

Project:	CVRD Coastal Flood Adaptation Strategy Phase 2 – Risk and Preliminary Options Assessment		
Meeting:	Engagement Round 2	Original Document Date:	7 September 2021
Subject:	Pre-Meeting Information Package 2 – Adaptation Strategy Descriptions		

Note: The original version of this document was prepared as a pre-meeting information package for the project's engagement Round 2 (held on 9 September 2021). The format and contents have been modified slightly compared to the original for clarity and consistency with information presented in the main report.

Overview

As part of Phase 2 of the CVRD Coastal Flood Adaptation Strategy (CFAS), stakeholder engagement activities have begun, and a risk assessment is nearly complete. Information from these activities will now be used to inform a preliminary options assessment. At our second Stakeholder and Partner engagement session on 9 September 2021, we will focus on the Saratoga Beach area to explore strategies and approaches for addressing risk and resilience. In preparation, Information Package 1 describes the values and assets that could potentially be impacted, and the subsequent consequences that may arise from a flood event in the Saratoga area.

This Information Package 2 describes high-level adaptation strategies that can be used to mitigate coastal flood risk. These examples are meant to be illustrative to support discussions on the advantages, disadvantages and tradeoffs associated with potential adaptation strategies. These options DO NOT reflect options under active consideration for implementation.

Adaptation Strategies

There are a wide range of choices we could make to adapt to coastal flood risk. To guide us in thinking through some of these choices, a high-level description of five common strategies is outlined below: Protect, Accommodate, Retreat, Avoid, and Resilience-building (i.e. PARAR). Within each strategy there are a range of actions and options that could be implemented, and the strategies themselves are interconnected. An overall Coastal Flood Adaptation Strategy would include a combination of actions from many or all of these strategies.

The tables below briefly summarize what the adaptation strategy is, including a list of actions that are typically taken. High-level opportunities and risks are also provided, although the lists are not comprehensive. Real-world examples are also provided through web resources for more insights on the strategy discussed.

Protect

What is it? Reduces the hazard by building infrastructure to keep floodwater out or by building infrastructure to reduce the power of the hazard and protect areas and community assets.



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Protect

Typical actions are engineering-based and include:

- Building large structural works such as shoreline and inland dikes, and seawalls.
- Construction of offshore features to help reduce wind and wave action (e.g. sea barrier), or construction of hardened shorelines to reduce the power of wave action on the foreshore
- Using nature-based approaches such as constructed wetlands and beaches to manage erosion and wave effects; property-level measures can also be considered (although these are also attributed to the “accommodate” strategy).



✓ Pros / Opportunities:

- Nominally protects all assets behind the structure (e.g., homes, critical infrastructure, people, etc.).
- Structural works can be enhanced with other amenities such as a bike and pedestrian path.
- Opportunity for naturalization and habitat enhancement (though this is limited).

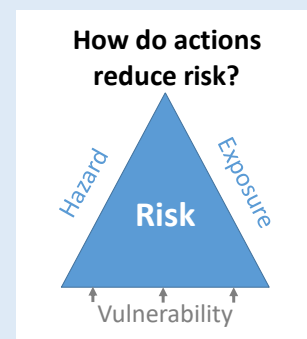
✗ Cons / Risks:

- Individual actions to harden the shoreline would have cumulative effects on shoreline function and potentially increase hazard and risk to neighbouring locations.
- Potential loss of foreshore properties and of beach, depending on design (i.e., the footprint of infrastructure can cause displacement).
- Implementation challenges (e.g., acquiring permits and land).
- Technical challenges and drainage issues.
- Can reduce ease of access to water.
- Requires additional measures for redundancy in case of failure.
- Moving parts mean more maintenance and greater potential for failure.
- Impacts on recreationalists, aquatic habitat, and water quality.
- High capital, operation, and maintenance costs.
- Reduced aesthetics (e.g. fewer beach views from homes and businesses).
- Dikes and infrastructure, although constructed to high design standards, can fail.
- Tends to create an entrenched pathway, when a feeling of safety created by the infrastructure results in additional development.
- Infrastructure is generally designed to a standard hazard event (e.g., 0.5% AEP flood event), and is

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Protect	
	therefore not necessarily adaptable to future flood scenarios with climate change.
Example	Dikes and Related Works (BC Floodwise Website)
Resources	City of Richmond Flood Protection

Accommodate	
What is it?	Reduces vulnerability by using a range of actions to allow flooding to occur with minimal damage / consequence. Sometimes described as a “living with water” strategy.
	
Typical actions range through educational, planning, and building options and include: • Giving nature the space to adapt gradually over time in natural and undeveloped areas using nature-based approaches such as constructed wetlands and beaches to manage erosion and wave effects. • Using Flood Construction Levels to raise the height of the damageable components of structures. • Retrofitting infrastructure, buildings, and communities over the natural building cycle to be flood-resilient. • Raising the physical height of municipal services (roads, water, etc.) over time and taking advantage of regular planned infrastructure turnover cycles (e.g. asset management). • Incorporating flood-resilient design adjustments to building codes, and using options and incentives to help residents and businesses improve property-level protection.	
✓ Pros / Opportunities: • Potential habitat, recreational, and aesthetic gains. • Very effective when used in combination with other options. • Reduces overall risk in absence of “protect” options, or in the event of dike/structural failure. • Can benefit local drainage. ✗ Cons / Risks: • Potential for reduced aesthetics when neighbouring sites are at different elevations or have different treatments of the streetscape. • Implementation requires coordination among many governmental departments. • Potential equity issues, depending how it is implemented. For example: ○ new and renovated buildings may be required to adopt higher flood construction	



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Accommodate

- Can be strengthened by coordinating measures across properties to promote continuity and consistency.
 - Very adaptable to future climate change.
 - Is incremental in approach, which makes implementation easier.
- levels, but older buildings would remain at risk.
 - Property owners with more financial capacity can afford to make upgrades while others may not have the means.
 - Flood Construction Levels (FCLs) do not protect infrastructure, parks, and heritage buildings.

Example Resources [Homeowners Guide to Flood Resilience](#)
[City of Brisbane Flood Resilient Homes Program](#)
[Lower Mainland Floodwise Website](#)
[New York City Retrofitting Buildings for Flood Risk Design Manual](#)

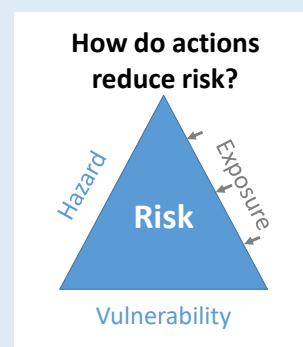
Retreat

What is it? Reduces exposure by moving existing structures out of flood risk areas.



Typical actions here are policy-based and include:

- Moving high-risk structures out of flood-prone areas.
- Opportunistic buy-outs as homes and businesses come up for sale over time, with more aggressive buyouts as hazard becomes greater with climate change.
- Opportunistic removal of roads, other infrastructure, and contaminants as land is vacated.
- Implementing aggressive renaturalization and restoration.



✓ Pros / Opportunities:

- Absolute reduction in risk (i.e., the most effective strategy to reduce/remove risk)
- Potential habitat, recreational, and aesthetic gains.
- Long-term strategy that is effective regardless of sea level rise rates.
- No capital construction costs.
- No permitting requirements.

✗ Cons / Risks:

- Psychosocial impact to homeowners and businesses who need to move.
- Relatively new concept likely means implementation challenges related to issues of fairness.
- Significant cost; although who pays for buyouts and retreat is unclear.
- Loss of land.

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Retreat	
	• Would likely require decades to fully implement.
Example	Willing seller program in New Jersey
Resources	Quebec buyouts program Natural Resources Canada Planned Retreat Approaches

Avoid	
What is it?	Reduces exposure by limiting development within the floodplain through planning.
Typical actions here are based on planning and regulation and include:	• Protection and restoration of natural assets. • Integrating future flood hazard area considerations within guidance documents such as regional growth strategies and official community plans. • Creating watershed-based land use authorities and legislation. • Establishing policy and planning tools such development permit areas, sea level rise planning areas, and setbacks that guide future development to avoid building critical infrastructure in flood-prone areas. • Developing tools such as flood bylaws to put in place the regional vision. How do actions reduce risk?
✓ Pros / Opportunities: • Absolute reduction in risk (i.e., the most effective strategy to avoid future increases in risk). • Can be complementary to other strategies. • Natural assets can be protected and restored. • The positive flood management benefits of assets such as wetlands, salt marshes, and estuaries can be realized, reducing adaptation costs.	✗ Cons / Risks: • Affects long-term economic interests of developers. • Does not address exposure of existing development.
Example	Puget Sound Partnership Projects
Resources	Ontario Conservation Authorities US Executive Order 13690

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Resilience-Building

What is it? Covers all aspects of work with the community to enhance its ability to cope with and recover from a flood event, and the cumulative effects of change.

Typical actions range from education to policy-based approaches and include:

- Engaging broadly in planning for coastal flood risk, to build understanding and capacity of the community to address risk and build resilience (individual and collective).
- Educating and engaging the public about the short and long-term risks, and how they can take steps to improve their physical, social, and psychological resilience.
- Having tough conversations about values, tradeoffs, risk tolerance and change, to develop shared understanding and direction over time.
- Grow social connectedness/capital (emphasis on care for vulnerable populations, shift to a low-carbon economy).
- Developing neighbourhood-level preparedness and resilience-building programs, being mindful of issues of equity
- Developing supports for dealing with psychosocial impacts of anticipated and experienced impacts.
- Creating flood recovery plans in advance of events, to enable communities to “build back better”.
- Developing robust emergency preparedness and response plans (e.g., flood monitoring and warning systems) to limit damages during a flood event.

✓ Pros / Opportunities:

- Very complementary to the other strategies.
- The resulting community-building can help with other sustainability-related objectives.
- Potentially lower-cost if there is buy-in from community leaders, who can galvanize the public.

✗ Cons / Risks:

- Potential for conflict as values are re-evaluated, creating greater awareness of “winners” and “losers”.
- Requires a concerted and coordinated effort among civil society groups and government.

Example Resources [City of Vancouver Resilient Neighbourhoods Program](#)
[City of Vancouver Sea Level Rise Toolkit](#)
[Grand River Conservation Authority Flood Warning System](#)