Community Workshop
North Shore Sea Level Rise Strategy

Welcome! Please join a table

February 2020
Workshop Purpose

Objectives

• Learn more about sea level rise
• Learn about developing the North Shore Sea Level Rise Strategy
• Listen to your views and issues about adapting to sea level rise

We are not designing or deciding on measures today.

How input will be used

• Summary of main themes from initial public engagement (workshops, online survey)
• Consider input alongside technical analysis for draft Strategy
Workshop Outline

Introductions
Presentation
Activity 1: What matters?
  *Short break*
Activity 2: Explore adaptation approaches
Activity 3: Reflection
Next steps
How close do you live to the ocean?
Presentation
North Shore Sea Level Rise Strategy Process

**Technical Analysis**
SUMMER 2018 - SPRING 2019
- Review context
- Identify coastal flood hazards
- Assess vulnerability and risk

**Adaptation Actions Development**
SUMMER 2019 - WINTER 2020
- Explore adaptation approaches
- Develop adaptation concepts and action areas

**Final Strategy**
WINTER 2020 - SPRING 2020
- Refine adaptation concepts and action areas
- Finalize strategy

We are here

DNV.org/SeaLevelRise
- Initial public & stakeholder engagement (Online survey open until Feb 23)
- Potential adaptation approaches
Worldwide Coastal Impacts

Venice, Italy - November 13, 2019
85% of the city flooded

New Jersey, USA – October 2012
Hurricane Sandy

Photos (L-R): CBC News
Regional Coastal Impacts

- Jan 2019 Deep Cove, king tide
- Dec 2018 White Rock Pier damage
- Feb 2019 Horseshoe Bay High winds/waves
- Dec 2012 coastal storm West Van seawall, Stanley Park seawall

Photos (L-R): NS News, CBC News, Vancouver Sun
Climate Change Adaptation Strategy (2017)

Sea Level Rise
Sea Level Rise

Causes of sea level rise

Measured rise (20th Century):

- Global average: 0.17m (7”)
- Vancouver: 0.04m (1.5”)
- Varies due to local conditions

- Melting glaciers and polar ice caps
- Changes in ocean circulation
- Warming oceans cause waters to expand
- Land raising or sinking
Anticipated Sea Level Rise

(MOE/Ausenco Sandwell, 2011)
How Sea Level Rise Impacts Flooding

- Mean Sea Level
- Stillwater Level
- Wave Effects
- Combination of tide and storm surge
- Wave runup (temporary with waves/wind)

On-shore wind

North Shore Sea Level Rise Strategy
1m & 2m Sea Level Rise Scenarios
Without adaptation measures

Sea level rise planning area
1m flood extent with sea level rise during extreme storm
2m flood extent with sea level rise during extreme storm
Consequences

*Without adaptation measures*

During major storm, whole study area

- 1,300+ residents could experience flooding
- 450+ businesses could experience flooding or power outage
- ~$900 million in building damage
- ~19,000 tonnes of debris
- ~80 hectares of parkland at risk of flooding
- ~40 cultural and heritage places at risk of flooding
Consequences

Without adaptation measures

During extreme storm, whole study area

- 2,700+ residents could experience flooding
- ~1,900 businesses could experience flooding or power outage
- ~$2.7 billion in building damage
- ~50,000 tonnes of building debris
- ~105 hectares of parkland at risk of flooding
- ~50 cultural and heritage places at risk of flooding
Intertidal Habitat Impacts

“Coastal Squeeze” occurs when walls and armoured shorelines shrink intertidal area.

Natural shorelines

Walled shoreline

Photo: Port of Vancouver
Adaptation Approaches
Adaptation Approaches
Adaptation Approaches
Adaptation Approaches
Adaptation Approaches

Likely a combination of approaches

Resist

Accommodate

Avoid

Advance

North Shore Sea Level Rise Strategy
Activities: getting started
Activity 1: What matters?

Table discussion (20 minutes)

- What is important to you and why?
- What do you think is important to the community as a whole?
- As a table, pick top 3
Break
Activity 2: Explore adaptation approaches

Table discussion (20 minutes)
• Which benefits or disadvantages stand out to you?
• What trade-offs should be considered?
• What co-benefits could there be?
Share 1 key take-away or parting thought
Wrap-up

Revisiting the objectives
• Learn more about sea level rise
• Learn about developing the North Shore Sea Level Rise Strategy
• Listen to your views and issues about adapting to sea level rise

How input will be used
• Summary of main themes from initial public engagement (workshops, online survey)
• Consider input alongside technical analysis for draft Strategy
Next steps

Online survey open to February 23rd at DNV.org/SeaLevelRise

Spring 2020
• Draft strategy
  o public engagement
• Present to DNV Council
  o Partners present to their Councils/boards
Approach: Resist

Focus on structural measures such as building dikes to reduce the likelihood of flooding.

PROS
- Ability to implement standalone projects.
- Protects existing land and developed areas.
- Potential for waterfront recreational trails or roads.

CONS
- Requires land to build structures. For example, conventional flood protection infrastructure such as dikes would require significant space (on the order of 30+ metres); other protection infrastructure such as flood walls may require less space.
- Potential to increase flood hazard due to “bathtub effect”, where flooding from rivers or creeks is prevented from flowing to the ocean. Structures may introduce a false sense of security (e.g. in event of structure failure).
- Potential habitat impacts.
**Approach: Accommodate**

Focus on non-structural adaptation measures, including consciously acknowledging flood risk, defining how much risk we are willing to tolerate, and raising livable spaces in areas vulnerable to flooding.

**PROS**
- Can be gradually implemented with redevelopment and infrastructure upgrades over time.
- Adapting existing infrastructure may be more cost-effective than building new infrastructure.

**CONS**
- Challenge to define risk tolerance (i.e. what the community is willing to tolerate), and potential to result in elevated risk.
- After accommodate approach measures are implemented, may need on-going education for owners on how to safely use areas below flood level (e.g. keeping mechanical equipment elevated), and difficult to enforce on private property.
Approach: Avoid

Focus on land use planning to avoid building or adding more uses in areas that are vulnerable to flooding, or gradually relocating buildings and infrastructure away from areas at risk of flooding.

PROS
- Highly effective at reducing risk.
- Opportunity for habitat, recreational, cultural co-benefits.
- Increased public access to waterfront.

CONS
- Costs for relocation of infrastructure or buildings.
- Possible reduced development potential, and lost tax revenue.
- Potential equity issues of who may need to move.

Convert flood-prone areas into park land and natural habitat

Relocate residents, businesses and infrastructure away from low-lying areas
**Approach: Advance**

Reclaim land to make space for structures such as dikes, which can reduce the likelihood of flooding in coastal areas.

**PROS**
- Less impact on existing developed lands to make space for flood protection measures.
- Potential opportunities for habitat, recreational, cultural co-benefits.
- Potential development opportunities.

**CONS**
- Potential for major impacts to habitat.
- May entail complex implementation and regulatory requirements.
- Likelihood for high costs for reclaimed land, and may need to be combined with other adaptation approaches.

**Images**
- Norgate coastline in 1953: natural intertidal area
- Major land filling
- Norgate coastline in 1970: land filled
Ways we use the land in the planning area

- Residential
- Industrial
- Commercial
- Parkland
- Bridgeheads
- Railways
- Streets
- Natural Areas
If no adaptation measures are implemented:
Sea Level Rise Scenarios - Norgate

If no adaptation measures are implemented:

- Flood Planning Area
- 1m during extreme storm
- 2m during extreme storm

DNV.org/SeaLevelRise
Sea Level Rise Scenarios - Maplewood

If no adaptation measures are implemented:
If no adaptation measures are implemented:

Sea Level Rise Scenarios - Deep Cove

[Map showing flood planning areas and water levels during extreme storms]
Sea Level Rise Scenarios - Indian Arm

If no adaptation measures are implemented: