline programming such as the kind Green Shores® provides. The group of respondents views non-governmental organizations as the most suitable (Figure 19), followed by academic institutions. Local governments are the least suitable, according to this group of respondents.

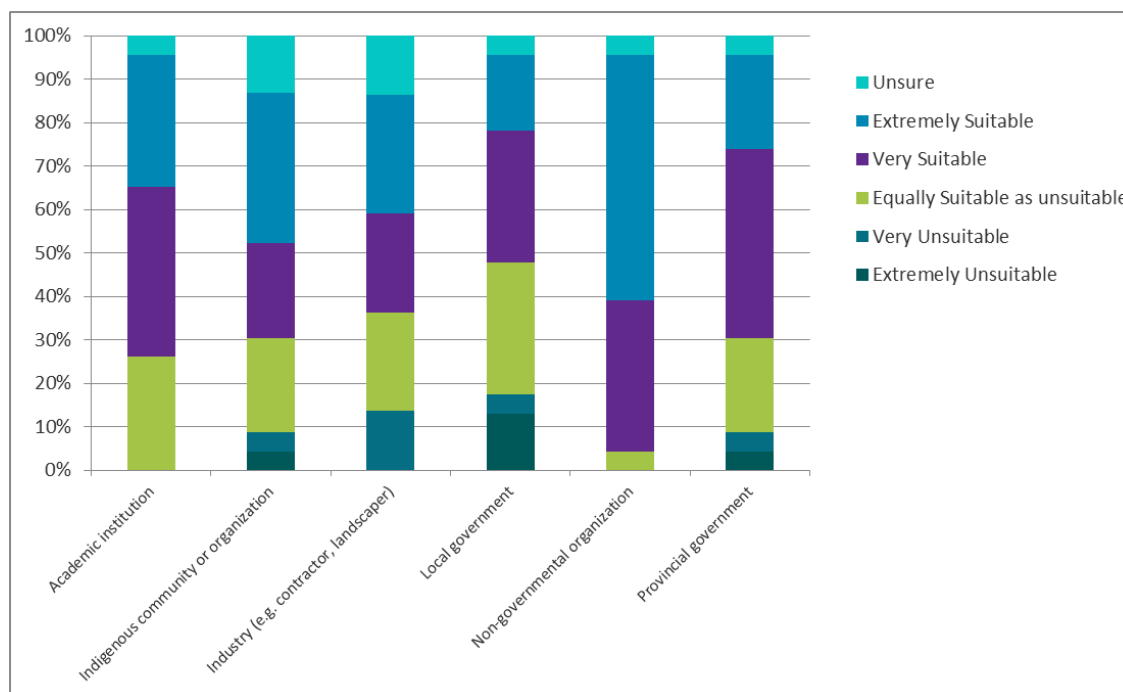


Figure 19: From your perspective, what types of organizations are best suited to deliver a soft shoreline program such as Green Shores® in your jurisdiction(s) of Atlantic Canada? (Shoreline professionals, n=23)

We also asked which organizations respondents would most trust to deliver a soft shoreline program such as Green Shores® in their jurisdiction of Atlantic Canada. Here again NGOs were selected most frequently

(9/23 or 39% of respondents). Indigenous communities, local government and provincial agencies combined were selected by 25% of respondents (6/23).

As over half (13/23) of respondents represented the private sector and local governments we do not consider the results on suitable and trusted types of organizations to deliver Green Shores programming as biased. These results can inform existing views on candidates for an Atlantic entity to coordinate Green Shores activities in that region.

4.5 Comparisons between Respondent Groups

We performed Chi square tests on a range of categorical variables to assess any statistically significant differences across groups (e.g., by jurisdictions), but no useful associations were detected (see Appendix I). In particular, the pool of responses was too small to explore differences across jurisdictions. Still, some patterns in differences and similarities in responses between waterfront property owners and shoreline professionals are worth noting. In brief:

- Waterfront property owners and shoreline professionals share attitudes on the most and least important shoreline development concerns;
- Improvements in biodiversity and wildlife habitat as well as protection from sea level rise are the top 3 benefits that both user groups perceive from soft shoreline approaches;
- Both user groups share the view that factors involving costs and financial incentives are most influential in motivating uptake of Green Shores as part of shoreline projects.

Based on aggregate, average scores, water quality and shoreline erosion are both within the top 3 of important concerns for property owners and shoreline professionals. Insurance rates are unimportant for both groups (Table 29).

Table 29: How important to you are the following shoreline-development concerns? (Rank order based on average score)

Property owners	Shoreline professional
Shoreline erosion	Sea-level rise
Water quality	Water quality
Seasonal and/or storm surge flooding	Shoreline erosion
Reduced coastal biodiversity	Lack of wildlife habitat
Pollution from shoreline development	Reduced coastal biodiversity
Sea-level rise	Seasonal and/or storm surge flooding
Lack of wildlife habitat	Pollution from shoreline development
Property value	Cost of maintaining protective structures
Loss of shoreline access	Loss of shoreline access
Algae blooms	Saltwater intrusion of wells
Cost of maintaining protective structures	Algae blooms
Saltwater intrusion of wells	Waterfront insurance rates
Waterfront insurance rates	Property value

According to aggregate, average scores, improvements in biodiversity and wildlife habitat as well as protection from sea level rise are among the top 3 benefits that property owners and shoreline professionals perceive from soft shoreline approaches. Both groups agree that the applicability of soft

shoreline approaches to a range of shoreline types is of relatively less importance than other features (Table 30).

Table 30: How important to you are the following benefits to adopting soft shoreline approaches? (Rank order based on average score)

Property owners	Shoreline professional
Add native vegetation and wildlife habitat	Add native vegetation and wildlife habitat
Beautify shorelines	Protect against rising sea levels
Protect against rising sea levels	Make shorelines accessible, eliminating drop-offs and walls
More secure against erosion and flooding	More secure against erosion and flooding
Make shorelines accessible, eliminating drop-offs and walls	Beautify shorelines
Used on a variety of shoreline types	Used on a variety of shoreline types

Waterfront property owners and shoreline professionals alike perceive that project design costs are the factors that most discourage adoption of Green Shores (Table 31). Lack of demonstrated success, a challenge that stands out both in published literature and in feedback from stakeholders in BC and Atlantic provinces, is moderately discouraging, according to survey respondents. Lack of information and permitting issues are perceived as the least influential factors.

Table 31: From your perspective, what would discourage adoption of the Green Shores® approach to shoreline projects? Rate each of the following factors (with 1 being least discouraging and 5 most discouraging)? (Rank order based on average score)

Property owners	Shoreline professional
Project design costs (engineering, landscaping, etc.)	Project design costs (engineering, landscaping, etc.)
Lack of local service providers (engineers, construction contractors) capable of applying Green Shores® approaches	Cost of shoreline assessments (a pre-requisite to apply Green Shores®)
Lack of demonstrated success (e.g., no one you know has applied it)	Lack of demonstrated success (e.g., no one you know has applied it)
Cost of shoreline assessments (a pre-requisite to apply Green Shores®)	Lack of local service providers (engineers, construction contractors) capable of applying Green Shores® approaches
Lack of information about Green Shores®	Lack of information about Green Shores®
Permitting issues	Permitting issues

Consistent with the results in the table above, both groups perceive factors with financial implications (free shoreline assessments, financial incentives and free workshops) to hold most potential to encourage the adoption of Green Shores (Table 32). Streamlining regulations / permitting and public recognition are perceived as weaker in encouraging Green Shores adoption.

Table 32: From your perspective, what would encourage adoption of the Green Shores® approach to shoreline projects? Rate each of the following factors (with 1 being least encouraging and 5 being most encouraging). (Rank order based on average score)

Property owners	Shoreline professional
Free shoreline assessments	Free shoreline assessments
Free workshops for homeowners and shoreline professionals	Financial incentives
Financial incentives	Free workshops for homeowners and shoreline professionals
Increase in public awareness/education	Increase in public awareness/education
More information about how to implement the Green Shores® approach	More information about how to implement the Green Shores® approach
Access to expertise in shoreline project design	Demonstration sites
Demonstration sites	Access to expertise in shoreline project design
Changes in regulations and permitting that make it easier to implement the Green Shores® approach	Public recognition for obtaining Green Shores® certification
Public recognition for obtaining Green Shores® certification	Changes in regulations and permitting that make it easier to implement the Green Shores® approach

Interest in training on Green Shores varies between the two groups (in predictable ways, see Table 33). Property owners are primarily interested in Level 1 training, followed by both Level 1 and Level 2. However, about a fifth of respondents in this group are not at all interested in training.

All shoreline professionals are interested in training of some sort. About two thirds of the group of shoreline professionals are interested in both Level 1 and 2 training. About a third are only interested in Level 1 training.

Table 33: Would you be interested in participating in a training program to learn more about the Green Shores® program?

Interest in participating in a training program to learn more about the Green Shores® program	Waterfront property owners	Shoreline professional
Interested in Level 1 Training – general training about shoreline ecology and governance, with a brief introduction to Green Shores® credit and rating program.	44%	35%
Interested in Level 2 Training – in depth training about Green Shores® credit and rating systems and how to implement them in shoreline management programs.	4%	4%
Interested in Level 1 and 2 Training	31%	61%
Not at all interested	21%	0%
N	66	23

5. Recommendations for Future Action

Based on analysis from previous sections, this section provides recommendations on i) improvements to program delivery in BC so as to achieve broader and deeper reach and ii) strategies to roll out Green Shores in Atlantic Canada.

5.1 Improving Green Shores in BC

Academics and practitioners alike are actively exploring how to accelerate inclusion of nature-based solutions as part of coastal climate change adaptation strategies and how to do this at scale (e.g., Spalding et al. 2014, ICF 2018, GCA and WRI 2019). Broad, mutually-reinforcing strategies are as follows:



Figure 20: Strategies to accelerate uptake of nature-based solutions as part of climate change adaptation

Reflecting on these broad strategies as well as feedback from stakeholders in BC we offer the following recommendations on levers to support continued uptake in BC and understanding at scale:

1. **Get the incentives right:** Adoption of Green Shores techniques is voluntary at present yet the original intent was to link certification to an incentive (e.g., a grant, fee deferral or tax rebate, accelerated development permit). Stakeholders provided a few examples to explore including payment for ecosystem service schemes and user-pay models that link implementation of best management practices on one's property (the example was stormwater management) to utility bill discounts. Not all users may require financial incentives (e.g., larger local governments); this lever seems most appropriate for encouraging uptake in small communities and among homeowners.
2. **Link to other change-makers in the system:** Initiatives and the community of practitioners promoting the adoption of nature-based approaches in meeting development challenges is growing in Canada. Among them, the Municipal Natural Assets Initiative (MNAI) stands out for its visibility, strong strategic communications and provincial advocacy and for its direct path to decision-making processes municipalities are already familiar with (i.e., local government asset management). After focusing on stormwater management, MNAI has ventured into helping municipalities identify, quantify, monetize and manage coastal natural assets. MNAI is also exploring how to turn the knowledge and lessons accrued through cohorts of local, pilot applications to some sort of national standard. Strengthening linkages with MNAI and clarifying the areas of overlap and complementarities between MNAI and Green Shores in BC is an important first step, if that remains to be done. For example, SCBC could explore how use of the screening-level tool that MNAI is developing to explore coastal protection scenarios could help in outreach efforts (i.e., scenario-building as an educational tool) and build a business case for uptake of Green Shores techniques. Working together to attract funding is to address shared goals is another step worth pursuing.

3. **Further target education and outreach** in response to apparent barriers and opportunities: Stakeholder interviews and focus groups revealed the importance of i) mobilizing contractors as change agents and ii) raising awareness of the full range of benefits provided by Green Shores projects among provincial actors. As noted in Section 2.2 contractors are important allies in disseminating information about Green Shores and in bundling application of Green Shores within development projects, making soft shoreline protection increasing “business as usual”. SCBC should invest in understanding this market segment more deeply and design training sessions and information products tailored to their needs. As for provincial actors, local governments and shoreline professionals share the view that “getting the province on board” is critical to creating the enabling conditions for Green Shores implementation to prosper. Local government stakeholders provided examples of practices undertaken by the province in conflict with principles and techniques promoted through Green Shores, including continuing to build hard installations at the ocean-road terminus and authorizing certain engineered works on river systems. SCBC should analyze provincial-level barriers (attitudes, legal, technical, financial, regulatory) to undertaking Green Shores projects, both within mandate areas of the province and more broadly. Findings could then inform a tailored advocacy strategy tied to specific objectives.
4. **Enhance learning and effectiveness monitoring:** The relative paucity of successful examples of Green Shores applications limits the SCBC’s ability to make a compelling case for creating the transformative change needed to increase the popularity of soft and hybrid shoreline approaches. At the same time, with few and largely opportunistic pilot sites implemented the learning loop on which approaches to use where and when is not yet complete. We recommend two lines of action for SCBC to pursue. First, clarify priorities for implementation of Green Shores projects, based on the potential to significantly accelerate learning about the effectiveness of Green Shores approaches in a given coastal system, community size, exposure to climate change and variability, level of environmental degradation, development pressures and other relevant variables. These priority site archetypes could then inform a targeted grant request and call for proposals. We also recommend enhancing monitoring requirements for the selected Green Shores projects so that the performance of these projects can be assessed over time.

5.2 Taking Green Shores to Atlantic Canada

Survey findings and perspectives shared through an SCBC workshop in October 2019 provide input to help structure a strategy to extend Green Shores practices to Atlantic Canada. Building the foundation for delivery of Green Shores programming in the region and encouraging adoption of alternatives to engineered approaches to shoreline development involves working with current assets, capacities and momentum, as well as addressing implementation barriers head on. In taking Green Shores to Atlantic Canada this means capitalizing on changing attitudes toward conventional approaches and on the ability of Green Shores to cost-effectively address coastal impacts communities are already concerned about, such as habitat degradation, erosion and flooding. At the same time, the emerging enthusiasm for nature-based solutions, and associated funding, political will, demand, and regulatory environment will need to be tempered by current levels of technical capacity to implement soft shoreline techniques.

The next section outlines the proposed strategic approach for Green Shores roll out in Atlantic Canada, assuming a five-year implementation timeline. When taking action to support next steps within this timeframe it will be important to invest in support for enabling conditions in the near-term (1-3 years), before investing in activities that support scaling up in medium term (3-5 years). A sequencing of actions follows an asset-based approach, seeking to build on and activate the combination of human, social, physical and natural assets that exist within Atlantic jurisdictions.

5.2.1 Overview

Analysis of feedback from Atlantic stakeholders at an SCBC workshop in New Brunswick in October 2019 and survey responses from waterfront property owners and shoreline professionals suggests that the most promising strategies to facilitate scaling out of Green Shores programming to the Atlantic region involve taking the following steps:

1. **Ground Truth the Theory of Change for Green Shores Atlantic:** Experience with Green Shores in BC led to the development of the results chain shown in Figure 3, linking SCBC's inputs, activities, outputs, outcomes and longer-term impact associated with BC's Green Shores programming. This results chain is an important input to clarifying a theory of change for Green Shores in the Atlantic region but is not fully transferable. Ground-truthing a region-specific Theory of Change is a first step to guide the efforts described below so that the roll out has a reasonable chance of generating benefits to people and nature in Atlantic Canada in a cost-effective way.
2. **Identify and Develop Capacity of a Backbone Organization** to facilitate coordination and partnered local delivery in the near-term. In rolling out Green Shores programming to the Atlantic region, SCBC is likely to retain key roles – at least initially-- in oversight, research & development and marketing support, and certification. However, a pre-requisite for tailoring Green Shores to the needs of Atlantic provinces is exploring options for governance and day-to-day operations, as well as establishing agreements to bring the desired options to fruition. A backbone organization – an organization that drives multi-sectoral collaboration (Crespin and Moser, 2018) – will be an essential enabler of adoption in Atlantic Canada.
3. **Put in Place Enablers for Green Shores Deployment and Adoption:** Widespread adoption of soft shoreline techniques in Atlantic Canada is unlikely to take place in the longer term without actively creating a demand for these approaches and nurturing the capacity and motivation to deliver technical services associated with site-level implementation of Green Shores practices. In the near-term, the most promising enabling tools range from awareness-raising and education campaigns and mobilizing financial resources to develop demonstration projects. In the medium term, efforts can then focus on training for professionals, understanding regulatory (permitting, bylaws) barriers. Once the enabling conditions are in place and a case for regional and local action has been built, growing the depth and breadth of impact will require additional enabling tools, including a supportive regulatory environment, sustainable financial models and a regionally-based certification scheme.
4. **Understand Target Audiences:** Waterfront property owners, shoreline professionals, communities, regulators and funders are among the groups with a stake in seeing Green Shores succeed. These groups will include visionaries (innovators, early adopters) and pragmatists (early majority) who will have different needs and will want different things. Communications and engagement strategies and tactics in the near-term should ideally account for baseline differences in knowledge, attitudes and behaviour within and across these groups to be the most cost-effective.

The sections below provide additional information on each strategy. Where possible we suggest implementation actions per strategy.

5.2.2 Ground Truth the Theory of Change for Green Shores Atlantic

A proposed Theory of Change for Green Shores in the Atlantic region appears in Figure 21. This Theory of Change draws from the results chain for Green Shores BC shown in Figure 3 (Section 2), is consistent with

responses to a survey of the target community in Atlantic Canada deployed in 2020, as well as feedback on opportunities and aspirations revealed by Atlantic stakeholders at an SCBC workshop in October 2019.

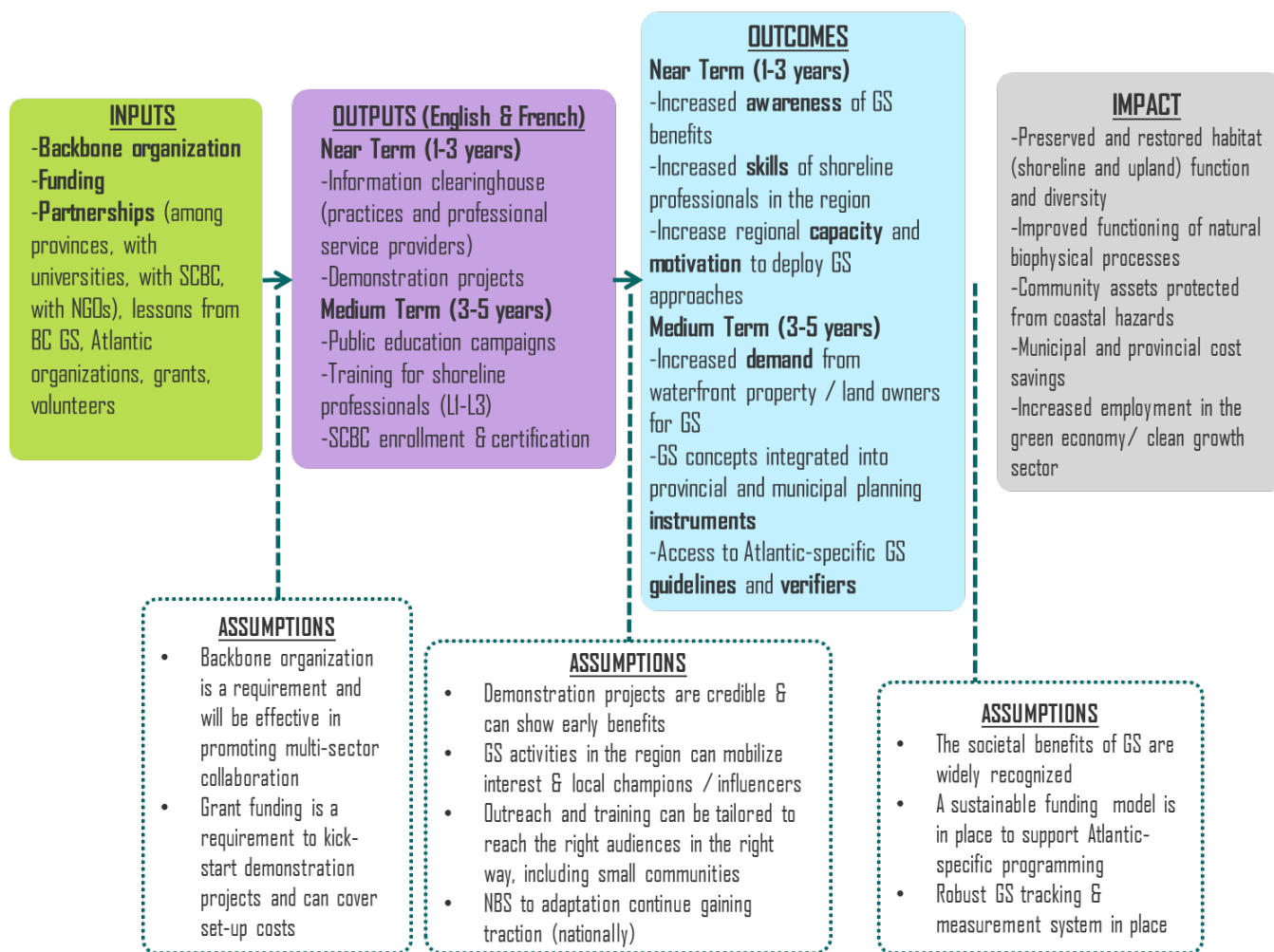


Figure 21: Proposed Theory of Change of Green Shores in Atlantic Canada (Nova Scotia, New Brunswick and Prince Edward Island)

The Theory of Change suggests that if *awareness* of GS approaches and their benefits among a range of audiences (e.g., land owners, local and provincial governments) as well as *knowledge and skills* to implement GS practices to restore developed shorelines are built and funding is in place to *demonstrate the value of GS* over conventional approaches then *positive attitudes* toward GS will be created. If attitudes shift and GS gains acceptance among a critical mass of property owners and shoreline professionals, governments will be more inclined to *mainstream GS concepts and requirements* into existing regulatory and planning instruments. With an enabling institutional environment and enhanced regional capacity to support adoption of GS across different shoreline types, Green Shores programming can be *increasingly customized* to regional and local conditions, amplifying the potential for uptake. Widespread uptake of Green Shores approaches leads to *demonstrable benefits for nature and people, including restored and diverse habitats, improved functioning of coastal processes, avoided costs from the combined impacts of sea-level rise and coastal hazards and enhanced employment in green sectors*.

Underlying this Theory of Change are assumptions about what to focus on in the near-term and medium-term to be most successful. Such temporal sequencing of efforts recognizes that not everyone is ready to adopt GS concepts and practices today (see Audience Segmentation discussion below), and that the enabling environment needs to be established before broader uptake is possible (see discussion about

Backbone Organization and Enablers below). This Theory of Change, both the results chain and assumptions in between, requires some validation with Atlantic stakeholders and possibly tailoring for each province or urban and rural settings. It is also worth noting that this Theory of Change provides an overly simplified view of the interaction among inputs, outputs, outcomes, and impacts. For instance, there can be important positive feedbacks between awareness raising and increasing demand for GS concepts and practices.

5.2.3 Identify and Develop Capacity of a Backbone Organization

At this juncture, SCBC is seeking to expand Green Shores programming into new geographic areas. Some aspects of Green Shores may be easy to “copy” or replicate by others (for example, delivering Level 1 training). To facilitate successful scaling, SCBC might want to retain control of aspects of Green Shores that require specific technical skills, dedicated knowledge management systems or unique partnerships based on trust, for example. Several pathways exist to scaling (Figure 22), with choices influenced by SCBC’s goals and motivations, as well as the skills and operating environment of the area or entity receiving the innovation.

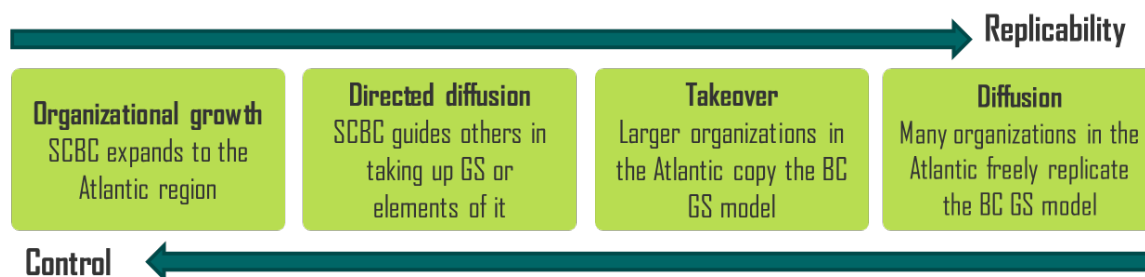


Figure 22: SCBC has a range of options to choose from in extending Green Shores programming to the Atlantic Region, SCBC’s degree of control depends on how easy it is to build an organizational structure to implement Green Shores (Shared Assets, 2014).

Of the scaling pathways illustrated in Figure 22 “directed diffusion” is perhaps the most appropriate in the near term with the intent of encouraging “takeover” of the GS model by another organization in the Atlantic in the medium to long term. Facilitating uptake of Green Shores in the Atlantic will require significant guidance from SCBC regardless of the organization(s) responsible for delivery in the region. Further, since Green Shores is a recognized brand in BC and beyond, the Stewardship Centre has a direct interest in seeing it applied credibly.

Indeed, the Theory of Change we propose above assumes that an Atlantic entity will lead coordination of Green Shores delivery in the region. We refer to this entity as a “backbone organization”, an organizational expression increasingly common in social change / stewardship initiatives involving multi-sector collaboration around a common purpose. We anticipate that this backbone organization could play key roles in implementing the enabling conditions described here, which would include:

- ensuring the common purpose is clear to everyone involved
- mobilizing / pooling / creating resources that are broadly applicable (e.g., grant funding, education and training, marketing)
- initiating implementation / adoption in the near term and sustaining the long-term momentum for Green Shores implementation
- nurturing key partnerships
- encouraging learning from implementation

CollaborateUp (2018) provides additional information on principles and practices to effectively set up and run backbone organizations.

Although the backbone organization could serve regional needs and avoid duplication of efforts, it's important for each jurisdiction to play roles in direction-setting and in local delivery. Therefore, we can envision a board or advisory committee with representation by all provinces and SCBC to fill the role of executive leadership. Because of the need for close engagement with waterfront property owners, shoreline professionals and other provincial and local users and supporters of Green Shores, we envision roles for local delivery partners as well. For example, each province could have its own technical working group, which would tailor tools and resources to local contexts, when customization is demonstrably beneficial (e.g., differences in culture, biophysical or institutional contexts).

Survey responses suggest that an NGO may be the most suitable candidate to assume the role of the backbone organization, although academic institutions are also considered suitable and trusted to deliver a soft shoreline program such as Green Shores. NGO and academic representatives who assisted with disseminating the survey in their networks could well be obvious candidates.

Until sufficient knowledge, skills and networks are built in the Atlantic, SCBC will likely retain the role as the certifying organization, including managing project enrollment, overseeing recruitment and training of third party verifiers, stewarding verification data and issuing project certificates. Because of the significant research and technical input involved in creating and updating credits and rating guides, SCBC will likely continue to perform this function (or retain significant leadership over these activities). Long-term support to ensure successful transfer of an innovation in environmental stewardship is a proven determinant of success (Battista et al., 2017).

5.2.4 Put in Place Enablers for Green Shores Deployment and Adoption

The delivery model for BC Green Shores comprises four key components: credit and ratings guides, education and training, community partnerships (including the Local Government Working Group) and SCBC as a certifying organization. Although these components have been proven to be essential to the Green Shores delivery model in BC an exact copy of this model in Atlantic Canada is not feasible at present nor might it be necessary (see discussion on Theory of Change above). Therefore, it's important to prioritize the Green Shores components and activities that will help (i) build the enabling conditions and business case for uptake of Green Shores approaches in the near term (1-3 years), and (ii) reinforce Green Shore's reach and impact potential in the region once foundations are established in the medium term (3-5 years). We recommend focusing on information, education & training and investing in demonstration projects, as strategies to build momentum for Green Shores (see outputs in Figure 21). In particular we recommend:

- Establishing a clearinghouse of information for waterfront property owners and shoreline professions, compiling evidence and guidance for those with pre-existing hard structures and new developments as well as a registry of professionals (engineers, builders, biologists, etc.) that specialize in shoreline restoration. Coastal stewardship groups have observed that they are unable to fulfill property owners' requests for information on soft shorelines goes unmet.
- Supporting a network of demonstration sites representing a range of shoreline types in the region. Aside from information on cost-benefit and cost-effectiveness analysis from BC-based applications, demonstration sites are a way to show the business case for Green Shores, serve as "living labs" and raise the visibility of this program. Demonstration sites should include a mix of public and private developments.

- Developing an outreach program (marketing campaigns, webinars and workshops) to educate and engage the general public in coastal communities, waterfront property owners, professionals, local and provincial governments on Green Shores for Homes and for Shoreline Development. The program should highlight economic benefits or applying Green Shore techniques since survey results showed that financial costs (e.g., project design) discourage their adoption.
- Initiating a training program targeting shoreline professionals in the Atlantic region, with the aim of growing a cadre of regionally-based experts qualified to implement Green Shores projects. Integrating peer learning, whereby certified Green Shores professionals from BC connect with and mentor Atlantic professionals is a way to leverage the capacity built in the west coast.

External funding and financial incentives will be important to get started, including supporting the establishment of demonstration sites and subsidizing selected implementation costs (e.g., shoreline assessment cost) for developers eager to adopt alternatives to hard protection structures but facing financial barriers. Survey results revealed that both property owners and shoreline professionals perceive factors with financial implications (free shoreline assessments, financial incentives and free workshops) to hold most potential to encourage the adoption of Green Shores.

While establishing the building blocks of Green Shores in the Atlantic Region in regards to awareness, education and mounting a business case, it's also important to support institutional reforms such that natural alternatives are on equal footing to hard armouring and property owners are empowered to protect their shoreline using Green Shores approaches. Documenting specific regulations, bylaws, permitting processes and other norms that could present barriers to adoption of Green Shores is important for understanding next steps once the enabling conditions described above have been put in place. Institutional barriers of this type could be federal, provincial or municipal, for example: federal regulations preventing putting a "reef" or other protective features (boulders) into the ocean a few metres out from a sea wall or strict provincial controls on wetland and watercourse alterations within 30 m of the high water mark.

Establishing and maintaining a regionally-based certification program is proposed in a next phase of roll out, once a degree of momentum around Green Shores implementation is built, local capacity has been strengthened (including integration into academic curricula) and the Green Shores brand has visibility and recognition in the region. The growth in services delivered will require additional core funding. As such, sources of funding aside from grants should be pursued, including structuring revenue streams (e.g., from training, project enrollment and certification and continued verification), as well as payments for ecosystem services and green bonds.

5.2.5 Understand Target Audiences

Just as in BC, communications and engagement is a cross-cutting function for strategic leadership and operations of Green Shores programming in the Atlantic Region. Individuals within target groups (e.g., users of Green Shores guidelines, waterfront property owners, etc.) have different knowledge levels, attitudes and behaviours in relation to soft shorelines. Once communications and engagement goals are clear, it is important to understand differences among individuals since this information will guide who to engage and why, how to engage them and what specifically to show or tell them. So-called audience segmentation approaches can be used to design outreach campaigns, recruit partners and obtain support from funders, among other activities in the near-term. This work will help ensure that resources and strategies to increase uptake are the most cost-effective.

In introducing Green Shores to the region there is a need to identify segments of these target groups who are ready to make the switch to Green Shores approaches in the near-term (innovators or early adopters) or could do so with strategic and targeted nudges in the near to medium term (early majority or

pragmatists). These individuals and institutions can support active implementation of Green Shores programming, by acting as champions and influencers within their own networks. Once Green Shores starts to take root in the region among visionaries and the business case for Green Shores is increasingly shown, communications and engagement efforts can then turn toward the early majority, who tend to “wait and see” if innovations are satisfactory before acting themselves.

A number of tools and toolkits are available to nudge different communities beyond awareness and into active engagement. For example, many excellent lessons on “activating” strategic plans can be drawn from the United Nations, which has developed guidance toolkits to help catalyze contributions towards Sustainable Development Goals (SDGs) (<https://www.sdglab.ch/en/toolkit>). Much of the guidance provided in these toolkits is designed to boost participatory decision-making through structured activities and workshops and is directly transferrable to supporting uptake and expansion of Green Shores in Atlantic communities. As another example, guidance is also available to help design and monitor the effectiveness of advocacy strategies seeking policy and regulatory change (<https://www.evaluationinnovation.org/wp-content/uploads/2015/03/Adocacy-Strategy-Framework.pdf>). Tactical choices on communication platforms and formats are also worth thinking through and one excellent resource published by the Local Government Association (UK) draws attention to a range of communication options aligned with goals that range from awareness, understanding to acceptance, commitment and ownership ([http://www.local.gov.uk/sites/default/files/documents/Channel chooser how to use it infographic.pdf](http://www.local.gov.uk/sites/default/files/documents/Channel%20chooser%20how%20to%20use%20it%20infographic.pdf)).

6. Concluding Remarks

Green Shores (GS) is a voluntary incentive program launched by the Stewardship Centre for British Columbia (SCBC) in 2010; it provides science-based tools and best practices to minimize the impacts of new developments; and restore shoreline ecosystem function of previously developed sites. This report uses multiple lines of evidence to document the benefits of Green Shores programming –capacity building, tools and best practice standards— for communities in BC.

- Qualitative research with Green Shores stakeholders in BC, including representatives from local governments, shoreline professionals and funders, helped clarify the perceived impact of Green Shores on shifting attitudes toward coastal stewardship, generating trust among practitioners from diverse domains and strengthening readiness to employ soft shoreline techniques, with ultimate benefits to waterfront property owners and business managers and coastal ecosystems.
- Focusing on Green Shores for Shoreline Development (GSSD) and leaning on techniques to value ecosystem services, we undertook an economic analysis of three GSSD projects (New Brighton Park, Jericho Beach and Riverbend Business Park) and of GSSD programming overall from a societal –or triple bottom line— perspective. Our analysis indicates that three Green Shores projects represented an economically efficient use of resources; for every \$1 spent on these projects social welfare in BC increased by \$2.50 (New Brighton Park) to \$20 (Jericho Beach). More broadly, our analysis suggests that SCBC’s investments in delivering GSSD programming have economic merit; each \$1 invested in GSSD program delivery generated \$7.10 in social welfare in BC. Further, investments made as part of GSSD programming have made noteworthy contributions to the BC economy by, for example, supporting 74 to 83 jobs.

This report also explores strategies and actions to accelerate uptake of Green Shores at scale. Interviews, focus groups, workshop discussions and results from a web-based survey informed our analysis of i) challenges in increasing adoption of Green Shores in BC and opportunities to address them and ii) the potential need and demand for aspects of Green Shores programming in Atlantic Canada.

In BC, technical resources, partnerships, practitioner networks, champions and delivery capacity have been created. We suggest that radically increasing penetration of Green Shores in the province will require a renewed examination of incentive structures faced by Green Shores user groups, and designing interventions to address misalignments. This may include forging new partnerships, such as with the Municipal Natural Assets Initiative. As shown in our economic analysis Green Shores projects achieve returns on investment and provide important societal benefits, it’s important for policy, regulatory and planning frameworks to facilitate economically efficient decisions. Stepping up efforts to learn and generate robust knowledge about the performance and effectiveness of Green Shores projects across diverse coastal contexts remains germane.

Atlantic stakeholders are enthusiastic about the prospect of extending aspects of Green Shores to the region. Coastal development challenges around accelerated erosion, biodiversity losses, storm surge flooding and climate change combined with socio-demographic trends (e.g., aging populations, rural outmigration, foreign ownership of second homes) provide a degree of urgency in seeking sustainable solutions for shorelines that do not rely on engineered structures alone. Taking Green Shores to Atlantic Canada does not simply involve reproducing BC’s Green Shores model. Lessons from implementation in BC and ambitions of Atlantic stakeholders can inform a region-specific model for Green Shores that is grounded in current assets, capacities and momentum. This report proposes a five-year roadmap for extending Green Shores to Nova Scotia, New Brunswick and Prince Edward Island, identifying broad strategies to foster enabling conditions in the near-term (1-3 years), before investing in activities that

support scaling up in medium term (3 – 5 years). An important next step for SCBC and partners is to identify an organization based in the region with the convening capacity and organizational skills to guide collaboration around the common purpose of advancing adoption of Green Shores.

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Appendix I: Chi-Square Tests

Here we present the Chi-square results for selected survey questions. The Chi-square test aimed to verify if a relationship existed between shoreline professionals (SP), property owners (PO) and their selection of answers. The statistical results revealed that a significant relationship was only found for question 8 regarding the province of origin of shoreline professionals (SP) and their survey answers. *The results were significant $p = 0.006315$ for Level 2 Training for shoreline professionals acting in multiple locations/provinces.*

Question 5. From your perspective, what would discourage adoption of the Green Shores® approach to shoreline projects? Rate each of the following factors (with 1 being least discouraging and 5 most discouraging).

The chi-square and p-value results show that no relationship exists on the categorical variables in the studied population, they are independent. We find no relationship between shoreline professionals (SP), property owners (PO) in their respective provinces and their respective answers for A-F options for question number 5.

Property owners = Blue

Shoreline Professionals = Orange

1 = A Cost of shoreline assessments (a pre-requisite to apply Green Shores®)

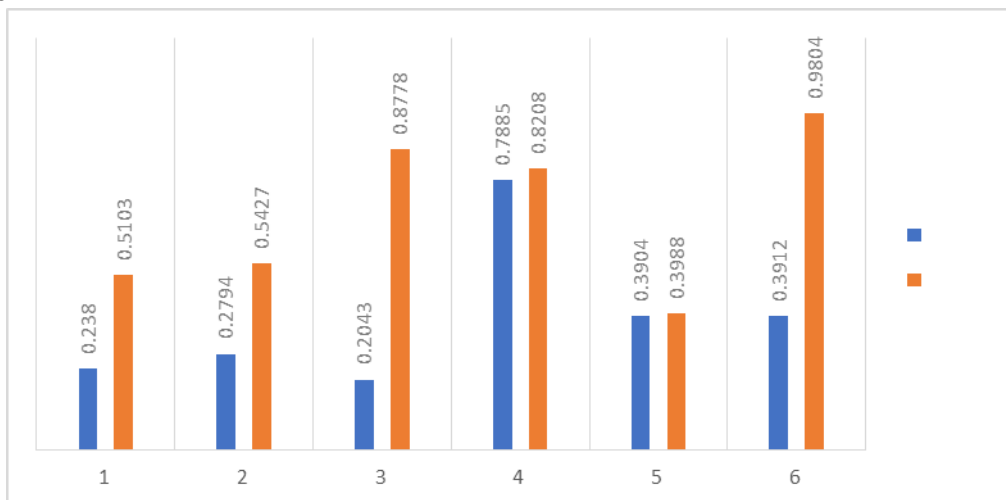
2 = B Project design costs (engineering, landscaping, etc.)

3 = C Permitting issues

4 = D Lack of information about Green Shores®

5 = E Lack of demonstrated success (e.g., no one you know has applied it)

6 = F Lack of local service providers (engineers, construction contractors) capable of applying Green Shores® approaches



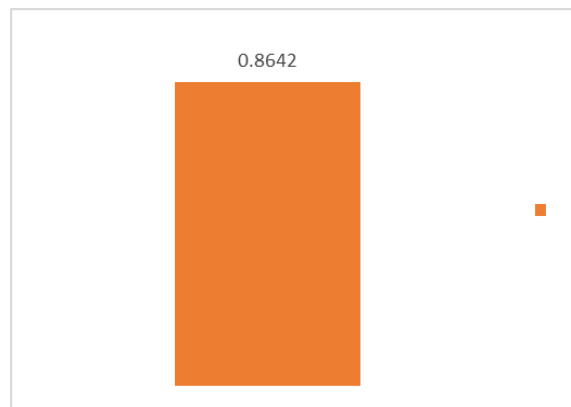
Question	X-squared	df	p-value
5 F SP	7.8782	18	0.9804
5 C SP	16.278	24	0.8778
5 D SP	17.624	24	0.8208
5 D PO	4.7061	8	0.7885

5 B SP	16.716	18	0.5427
5 A SP	17.186	18	0.5103
5 E SP	18.887	18	0.3988
5 F PO	8.4451	8	0.3912
5 E PO	8.4545	8	0.3904
5 B PO	9.7998	8	0.2794
5 A PO	10.4	8	0.238
5 C PO	10.955	8	0.2043

Question 7. Would you be interested in participating in a training program to learn more about the Green Shores program?

The chi-square and p-value results show that no relationship exists on the categorical variables in the studied population, they are independent. We find no relationship between shoreline professionals (SP) in their respective provinces and their respective answer for question number 7.

Shoreline Professionals = Orange



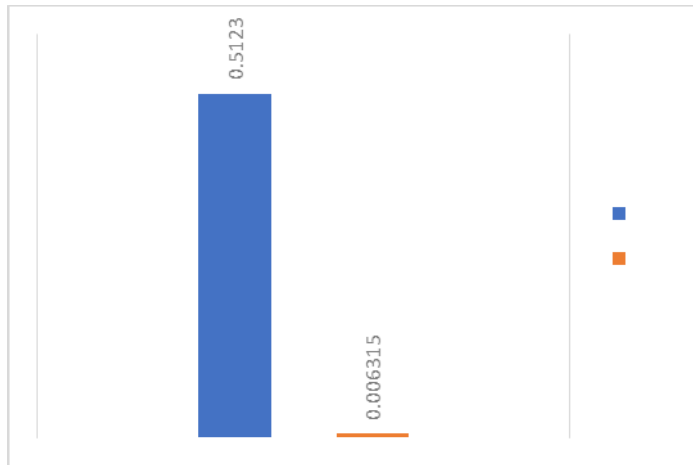
Question	X-squared	df	p-value
7 SP	16.624	24	0.8642

Question 8. Would you be interested in participating in a training program to learn more about the Green Shores program?

The chi-square and p-value results show that no relationship exists on the categorical variables in the studied population, they are independent. We find no relationship between property owners (PO) in their respective provinces and their respective answer for question number 8. However, for shoreline professionals (SP) we did find statistical significance considering their province of origin and their answer to question number 8. The results were significant for Level 2 Training for shoreline professionals acting in multiple locations/provinces.

Property owners = Blue

Shoreline Professionals = Orange



Question	X-squared	df	p-value
8 PO	5.2491	6	0.5123
8 SP	27.606	12	0.006315

Property owners

Shoreline Professionals

1 = A

2 = B