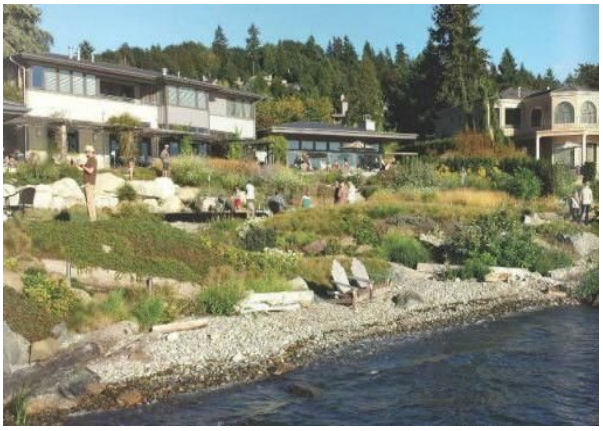
Incentivising a Shoreline Climate Change Adaptation Program



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1. Executive Summary

Background and Objective

Green Shores for Homes (GSH) is a program under the Stewardship Center for BC (SCBC), with a goal is to persuade the maximum number of shoreline property owners to choose a soft shore[1] approach instead. To achieve this, they want to find out what incentives are the most appealing to homeowners in order to best incentivize the program.

The objective of this study is to identify incentives which will convince homeowners, in the pilot community, Powell River, to opt for Green Shores over conventional shores.

Methodology and Limitations

To determine the incentives, we conducted extensive research on incentive programs of organizations working in on climate adaption programs. Specifically, two programs doing similar work such as Green Shores in the US are Living Shorelines Virginia and Maryland and Shore Friendly in Washington. Green Infrastructure in Philadelphia and Leadership in Energy and Environmental Design are two other types of climate adaptation programs that used to give us broader perspectives on potential incentives to adopt. In the discussion, we specified how each of these programs can be an effective reference for GSH.

[1] *Conventional 'Hard' engineered amouring approaches include: seawalls, gabions, groynes, and diking systems while 'soft' armoring includes beach nourishment, dune and wetland construction, shore vegetation preservation or restoration and constructed reefs/berms.*

Figure 1: List of 5 incentives and their types (financial, technical or regulatory), chosen for this study.

A previous engagement with the pilot community resulting in 15 incentives which we limited to 5 incentives by choosing and summarizing the ones most relevant to homeowners. A survey was distributed online to homeowners in the pilot community, Powell River Regional District (PRRD). The survey asked homeowners to rank the 5 incentives in order of preference

Finally a cost benefit analysis was done. The costs of providing the 5 incentives by GSH were estimated using costs provided by the Shore Friendly program. The benefits are the effectiveness of the incentive i.e. how many homeowners would prefer the incentive and choose the GSH approach. Unfortunately it was hard to quantify the benefits since there was no data on the effectiveness of the incentive programs of the case study organizations. The Survey does give us an idea of which incentive were preferred by the PRRD homeowners but we have only 9 responses which is not enough to base our entire benefit analysis on.

<u>Summary of results</u>

a) Case studies

Shore Friendly - top Incentives used:

- Funding/Project Grant from the government
- Free site assessment
- Assistance with permit processes

Living Shoreline - top Incentives used:

- Grants and loans
- A relative ease of regulatory process.
- Online toolkits for contractors and homeowners

Green Infrastructure - top incentives used:

- Fee credits and Grants
- Contests and Awards
- Recognition program

Leadership in Energy and Environmental Design - top incentives used:

- tax credits and breaks
- cost savings on monthly energy bills
- free or reduced-cost technical assistance

b) Costs for GSH

The most expensive ones are financial incentives - i.e. the one with free shoreline assessment and design and least expensive was more information on Green Shores

c) Benefits for GSH

The most popular incentives according to the survey results were financial incentives that is the shoreline assessment and design. The least popular was more information on GSH.

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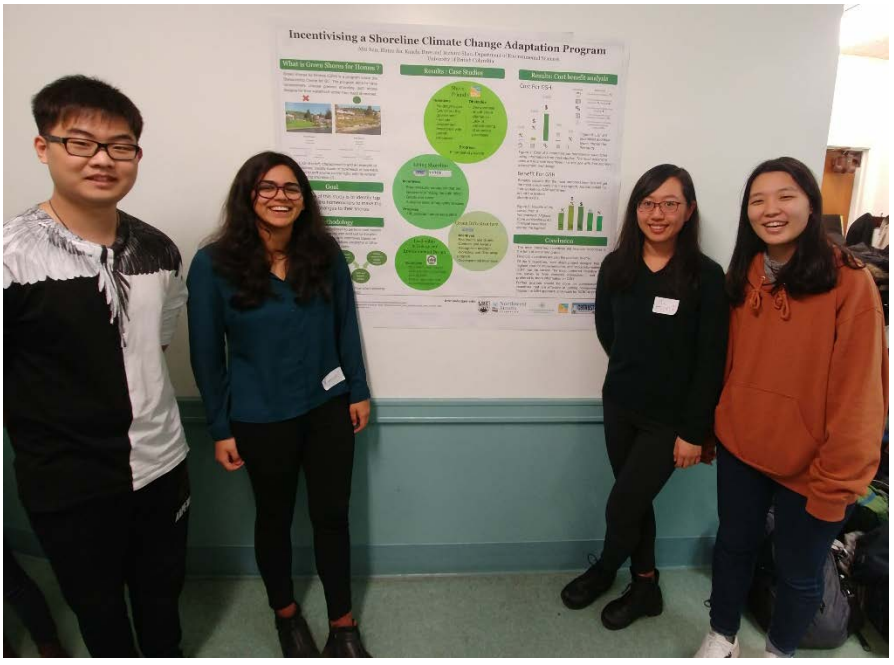

2. Introduction:

With increasing shoreline development to meet the demand of the expansion of human activities and transportation, many concrete infrastructures have been built along coastal areas. These structures, are often seen as the conventional approach of preventing physical changes of shorelines caused by waves, and the erosion that comes with it. Shorelines with seawall or bulkhead, are called hard shore. The need to consider Climate Change Adaptation/ Sea Level Rise (CCA/SLR) adaptive measures that will maintain the resilience of the shore is a reality for 30% of the municipal governments in BC and over two-thirds the population of the province who live in communities directly affected by coastal CCA/SLR . Sea level rise will increase the need to stabilize shorelines and protect development from flooding but traditional engineered approaches, such as seawalls, and bulkheads, to shoreline development may be maladaptive. Studies indicate that 'hard' engineered protection mechanisms are often associated with increased erosion rates and shore protection failure from cumulative impacts of storm surges and higher water levels that are the hallmarks of climate change and sea level rise[2]. 'Soft' shore protective measures fostered under the **Green Shores®** program may, in many coastal situations, be a more adaptive and resilient approach.

Coastal areas provide much more than just convenience for connecting between different lands. A healthy shoreline provides space for recreation, spiritual connection, and is a very important habitat for marine lives. Hard shores are less aesthetic and prevents natural processes nearshore, causing problems for the coastal ecosystem. These are just some of the reasons that Stewardship Center for BC (SCBC) is promoting soft shore approaches, using Green Shores designs that are both natural and effective at preventing erosion.

Green Shores for Homes (GSH) Green Shores for Homes launched in 2015 by SCBC, has the broad vision of increasing the capacity to address impacts of shoreline development and climate change on shoreline ecology and human well-being. Its guiding principles are to:

1. Preserve the integrity and connectivity of shoreline processes.
2. Maintain and enhance shoreline habitat diversity and function.
3. Minimize and reduce pollutants to the shoreline environment.
4. Reduce and reverse cumulative impacts to shoreline systems.

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[2] *These impacts are expected to rise in intensity over the next decade and increase more rapidly in the ensuing 50 years.*

This study investigated which incentives are preferred by residents of the pilot community (Powell River Regional District), and what are the costs and benefits of the preferred incentives. To this end, we asked the central question ‘How can Green Shores and the Powell River Regional District optimize the number of shoreline residents who use Green Shores in their shoreline projects?’

Our method and results (see below), serve as a resource for those that intend to take on this program in the future. Powell River Regional District is located on the west coast of BC, Canada (figure 1.). The population of the district is around 20,000. The waterfront facing properties are predominantly sea facing which face erosion from wave action and storm surges. Other waterfront properties are river facing.

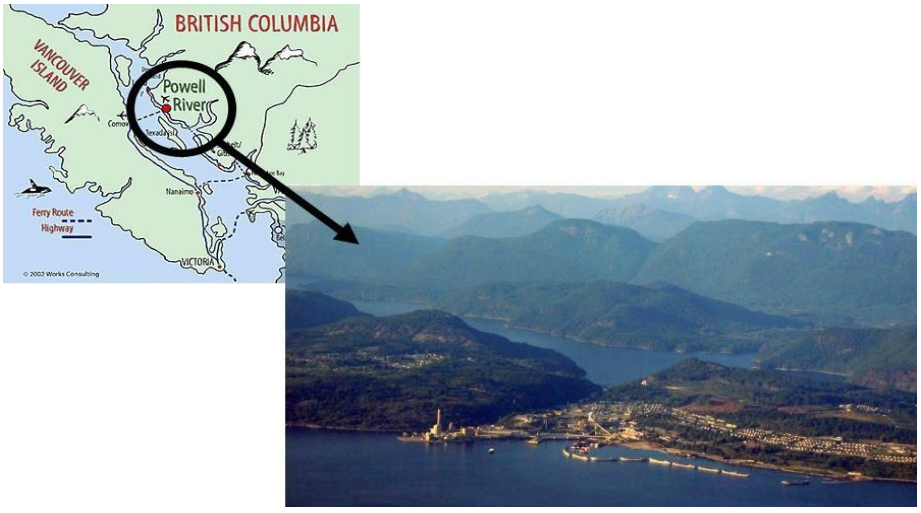

Figure 2: Powell River sits on the sunshine coast of BC. As the image shows, the district has a lot of waterfront real estate.

4. Methods:

In order to determine the best incentive to get people to renovate their shores, the study conducted a critical review of existing literature followed by a survey for the pilot community (Powell River) residents. The main takeaways from these studies were then used to evaluate the list of incentives provided by GSH.

4.1 Data collection

4.1.1 Green shores for Homes

The list of incentives to evaluate were provided by GSH. A consultation with the pilot community resulted in a list of 15 incentives (see appendix) that the people preferred. For efficiency, the list was limited to 5 incentives that were most realistic to use for this study. The incentives cover all the different types by being a mix of financial, regulatory and educative. These 5 incentives were further evaluated (Table 1).

Table 1: List of possible GSH incentives. The 5 incentives are a compilation of the initial list of 15 incentives and are comprised of financial, regulatory and educative incentives.

Incentives	**Description**
Free Homeowner workshops	GSH covers the cost for the workshops. Usual GSH workshops are for 20 people
Free Shoreline assessment	GSH covers the cost of the shoreline assessment
Assistance with shoreline project design	GSH would cost share the project design costs by partly covering the contractor cost
Free Green Shores for Homes project certification/ easier project permits	GSH would cover the cost of enrolment in the GSH program project certification[3] in the hope that it would make the permitting process easy
Gaining more information about implementation of Green Shore for Homes project	GSH would make available more information on shoreline assessment and design. For example by creating an online shoreline assessment toolkit for homeowners.

4.1.2 Climate Adaptation Program Case Studies

Case studies of similar climate adaptation programs were reviewed to gain insight on their incentive programs models and their experience implementing them. Four programs were chosen. **Living Shorelines (Chesapeake Bay area, Virginia & Maryland)** and **Shore Friendly (Washington)** are two US programs that are similar to the GSH program and that they both advocate for greener shorelines. While Green

[3]GSH project certification may, in some circumstances, enable an easier local and provincial permitting process

Infrastructure (**Low impact development** application) and **Leadership in Energy and Environmental Design (LEED**) are both climate change adaptation programs that focus more on green buildings and provide a broader perspective climate change adaptation incentives. The LEED program is similar to GSH such that both are certification programs. We obtained information by literature research, reading program reports, and communicating with program personnel. Insights on the programs, the incentives used, and their effectiveness were sought. Overall, the case study review gives a holistic perspective when evaluating the set of 5 incentives.

4.2 Survey--Opinion of Pilot Community

To get an opinion on which incentive the residents of the pilot community prefer, a survey (appendix 2) asking to rank the 5 incentives was created. The survey also aimed to get a preliminary idea of how much the community knows about the GSH approach. The survey was to be filled online and a link to the survey was posted on the Powell River Regional District website. Two newspaper ads about the survey were placed in the local paper and direct emails with the survey link was sent to a list of Powell River district residents. The survey was sent out mid-March. The results of the survey help weight which incentive works best.

4.3 Cost-Benefit Analysis for GSH

Data for the costs of the incentives came from the case studies **Shore Friendly** and **Living Shoreline.** The cost for each incentive was then normalised to per homeowner for better comparison. The benefits for GSH and for homeowners can not be converted to monetary value, and are therefore only listed.

5. Results

5.1 Case Studies

Case study 1: Shore Friendly in Washington State, USA

The Shore Friendly project is a project that aims to reduce the amount of hard shores along the shoreline of Puget Sound in Washington State, US. Its objective is very similar to that of the Green Shores for Homes (GSH) project here in British Columbia, Canada. The only difference is that the main goal for Shore Friendly is hard shore removal, whereas GSH is focused on stopping new hard shores from being built

and encouraging adoption of soft shore.

The Puget Sound is divided into 12 regions, each region having its own local governing body and organizations in charge of their hard armoring removal program [2]. Here, we present the related information and findings.

Background:

Shoreline property owners tend to [3]:

- Have high income, elderly
- Have strong voting habits
- Think the area is in good health
- Want to do the right thing but don't know what it is, wants further details (centralized educational info would be useful)
- Don't understand how armours impact coastal ecosystem, never considered removing armours

Most waterfront homeowners see erosion as their primary concern, and some think that armor is needed to protect certain features of their property [3]. An average of about one in three of shoreline parcels are owned by person living abroad [3].

There are several common barriers to program participation:

- Lack of awareness of soft shores as a better alternative and why [1]
- Not enough financial incentive, some concerned about the safety of their investment [3]
- Uneasiness in working with regulatory bodies [1]. Requires fact-to-face meetings with property owners, from trusted source (people suspicious about people trying to sell things, and government punishment) [3]
- Difficulty with permit process [1]

Knowing these, the GSH will have some idea about the areas they should focus on, such as: more public education, providing financial incentives, negotiating with the government about easier permitting process, and be considerate about the way the public is approached.

Incentives Used:

Incentives were used in combination and they work together to encourage homeowner participation. Therefore, we cannot quantify or consider each incentive separately or precisely.

- Increasing awareness by using brochures, newspaper/magazines, website, videos, public outreach, site visits and informative talks (staff intensive) [1]
- Free workshops on shoreline erosion management held at each locality, can include information about [4]:
    - Coastal, beach and bluff processes
    - How to manage beach and bluff erosion
    - Native vegetation for slope stability and habitat
    - Armor removal and alternatives to hard shoreline armoring
- Free site visits from professional coastal geologists to assess erosion risk [2]
- Free professional engineering services to create a permit-ready design for bulkhead removal or installing soft shore protection [2]
- Start-to-finish assistance with permitting, including help with assessments, permit meetings, and applications [2]
- Tax breaks [2]
- May be eligible for small restoration project funding (can help with the application process) [3]
- Reimbursement/grants from local government [3]
    - **In Kitsap County, the number one incentive was the $5000 mini-project grant** (from the result of phone interviews) [1]. However, environmental stewardship was the number one motivation.
- Celebration of and reference to successful projects [1]

Budget:

The project was fully funded by the Grant Program of WA Department of Fish and Wildlife, EPA, National Estuary Program, and other partners.

According to the Northwest Straits Foundation (one of the organizations in charge), project and permitting costs varies depending on the geology of the location. Most of their projects are large in scale. Here is the approximate cost for each step: (Northwest Straits Foundation, personal communication, February 28, 2018)

- Workshops (about 20 people): ~ 3,000 - 5,000 USD (~150 - 250 USD per person)
- Site Visits: ~ 1,000-1,500 USD
- Preliminary Design: ~ 15,000 - 30,000 USD (depends on the complexity of the site)
- Permitting: Varies (500 - 4,000 USD). A bulk of the cost is from biological and

archaeological assessments, which are around 3,000 - 5,000 USD each.

Progress:

Samish Island: A successful case of 10 homes working together to convert their bulkhead to soft shores was completed. [2]

Kitsap County (pilot community): As of early 2017, 6 bulkhead removal was completed, and another 3 was ready to head into the process. [1]

On the statewide Shore Friendly website (http://shorefriendly.org/real-stories/bainbridge-island/), a few successful examples have been displayed. [2]

The above are just some examples of progress for a few of the 12 regions in Puget Sound. An observed trend is that most projects are done with multiple homes cooperating and converting their shores together. Most of the regions in this program have implemented the program since 2014, and we hope to see similar progress for GSH in British Columbia.

Interviews were conducted with homeowners who have adopted soft shore and also those that are interested in the program. Several points were observed from these interviews [1]:

- A variety of outreach methods is useful, although the most effective ones that brought the most inquiries are mailed postcards, which is the least staff intensive.
- Many who are interested in the program do not know which steps they should take next. A detailed procedure explanation would be beneficial (i.e. during workshop, online, etc.)
- Almost all of the homeowners who have adopted the program have talked to others about their progress, and served as an example for those who were waiting to see how their project goes. Word of mouth is important.

Case study 2: Living shores in Virginia and Maryland, USA

Living Shoreline Initiative in Virginia and Maryland region first took shape and was carried out widely in the Chesapeake Bay region. Much like the Green Shores for Homes Program, Living Shorelines takes a nature based approach to protecting any type of shoreline from erosion and storm surges. Led by the Centre of Coastal Resources Management (CCRM) department in the Virginia Institute of Marine

Science (VIMS), the program is supported by various municipalities and non-government organizations across the region. Furthermore, the Virginia General Assembly in 2011 implemented a policy that Living Shoreline techniques (nature based) are the preferred stabilization methods for tidal shorelines. The Living Shorelines initiative is very widespread throughout the United States with states advocating for their own version of Living Shorelines. This case study only looks at the Chesapeake Bay projects since it it's the most widely practised region [7].

Background:

- Majority of waterfront property at Chesapeake Bay is privately owned.
- The CCRM is a point of information for online technical assistance such as shoreline design. However, a lot of the incentives are directly implemented by the municipalities in the region. Regional municipalities and organisations can tailor their incentives and resources best for the people in their district.
- The program mainly uses financial incentives but are trying to implement more legislative incentives such as a faster permitting process.
- The government advocating for living shorelines makes permitting and financial funding applications a lot easier.

Incentives Used:

Legislative [7]:

- General permit regulation created to regulate and encourage living shoreline with support from Virginia department of conservation and recreation and technical assistance from the VIMS effective 2015
- Readily available information on permits on CCRM website.
- Expedited permit processes for living shorelines than for bulkheads and revetments for some areas

Financial incentives: In Middle peninsula planning district [6] :

- Loans - $10,000 financed for up to 5 years. Above $10,000 financed for up to 10 years. Interests at the published Wall Street Journal Prime Rate on the date of Loan closing. Minimum : $1000. Maximum determined by income and ability to repay loan.
- Grants being set up. In search of funders
- LSIP Insurance program - coming up

Education: CCRM has online courses [7] which include:

- Contractors and managers: provision of site assessment tools which include

geospatial tools, shoreline management guides and past reports Etc
- Free Self guided decision tools, technical design guidance, an online course to inform homeowners on what kind of living shoreline works best for them.
- Readily available information on permits and laws
- Guide to native plants and planting tidal marshes including information on native plants nurseries in the region that provide free native plants.

Budget:

Their funding comes from Virginia Coastal Zone Management Program through grants from the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended.

Case study 3: Green Infrastructure (Low impact development application) in Philadelphia

L*ow* Impact Development *(LID)* is an approach to land development that works with nature to manage stormwater as close to its source as possible. This approach focuses on maintaining or restoring the natural hydrological processes of a site, providing opportunities for natural processes to take place.Some key principles in LID include:

- preserving natural site features
- small scale, integrated stormwater management controls
- dispersed throughout the site
- minimizing and disconnecting impervious areas
- controlling stormwater as close to its source as possible
- prolonging stormwater runoff flow paths and times
- creating multi-functional landscapes

Background:

Philadelphia city has adopted the ‘Green city, Clean water’ plan to mitigate stormwater, and reduce water pollution. Since the plan was implemented in June 2011, Philadelphia Water and private developers have added over 1,100 green stormwater tools to their landscape.

Incentives Used*:*

The four commonly used local incentive mechanisms includes fee discounts or credits, development incentives, best management practice installation subsidies,

and awards and recognition programs.

1. Fee Credits & Grants
   - PWD assesses commercial property owners with stormwater fees based on lot size and percent imperviousness.
     - e.g. Stormwater Credits program: Reduce commercial property owners' monthly fees by installing LID practices
   - Help them pay for LID practices (In 2012, city awarded around $3.2 million in grants)
   - Rain Check program: PWD compensates homeowners for about 80 percent of the cost of installing LID, or "Green Tools".

2. Contests and Awards
   - Design contest to encourage local participation and innovation
     - *e*.g. PWD started a design competition in 2013 named "Infill Philadelphia: Soak It Up!" to challenge interdisciplinary teams to design and develop new LID and green infrastructure models. Winners can receive recognitions and a $10,000 prize

3. Recognition program
   - Feature successful LID sites in newspaper articles, on websites and in utility bill mailings.
   - Issue yard signs to recognize property owners who have installed LID.
   - The program can help to increase property values, promote property sales and rentals, and generally increase demand for the properties.

4. Workshops and Give-Away Program
   - PWD holds rain barrel workshops several times each year and provides one free rain barrel to each participating household.
   - Offers a variety of online educational materials.

5. Development Incentives
   - Reduce permit fees
   - Expedite the permit process
   - Allow higher density developments
   - Provide exemptions from local stormwater permitting requirements for developers that use LID practices.

Case study 4: Leadership in Energy and Environmental Design (LEED)

LEED is developed by a non-profit U.S Green Building Council (USGBC) and aims to help building owners make environmentally friendly and resource efficient decisions through a set of rating systems approved globally. Its financial incentives (free technical and design assistance) are comparable to the GSH approach, and have been proven to be successful in many regions.
Buildings can qualify for four levels of certification: certified, silver, gold, and platinum, based on the amount of points earned through multiple categories such as energy use and air quality. Having over 100,000 projects worldwide, any building owner can become LEED certified as long as their building is qualified for energy efficiency and evaluated by a LEED inspector. Canada has its own branch in LEED run by the Canada Green Building Council (CAGBC). British Columbia is actively involved in the LEED program, and has mandated that all publicly-owned new construction and major renovation projects must achieve at least LEED Gold certification.

Background:

- LEED has had many rating systems (LEED New Construction (NC) v1.0, LEED NC v2.0, LEED 2009 (v 3.0), LEED v4.0)
- As of October 31 2016, all new projects must use LEED v4.0
- There is a LEED for every type of building project: Building Design and Construction, Interior Design and Construction, Building Operations and Maintenance, Neighbourhood Development, and Homes
- Since 2004, CAGBC has certified over 2800 LEED buildings in Canada and registered over 5000, with the 2nd highest number of LEED projects in the world
- Since 2002, LEED Canada has made significant improvements in energy savings, water savings, recycling, GHG reduction, and green roofs
- There are minimum program requirements, such as complying with environmental laws, must be complete and permanent building, reasonable site boundary, etc...
- The rating levels: Certified, Silver, Gold, Platinum aims to inspire project teams to seek innovative solutions, while saving homeowners money over a project’s life cycle

Incentives Used:

- automatic 100% real property tax exemption of the assessed property value

for newly constructed or rehabilitated commercial or residential properties that earn a minimum of LEED Certified (Cincinnati, Ohio)

- construction materials for a qualifying LEED building that are deemed "inseparable" parts, such as concrete or drywall, are exempt from local taxes (Nevada)
- funding half of the required additional cost for public school construction or renovation to attain LEED standard (Maryland)
- USGBC announced a program called LEED Earth that refunds LEED certification fees to the first LEED-certified project in the countries that so far lack one
- other common incentives include: tax credits, tax breaks, cost savings on monthly energy bills, priority or expedited permitting, free or reduced-cost technical assistance, grants and low-interest loans, sell home faster and for a higher price
- non-monetary incentives include: reducing carbon footprint and water waste, positive environmental image, better indoor air quality, increasing energy efficiency

5.2 Cost benefit analysis of Green Shore incentives

5.2.1. Cost for homeowners

NONSTRUCTURAL (PLANTING GRADING/FILL)	HYBRID (MARSH + SILL)	BREAKWATERS (OFFSHORE)	STRUCTURAL (REVETMENT)	LOCATION	DATE
$100-200	$250-$400	$450-$600	$500-$1,200	Maryland	circa 2014
$100-225	$250-$700	$450-$1,000	$500-$1,500	Delaware Estuary	circa 2012
$45+	$120-$395	$125-$200	$115-$285 (low energy)	Northern Gulf of Mexico	circa 2008
$50 - $100	$150-$300	$350-$500	$500-$1,000	Maryland	2007
$45+	$100+	$150-$250	$115-$1,200	Florida	2008

Figure 3: The range of initial construction cost (USD/ linear foot) for a range of waterfront design [17]

According to the initial cost of constructing a **Living Shoreline** ranges from USD 100 to USD 1200 per linear foot. The yearly maintenance cost (for a 50 year project) ranges from about USD 100 to USD 500 per linear foot [5]. Figure 3 shows the initial costs and the final costs of a range of shorelines

5.2.2 Cost for SCBC

The cost of each incentive was determined by the costs specified in the Shore Friendly case study (Table 2 and Figure 4). The estimate is an average of the upper and lower bound.

Table 2: Table summarising the upper, expected and lower bound costs for all the incentives per homeowner. The costs are derived from the Shore Friendly program. The table shows that the most expensive incentive is assistance with shoreline project design while the cheapest is more information about implementation of green shores for homes.

Incentives	**Lower bound (CAD)**	**Expected (CAD)**	**Upper bound (CAD)**
Free Homeowner workshops	*$*190	**$255**	*$*320
Free Shoreline assessment	*$*1280	***$1590***	*$*1900
Assistance with shoreline project design	*$*9500	***$15000***	$19000
Free green shores for homes project certification/ easier project permits	*$*650	***$650***	*$*650
Gaining more information about implementation of green shore for homes project	$0	**$10**[4]	$20

[4] According to SCBC current costs for communications (including community engagement/ websites/ social media/ staff, brochures) is about $7000/year. Assuming 50% of 7000 is for GSH and there are about 350 people that they can have an outreach too, the cost per person is 10

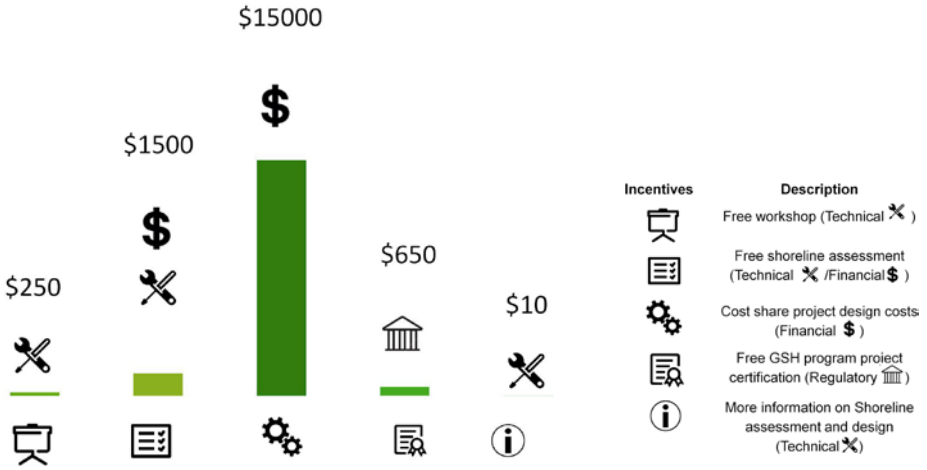

Figure 4: Visual comparison of costs from table above for GSH

5.2.3. Benefits of GSH

The benefits for GSH are determined based on a critical review of Living Shoreline and Shore Friendly (Table 3) as well as the survey results.

Table 3: Table listing the benefits of each of the incentives for GSH. The benefits are derived from the experiences of all the case studies with an incentives similar to the one presented here. Unfortunately, there are no numerical values. This comparison is a qualitative one.

Incentives	**Benefit**
Free Homeowner workshops	The format for the workshops are already set up. Only registration fees need to be waived
Free Shoreline assessment	Fees waived for Shoreline assessment. May need form partnership with a marine contractor
Assistance with shoreline project design	Cost share the project design costs with the homeowner. Can be implemented by setting up loan or grant programs for the homeowners. Funds for the program can be obtained from Government of Canada under the EcoAction Community funding program

Free Green Shores for Homes project certification	GSH enrollment fees are waived.
Gaining more information about implementation of Green Shores for Homes project	Will require research work into the type of techniques used by other programs to provide information. May include technical consultation fees make toolkits

Survey results

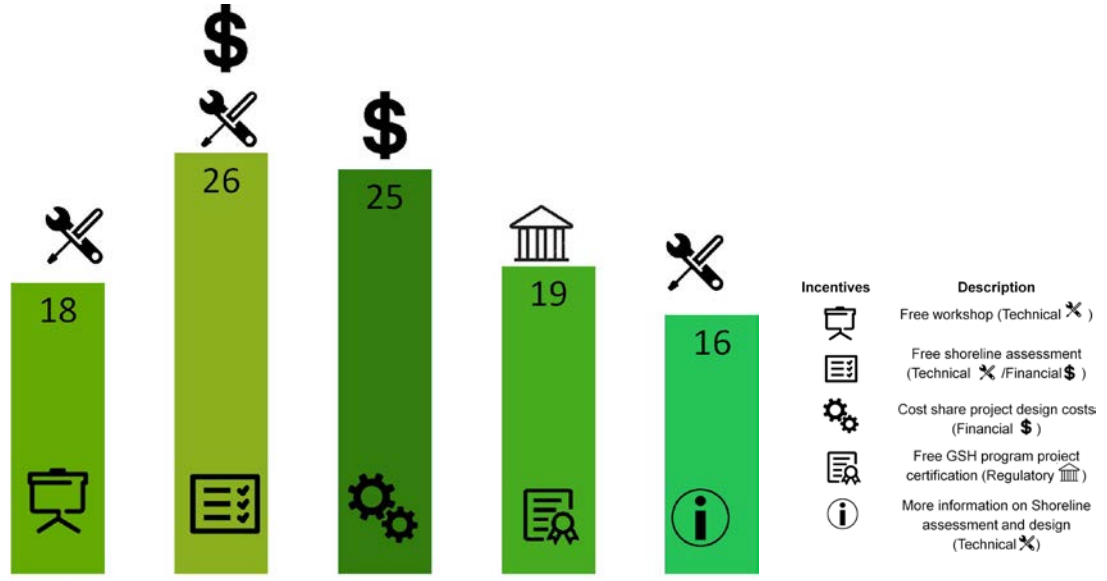

Figure 5: showing the results of the survey. Calculation is shown in appendix. Overall, 9 people have done the survey, and their preferences to incentives are ranked as shown in the figure above. Based on the results, we can find that the combination of financial and technical incentive, which is free shoreline assessment is given with the highest score, while the technical incentives of providing more information on shoreline assessment and design is given with the lowest score.

5.2.4. Benefits to Homeowners

Soft shores aim to preserve and restore natural physical processes that maintain healthy shorelines, which may otherwise be disrupted by hard shores. Since Green Shores also enhance shoreline and aquatic habitats for animal and plant communities, homeowners can continue to enjoy their company while simultaneously having a hand in conserving biodiversity. Additionally, this program prevents/reduces pollution of the aquatic environment, improves air quality from added vegetation, as well as protection against erosion and flooding. Making shorelines accessible and

eliminating walls creates opportunities for recreational waterfront activities, such as swimming, kayaking, and strolling on the beach. Overall, converting to soft shores reduces the cumulative negative impacts of construction and maintenance-related disruption from hard shores while creating a environmentally-friendly and aesthetically-pleasing shoreline for homeowners.

6. Discussion

Using the information gained from research and communication with related organizations, we were able to derive incentive suggestions from past sustainability projects. We also gained understanding of the perception of the program by our pilot community. Below, we discuss what we learnt from each case study, the survey results and the cost-benefit analysis, and what we can take away from them to help us better deliver the Green Shores for Home program in Powell River Regional District.

Case studies

#1. Shore Friendly

Having an already developed system for hard shore conversion, Washington State serves as a great example and produces many useful experiences for those that want to take on this project. From the results of the interviews conducted with homeowners in the program, we conclude the following.

Firstly, soft shore implementation is not yet a widely known option to deal with erosion, as many in the communities are not familiar with this option and its benefits. Many would benefit from more scientific knowledge on the shore processes, and the impacts of hard shores structures, such as bulkheads and seawalls. Raising awareness in such topics is important for the promotion of the program. As the most effective was word of mouth and mailed postcard for Kitsap County [1], GSH could consider this approach by incorporating more passive outreach (i.e. booths, postcards, media) and celebrating successful soft shore implementations.

Secondly, more detailed description of the process of converting to soft shore would make homeowners more clear about the steps they should take, and provides more incentive. Guidance throughout the procedure, including project design and permit process, would be helpful.

Although concern for the environment motivates homeowners to consider the program, financial incentives are the most important to homeowners [1]. Understandably, this largely decides whether or not they want to go ahead with the project. Clear directions and information on all forms of available financial incentives

Would be very helpful.

#2. Living Shorelines

Living Shorelines, in Virginia and Maryland, is supported by VIMS, a research institute which provides technical assistance. Furthermore, the government also supports soft shores. This does make it easier for the CCRM to gather momentum for the movement. However the main incentive takeaways are:

- For financial incentives use cost share method. Provide grants, loans and insurance programs for the homeowners to share the cost of the shoreline designing. Funds for the following can be applying for the EcoAction Community Funding Program by Environment provided the government of Canada
- For regulatory incentives the best way to go is by streamlining the permitting process
- For educative incentives, provide toolkits online for the shoreline assessment and designing. If possible, a course for shoreline design can be uploaded for any marine contractor.

The most striking feature of living shorelines was its extensive educative toolkits available online [7].

#3. Green Infrastructure (LID)

Green Infrastructure is a sustainable building concept that has been widely applied in both the US and in Canada. Similar to the Green Shore program, Green Infrastructure is also an application for climate adaptation. Both of their objectives are to replace concrete, impervious constructions with natural-like green buildings. Through the study of Green Infrastructure in Philadelphia, we can find that the incentives GI used are similar to what proposed by Green Shore for Homes. The one incentive that was not included in GSH is the ‘Contest and Awards’. This incentive can encourage local participation and innovation. According to Infill Philadelphia, 300 people attended the ‘Soak it up’ contests. This event attracts architects, landscape architects, engineers, and other sustainability professionals. It is also a great opportunity to let more people know about the program. Hence, with enough budget, starting a Green Shore design contest could also be an effective way to increase involvement.

However, since Green Infrastructure is funded by the EPA in the US and by the Infrastructure Canada in Canada, their funding could be more sufficient. Furthermore, unlike the Green Shore program which has the shoreline homeowner as their target audience, the Green Infrastructure is applied in public, commercial and residential infrastructure. Therefore, not all of their ideas and methodology are appropriate for the

Green Shore program to adopt.

#4. Leadership in Energy and Environmental Design (LEED)

As one of the renowned leaders for certifying environmentally friendly and energy efficient buildings worldwide, LEED provides a set of rating systems and four different certification levels to design, construct, and operate green buildings.

This program draws parallels to the Green Shores program as they both involve homeowners enrolling in the program and having their homes certified.

Although some incentives of the programs may differ, but the end goal is similar - to create a better overall environment for the homeowners, the people living around them, and the local ecosystem. Since LEED is a program that operates globally, the incentives differ from place to place and are usually decided by the local LEED branch or government. A few incentives that existing or prospective environmental programs should consult include tax credits, reduced fees on monthly bills, free or reduced-cost technical assistance, low-interest loans, and many more.

Ultimately, giving building owners enticing reasons to have their properties certified by a green building certification program results in a win-win situation for both humans and the environment.

Survey Results

From the survey results, we can find that financial incentives and technical support are the top two most favored incentives. At the same time, the lack of financial support is the primary reason for people to not adopt the GSH program. The results indicate that the financial support (i.e. grants, funding) is more needed by the local residents. With that in mind, we suggest the GSH to work on providing more financial incentives in order to encourage more people to participate in the program.

The survey is important because it conveys the voice of homeowners in the pilot community to GSH. However, the survey is just a preliminary one. A much more detailed study, such as focus groups, should be done to get more statistically sound opinion of the community.

Cost and Benefit Analysis Results

After conducting the cost and benefit analysis, we can conclude that the most costly incentive is ‘assistance with shoreline design’ and the least costly incentive is free shoreline certification. The benefits of each incentive are hard to quantify and difficult to compare. The determination of which incentive program works best is left best to GSH program since they know their circumstances the best.

7. Conclusion

Throughout the study, we identified many incentives that are effective in maximizing the length of hard shores removed or converted to soft shore. The top motivator is environmental stewardship, although more outreach is needed to increase awareness and knowledge on this topic and maximize the impact of this program. The top incentive is financial support, which suggests that more could be invested in developing different kinds of financial incentives. Barriers include difficult permitting process, which provide incentive for more government involvement to promote easier permitting for soft shores.

While they come from past projects, they can be adapted for other communities. This report provides useful information for organizations which want to introduce similar programs into their community. With the expansion of similar programs, we believe that redesigned soft shores would continue to increase in number and length.

Our suggestions for what comes next would be to work on easier permitting process, more funding and financial incentives, and more public education on the soft shore alternative. As for further studies, interviews with homeowners who have completed the project would be of great help to understand their needs and preferences about certain aspects of the program. Effectiveness of the incentives were hard to quantify, and this is also something that could be studied on more.

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10. Appendices

A1. Survey Questions

Q1. Are you over the age of (including) 19? YES/NO

Q2. Are you a waterfront property owner? YES/NO

If yes, are you concerned about shoreline erosion/ sea level rise? YES/ NO

Q3. Are you familiar with Green Shores approach for shoreline projects? YES/ NO

Q4. Have you adopted a Green Shores approach on your property?

Not Applicable

No

Yes

- If yes, would you be willing to offer your property as a demonstration site?

Q5. From your perspective, rank the following that would discourage adoption of a Green Shores approach (with 1 being the most discouraging and 5 the least)

- Cost of shoreline assessments
- Project design costs (engineering, landscape, etc)
- Permitting issues
- Lack of information/unsure of who to talk to about Green Shores
- Unsure

Q6. From your perspective, rank the following incentives that would encourage adoption of a Green Shores approach (with 1 being the most desirable and 5 the least)

- Free Homeowner workshops
- Free shoreline assessments
- Assistance with shoreline project design
- Free Green Shores for Homes project certification that may enable easier project permitting
- More information about how to implement a Green Shores project
- Unsure

A2. List of Incentives

15 incentives/strategies resulting from consultation with pilot community:

- Financial incentives for soft shore armouring or removal of hard shore armouring including tax incentives, interest-free loans, project grants, etc.
- Simple and streamlined processes and approvals for permitting, conservation covenants, etc
- education and resources such as workshops, simple guidelines, and free site assessments for homeowners
- free expert advice and support (without sales focus) such as a local Green Shores ambassador or technical ecologist
- Free erosion assessment by a third party not linked to the government or insures
- Regonocation and rewards for Green Shores properties to help support market recognition
- Simple joint agreements or group rates for the projects across multiple properties
- Demonstration projects, tours, testimonials
- Regulations and enforcement to guide waterfront development (setbacks, siting, landscaping, flood plain, servicing, sewage treatment, runoff, soil removal, and deposit, etc)

A3. Calculations and Assumptions

- The functional unit for comparison is CAD. The original USD estimates were converted to CAD using the current conversion rate of 1 USD= 1.28 CAD.
- For survey, the ranks for Q6 (incentive preference ranking), the ranks were added up for each incentive. 1 being the high preference and 5 being lowest preference. Sum of each incentive ranking was deduced by 45 (highest possible sum) to invert the sum so that the preferred incentive has the highest score. This was done for better visualization of the results