



How do you integrate co-benefits
into a NBS value proposition?

Living with Water—Case Studies

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Overview

- Challenges in the Fraser River Delta
- Need for Values-based Approaches
- Living with Water Project Overview
- NbS Case Study Projects
 - ✦ *Boundary Bay Living Dike Pilot Project*
 - ✦ *Sturgeon Banks Marsh Recesson Project*
 - ✦ *Vancouver Sea2City Design Challenge*
 - ✦ *Tsleil-Waututh Nation Shoreline Visualization Project*
- Considerations Moving Forward



Urbanized Delta

Living with Water—Background

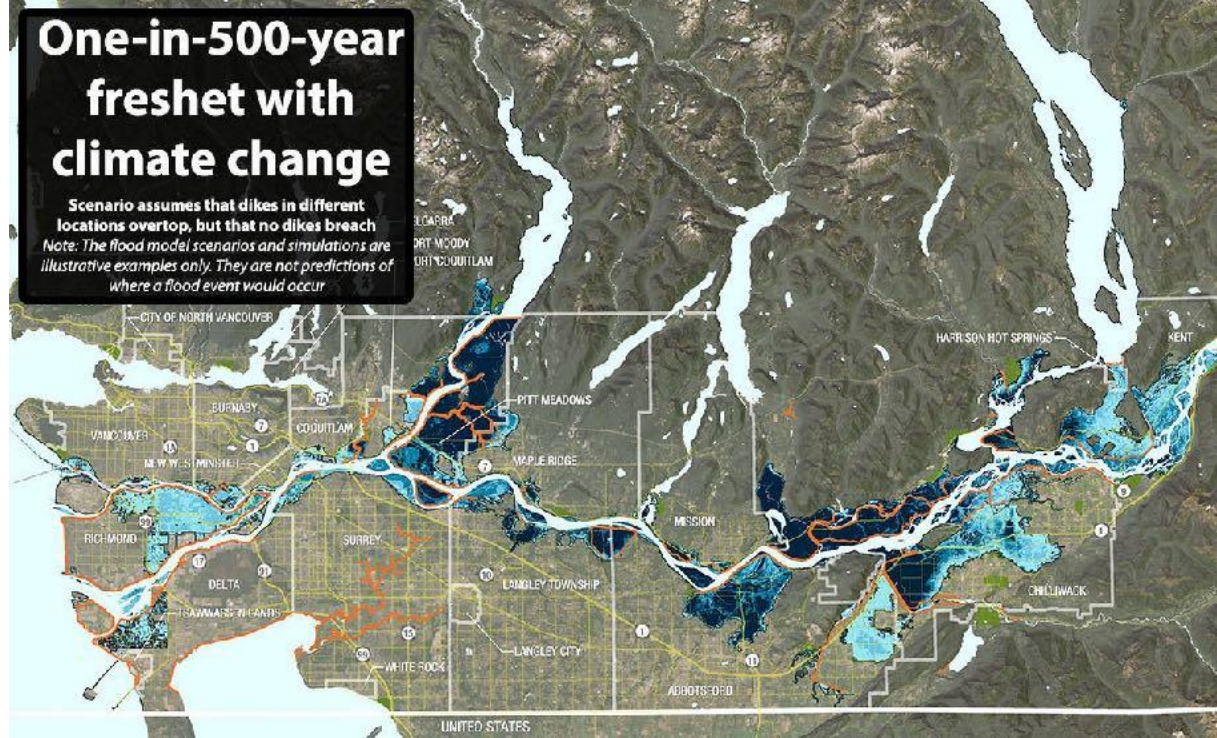
- **Projected growth** of 1 million people and 500,000 jobs over the next 20 years;
- **Complex jurisdictional environment:** 25 municipalities, 11 First Nations, and quasi-governmental authorities that occupy coastal areas (POV, YVR);
- **Pacific Flyway:** the region hosts critical habitats for fish (salmon, herring, sturgeon) and migratory birds;
- **Fraser River Estuary:** 102 species at risk of local extinction due to urbanization, fragmented habitats and climate change/sea level rise.



Flood Vulnerability

Living with Water—Background

- Nearly three-quarters of the 250km of dikes in the region are vulnerable to overtopping from coastal or riverine flooding
- Only 4% of dikes meet current provincial dike height and design standards.
- It will require an estimated \$9.5 billion (2011) to update and reinforce the dikes to protect the region against the impacts of climate change and SLR.



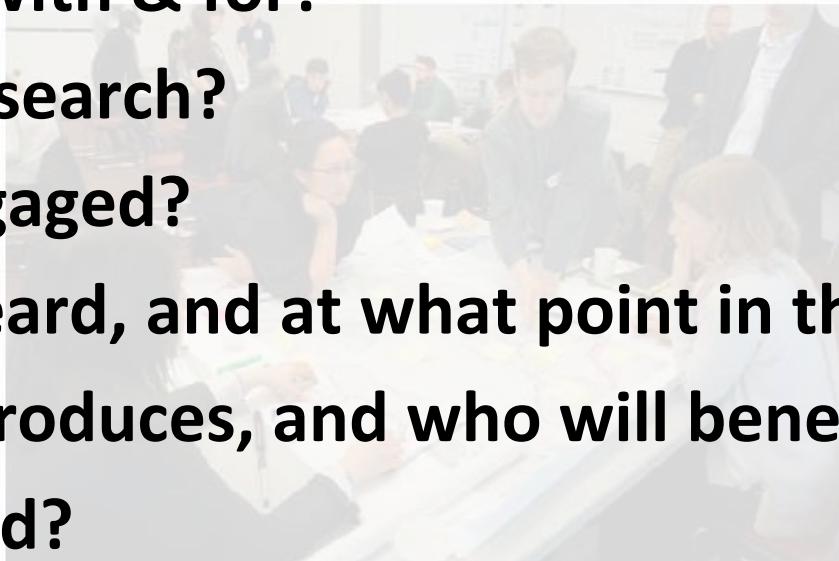
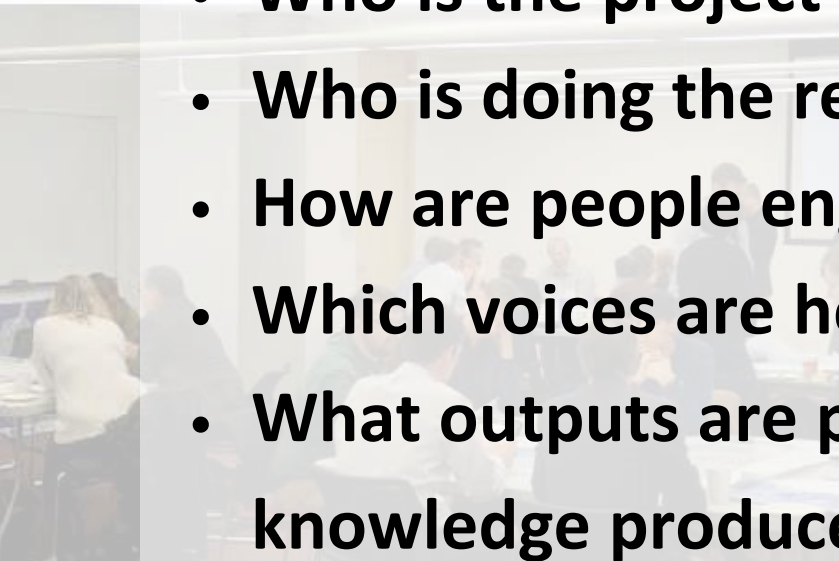
Values-based Approach

“What is considered successful and legitimate adaptation...is determined in part by what people perceive to be worth preserving and achieving, and these in turn hinge on their underlying values and objectives.”

“Values, climate change, and implications for adaptation: Evidence from two communities in Labrador, Canada,” *Global Environmental Change*, 2013
Johanna Wolf, Ilana Alice, Trevor Bell

Accountability

- Who is the project with & for?
- Who is doing the research?
- How are people engaged?
- Which voices are heard, and at what point in the process?
- What outputs are produced, and who will benefit from the knowledge produced?



Adaptation & Decolonization

RECONSTRUCTION

With higher risk of inundation of areas in the lower floodplain, the reconstruction of the lower floodplain will need to focus on construction on the higher ground. There are also opportunities to integrate green infrastructure with improved water management strategies in the future through the use of floodgates.

SLOPE STABILIZATION

Due to the increased risk of flooding on the river's left bank, the slopes that have the angle of the lower river valley have become exposed to higher risk of erosion. Slope stabilization through planting of trees and other vegetation management can greatly reduce the risk of erosion and further assist in the stabilization of these slopes.

DEMOLITION

In a mixed scenario, the removal of development within the floodplain is an essential strategy to well serve the river and its future. The risk area may not be necessary for food and water, but also allow for the growth and expansion of the river's floodplain along the banks of these rivers.

EARTHWORK REORGANIZATION

In a mixed scenario, the removal of development within the floodplain is an essential strategy to well serve the river and its future. The risk area may not be necessary for food and water, but also allow for the growth and expansion of the river's floodplain along the banks of these rivers.

RIPARIAN RESTORATION

The growth of riparian corridors are required for both the recovery of the river and the floodplain. The growth of riparian corridors are required for both the recovery of the river and the floodplain. The growth of riparian corridors are required for both the recovery of the river and the floodplain.

EROSION MITIGATION

Erosion mitigation strategies may be required by riparian corridors to stabilize the growth of the river and floodplain. The growth of riparian corridors are required for both the recovery of the river and the floodplain.

Living With Water

1. **Foreground Indigenous perspectives and community values** in coastal flood adaptation processes;
2. **Provide decision-support tools for alternative flood adaptation solutions** (e.g. nature-based solutions, managed retreat, multi-functional dikes);
3. **Support the development of multi-level governance arrangements** for regional coastal flood adaptation.

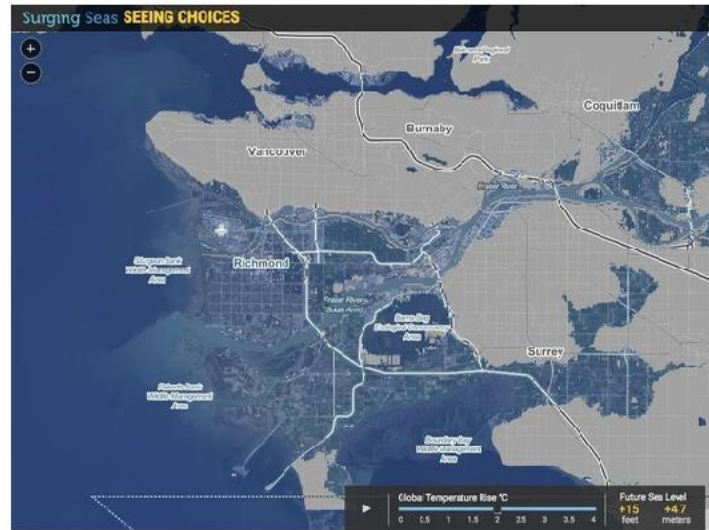


News / Local News

Wetlands, not walls, may be key to managing flooding as sea levels rise

Low-lying wetlands, salt marshes and natural assets could well be potent tools to manage flooding as sea levels rise by up to one metre over the next 80 years

Randy Shore
Dec 20, 2020 • Last Updated 16 days ago • 3 minute read



Under some climate-change scenarios, Richmond, Delta, much of Surrey and areas between Coquitlam and Pitt Meadows would be in danger of inundation due to rising sea levels. PHOTO BY CLIMATECENTRAL.ORG

As sea levels rise, building higher walls may not be the best way to protect property, infrastructure and ecosystems in southwestern B.C., according to the leader of a four-year project aimed at co-ordinating local adaptation efforts.

Low-lying wetlands, salt marshes and natural assets are not just valuable habitat for wildlife, they might also be potent tools to manage flooding as sea levels rise by up to one metre over the next 80 years, said Kees Lokman, director of the UBC Coastal Adaptation Lab.

B.C. lacks overarching authority to oversee coastal flood management, ecosystem conservation: researcher

BRENNA OWEN
VANCOUVER
THE CANADIAN PRESS
PUBLISHED DECEMBER 21, 2020
UPDATED DECEMBER 22, 2020

COMMENTS SHARE TEXT SIZE BOOKMARK



Boats are battered by waves at the end of the White Rock Pier during a windstorm in White Rock, B.C., on Dec. 20, 2018.

DARRYL DYCK/THE CANADIAN PRESS

Parts of British Columbia could see massive losses if the province doesn't start planning for flooding as ocean waters rise and storms surge due to climate change, says a researcher at the University of B.C. in Vancouver.

News / Local News

Building higher dikes may be a losing battle, experts warn

Tough decisions lie ahead as climate change means "we're not going to be able to permanently exclude water from some of these areas."

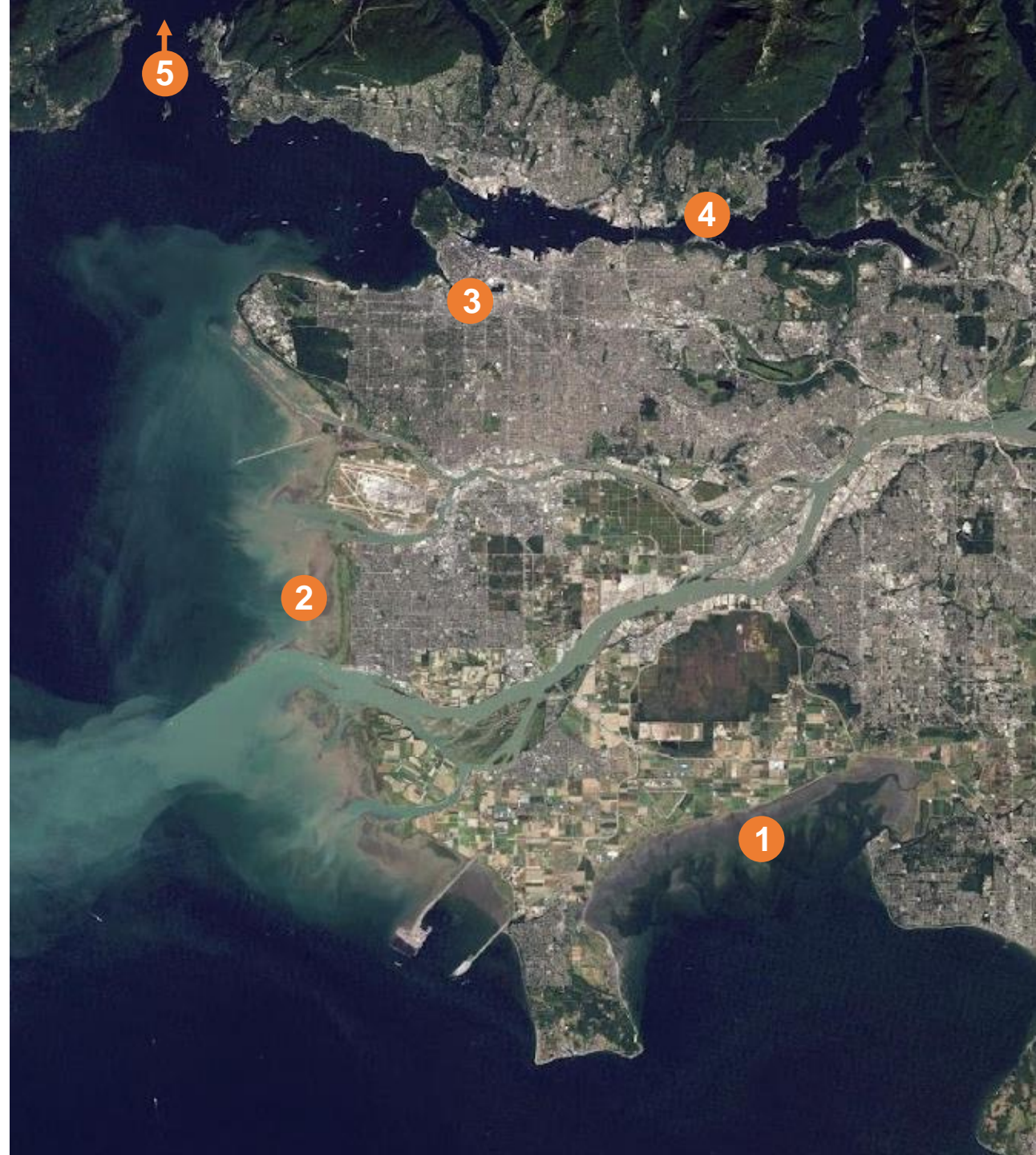
Glenda Luymes
Dec 05, 2021 • December 5, 2021 • 4 minute read • 39 Comments



Rancher Dave Zehnder in a riparian area. The head of Farmland Advantage works with farmers to protect and restore natural land, which can help prevent flooding. PNG

NbS Initiatives

1. **Boundary Bay Living Dike Pilot Project**
2. **Sturgeon Banks Marsh Recession Project**
3. **Vancouver Sea2City Design Challenge (False Creek)**
4. **Tsleil-Waututh Nation Climate Resilience / Shoreline Visualization Project**
5. **Squamish Siyích'em Reserve Dike**



Boundary Bay Living Dike Pilot Project

Case Study Areas

Creation of a gradual slope on the seaside to enable growth of salt marsh vegetation & mitigate/reverse coastal habitat squeeze

- Living Dike provides critical habitat for migratory birds and juvenile salmon
- Living Dike helps with wave attenuation and buffering of storm surges
- Living Dike can be nourished and adapted over time
- Height of the dike is limited as compared to what is required for a standard dike

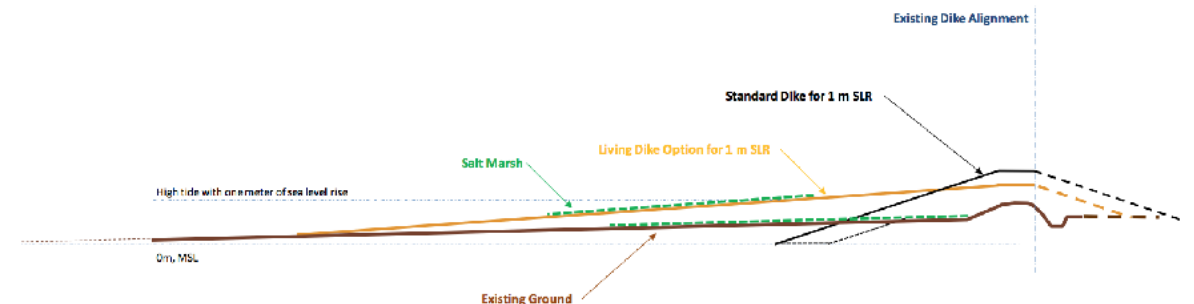
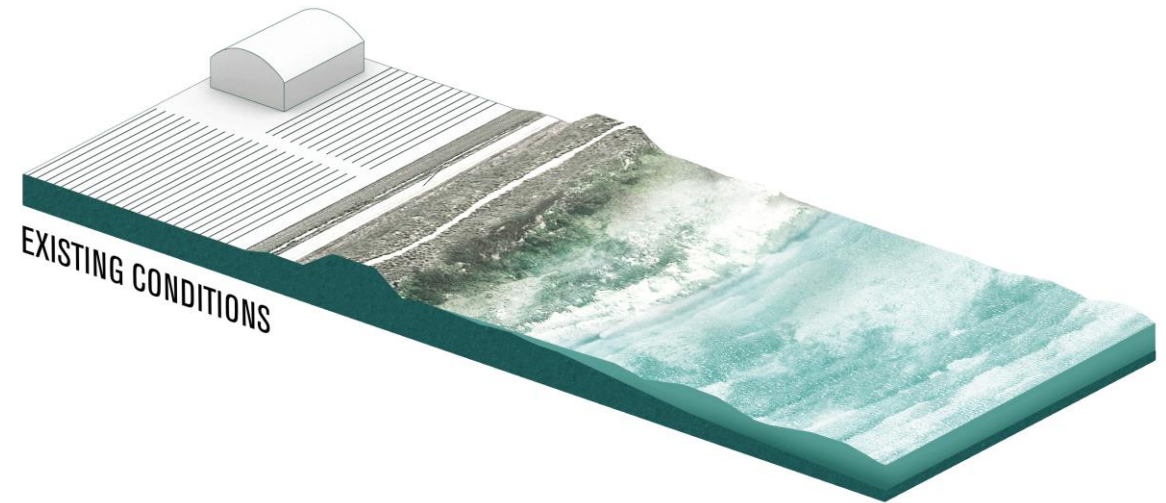


Figure 1: Schematic Illustration of a potential Living Dike Option and a Standard Coastal Sea Dike for 1 m of SLR

Based on existing coastal sea dike in Boundary Bay (shown as part of the Original Ground)

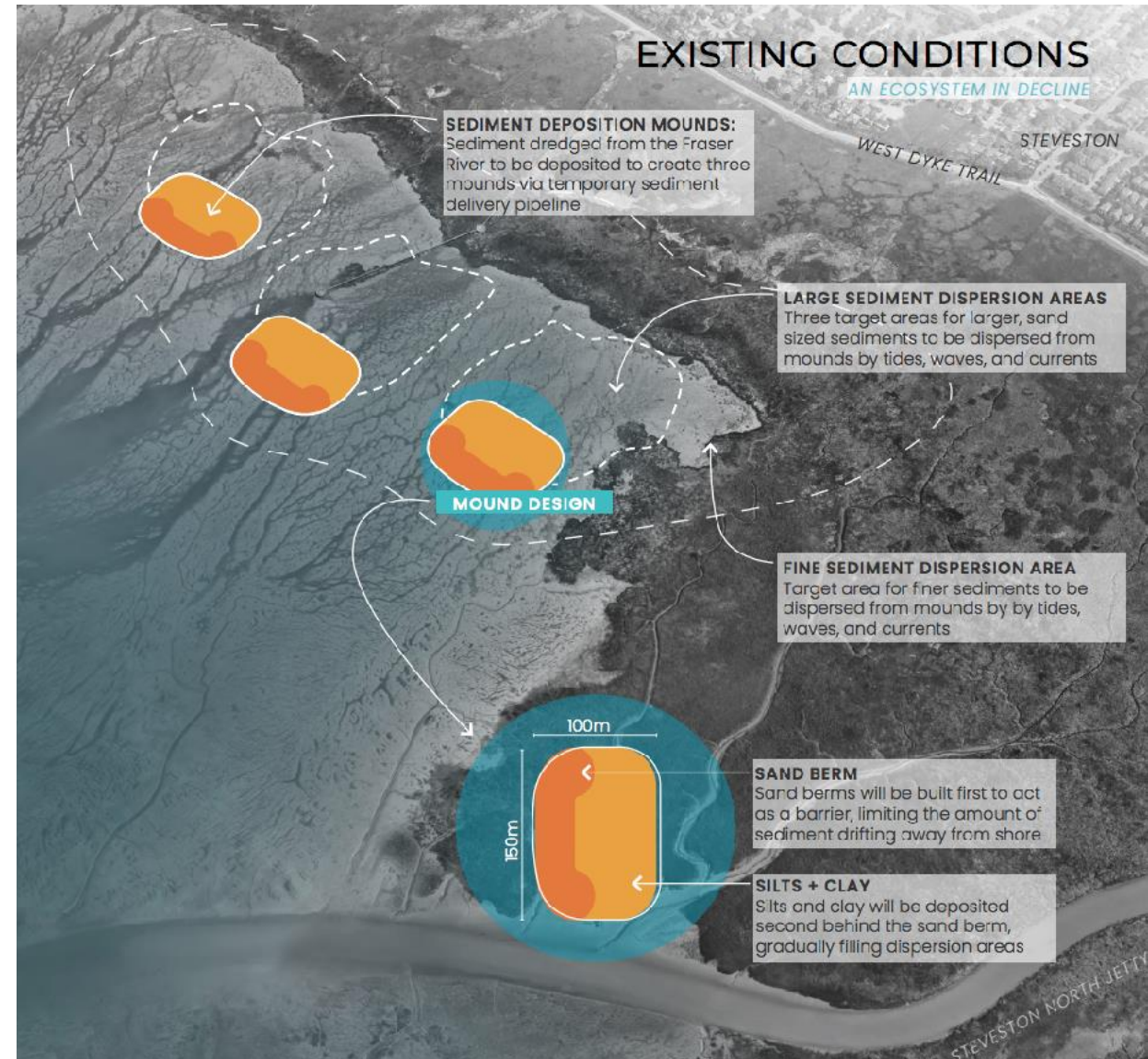
Standard Dike location selected to minimize intrusion on existing land-use.

Sturgeon Banks Marsh Recession Project

Case Study Areas

Sediment diversion & nourishment to help mitigate erosion and and(re)establish intertidal marsh vegetation

- Marsh provides critical habitat for migratory birds and juvenile fish
- Marsh helps with wave attenuation and buffering of storm surges
- Marsh provides passive recreation benefits
- Successful implementation of sediment diversion would limit the height of future dike reinforcements behind the marsh

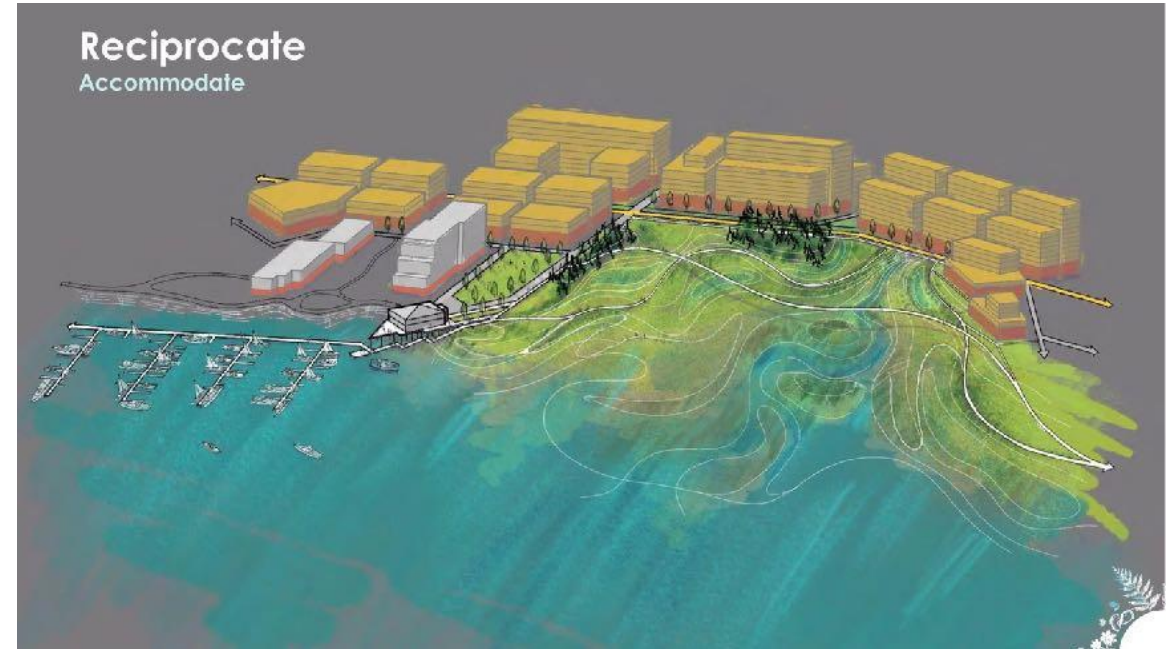


Vancouver Sea2City Design Challenge

Case Study Areas

Explore coastal adaptation approaches that respond to the social equity, economic, and ecological challenges posed by sea level rise and coastal flooding

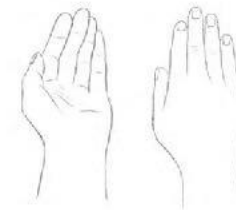
- Expand toolbox of coastal flood management approaches
- Increase public awareness of climate change and sea level rise
- Rethink the language and timeframes used to approach coastal flood adaptation
- Investigate coastal adaptation approaches for sea level rise beyond one metre



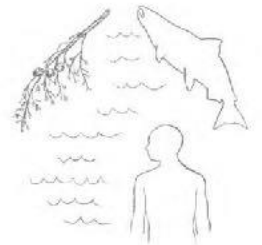
RESIST
ACKNOWLEDGE



ACCOMMODATE
RECIPROCATATE



MOVE/AVOID
REPAIR

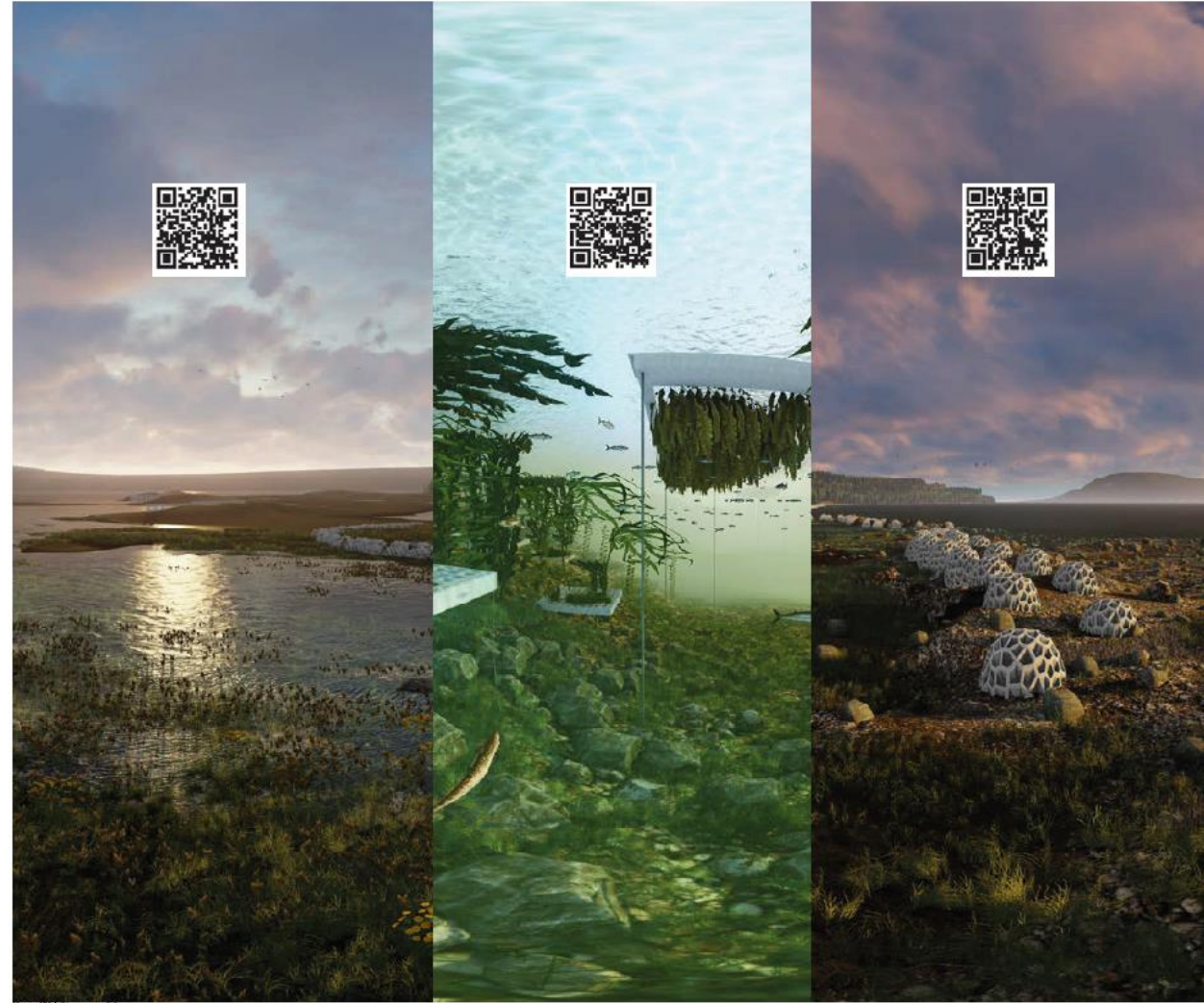


Tsleil-Waututh Nation Shoreline Visualization Project

Case Study Areas

Foregrounding of local Indigenous technologies in developing coastal adaptation futures

- Indigenous-led & coordination across multiple jurisdictions
- Leading with values
- NbS that encourage stewardship, intergenerational knowledge sharing, and (re)connection with the shoreline
- Development of contemporary iterations of traditional shoreline technologies (clam gardens, estuary root gardens, etc.)
- Use of Immersive Technologies to explore NbS with community



Considerations Moving Forward

- What & whose values are being promoted in the project?
- Community engagement in developing NbS solutions
- A need for experimentation and adaptive management
- Additional coordination to update regulations and bylaws for implementation of NbS
- New strategies to meet supply & demands of materials (appropriate sediments, plants, oyster reefs, etc.)
- A shift in education, training, and capacity building to make sure consultants are able to promote/plan/design/implement/monitor NbS
- Exploration of how can NbS be incorporated alongside more conventional methods?



Cohen-Shaham, Emmanuelle & Walters, Gretchen & Maginnis, Stewart & Janzen, Christine. (2016). *Nature-based Solutions to address global societal challenges*.

An aerial photograph of a coastal landscape. The scene features a large, light-colored sandbar in the foreground, leading to a shallow, rippled body of water. In the middle ground, there is a smaller, elongated island or sandbar covered in green vegetation. A few small figures of people are visible on this island. The background shows more water and distant land. The overall tone is natural and serene.

Thank you!

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