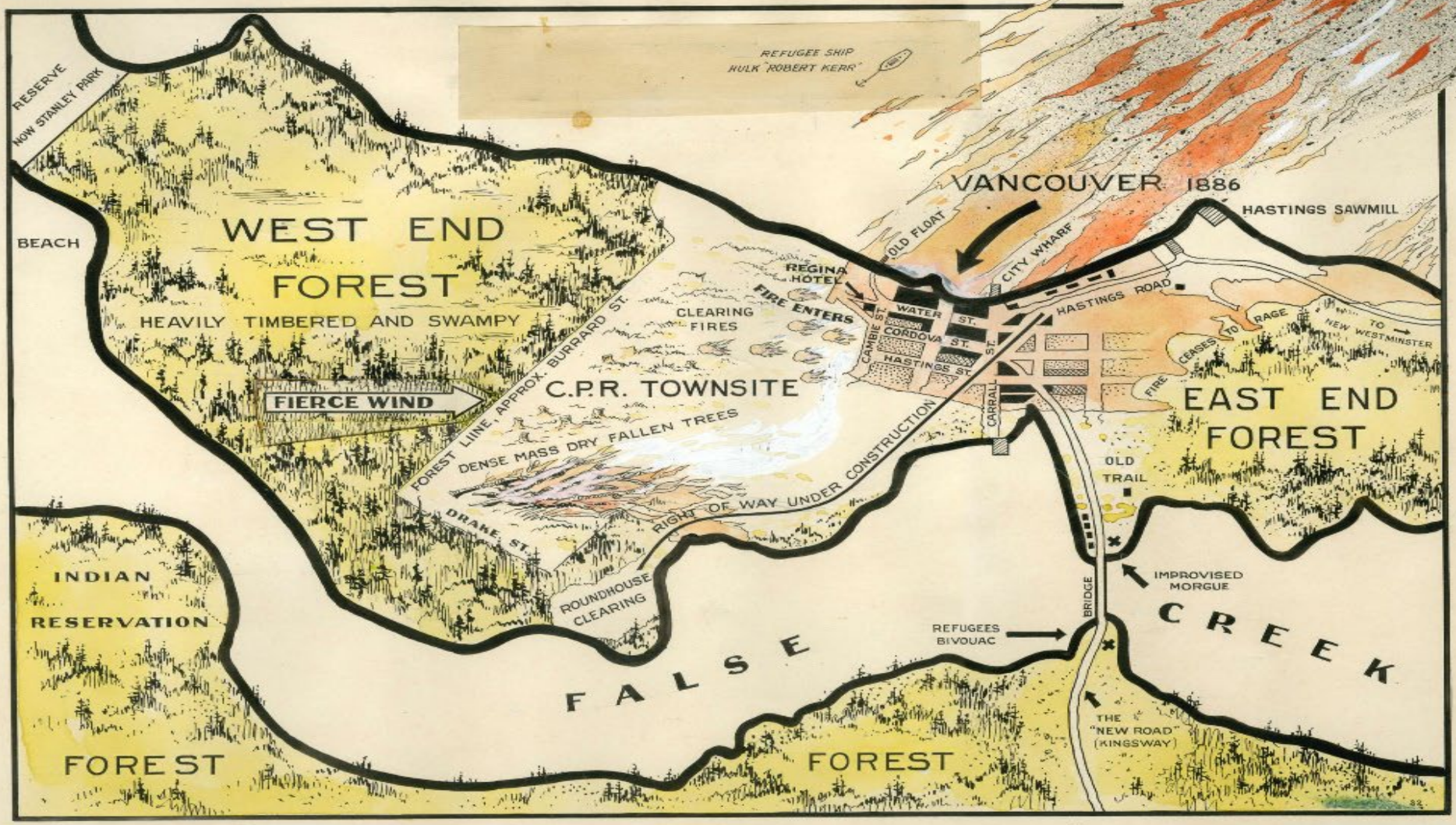
Hazard, Risk and Vulnerability Analysis:

The Case for Resilience

RTS#15885

March 13, 2024

The Great Vancouver FIRE



FROM SKETCH BY MAJOR J.S. MATTHEWS,
ARCHIVIST VANCOUVER

J. S. Matthews
Archivist
City of Vancouver
June. 1932.

O/K J Matthews 20/5 1932
Thomas Matthews 1986

George L. Schetky. 1986
O.K.
Geo. L. Schetky
May 20/32

Agenda

1. HRVA Background
2. Risk Scores
3. Snapshot of Hazard Profiles
4. Conclusions and Next Steps

HRVA Background

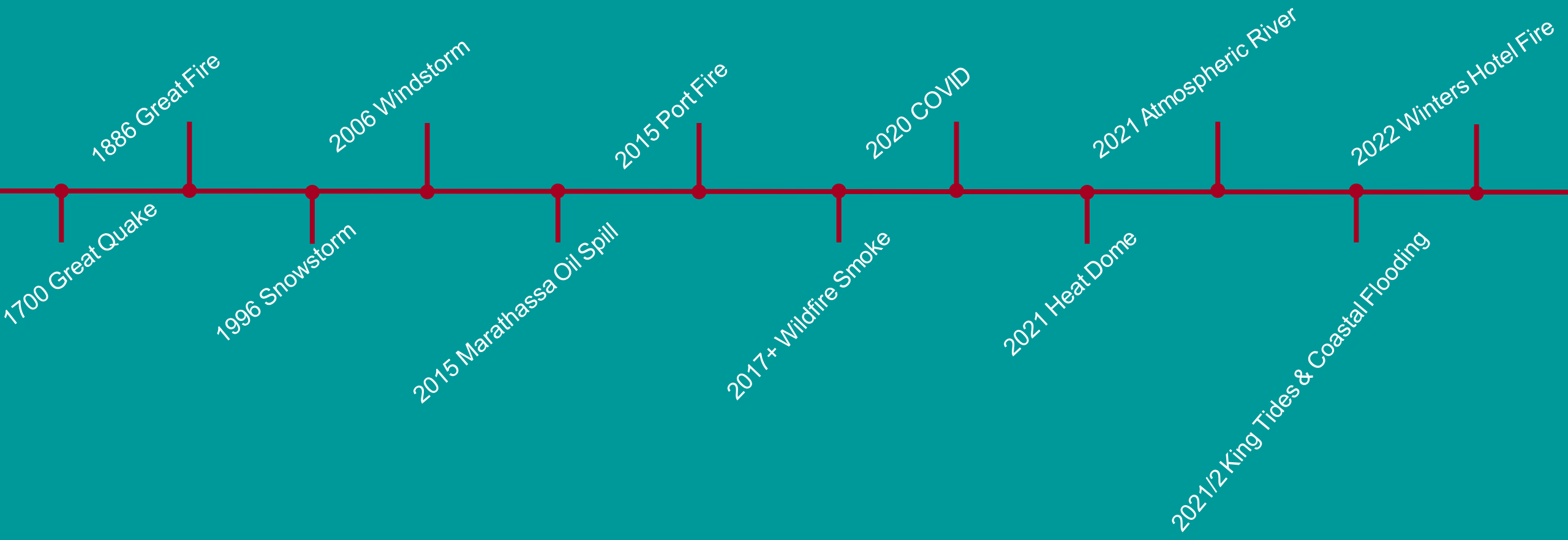
What is an HRVA?

A Hazard Risk and Vulnerability Analysis (HRVA) is a high-level study of the hazards that may impact a community and their potential consequences to people, property, environment, economy and critical infrastructure.

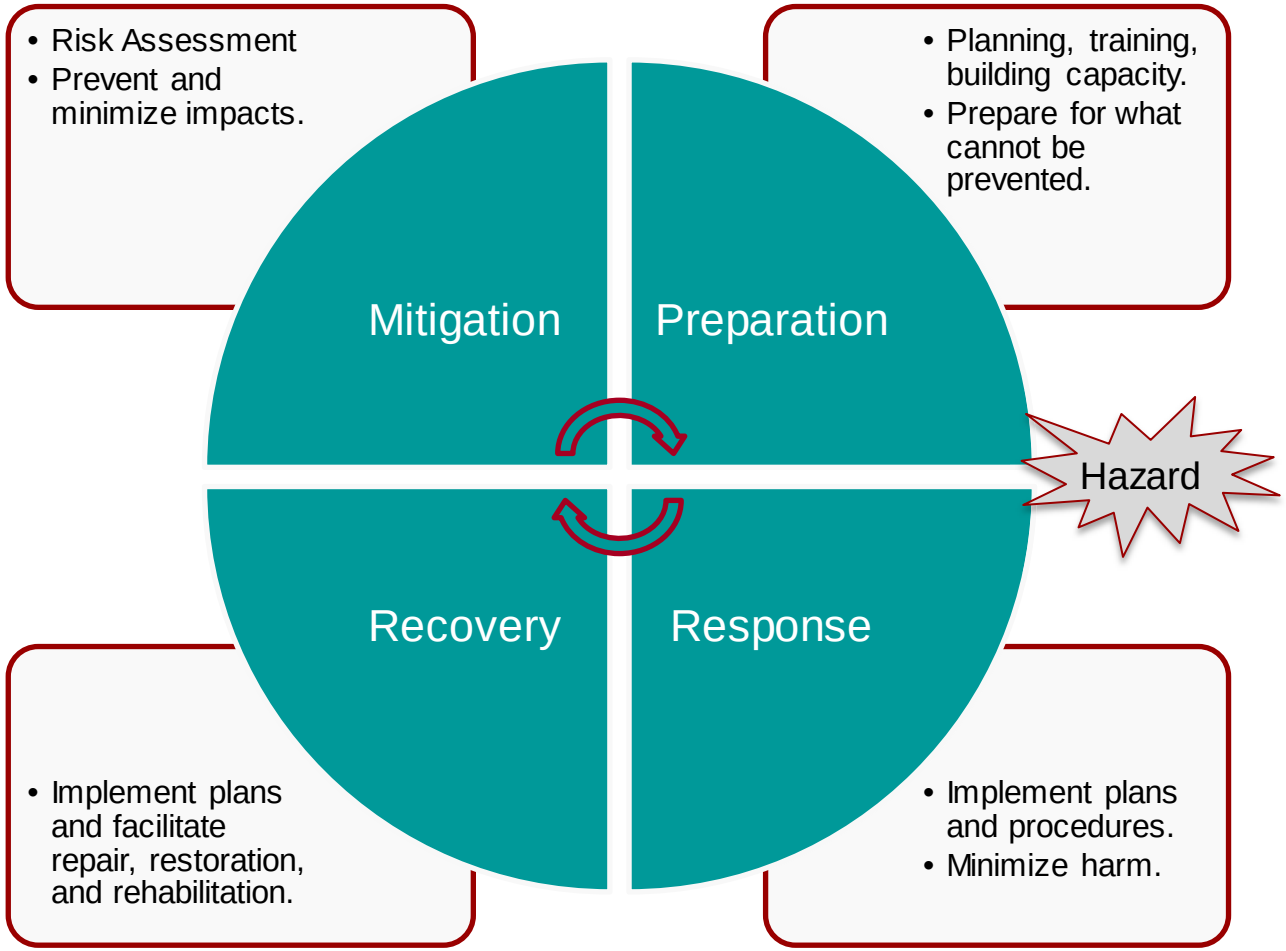
Why Do We Need an HRVA?

1. **Compliance:** Emergency and Disaster Management Act
2. **Policy Landscape:** Multiple thematic strategies and action plans
3. **Governance:** understanding risk → prioritization of actions & investments

Past Emergencies and Disasters



Use of an HRVA

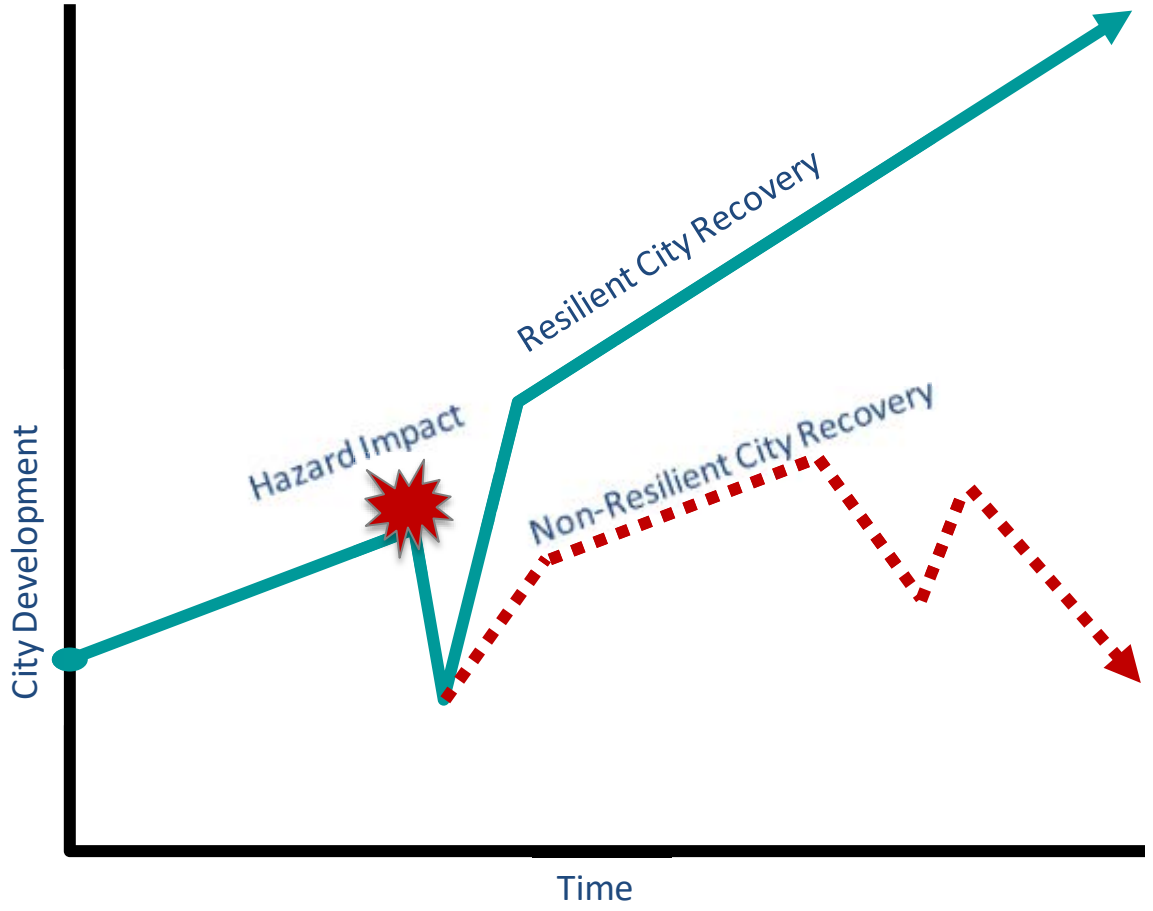


1. Emergency Management Plan
2. Land Use and Urban Design
3. Capital Upgrades: Civic Facilities
4. Thematic Plans: Earthquake Preparedness Strategy, Climate Change Adaptation Strategy, etc.
5. Priority Response Guidelines & Plans

From Hazards to Disasters

Hazards may be natural or human-made, but disasters are the result of our decisions as a society on:

1. Buildings, infrastructure, and development patterns
2. Social and economic systems
3. Ecological systems



Adapted from: Fundacion Idea's Urban Resilience Guide for Policy Makers


Our forests are increasingly dry, leading to uncontrollable wildfires and smoke
Mountains are formed by the same forces that cause earthquakes
Our industries produce pollution, and sometimes have fires or spills
Unreinforced buildings built pre-1990 were not designed to withstand earthquakes
Densely built areas made of concrete and glass can exacerbate the urban heat island effect
Our seas are rising and exacerbating coastal flooding during storms

Hazards of Greatest Concern

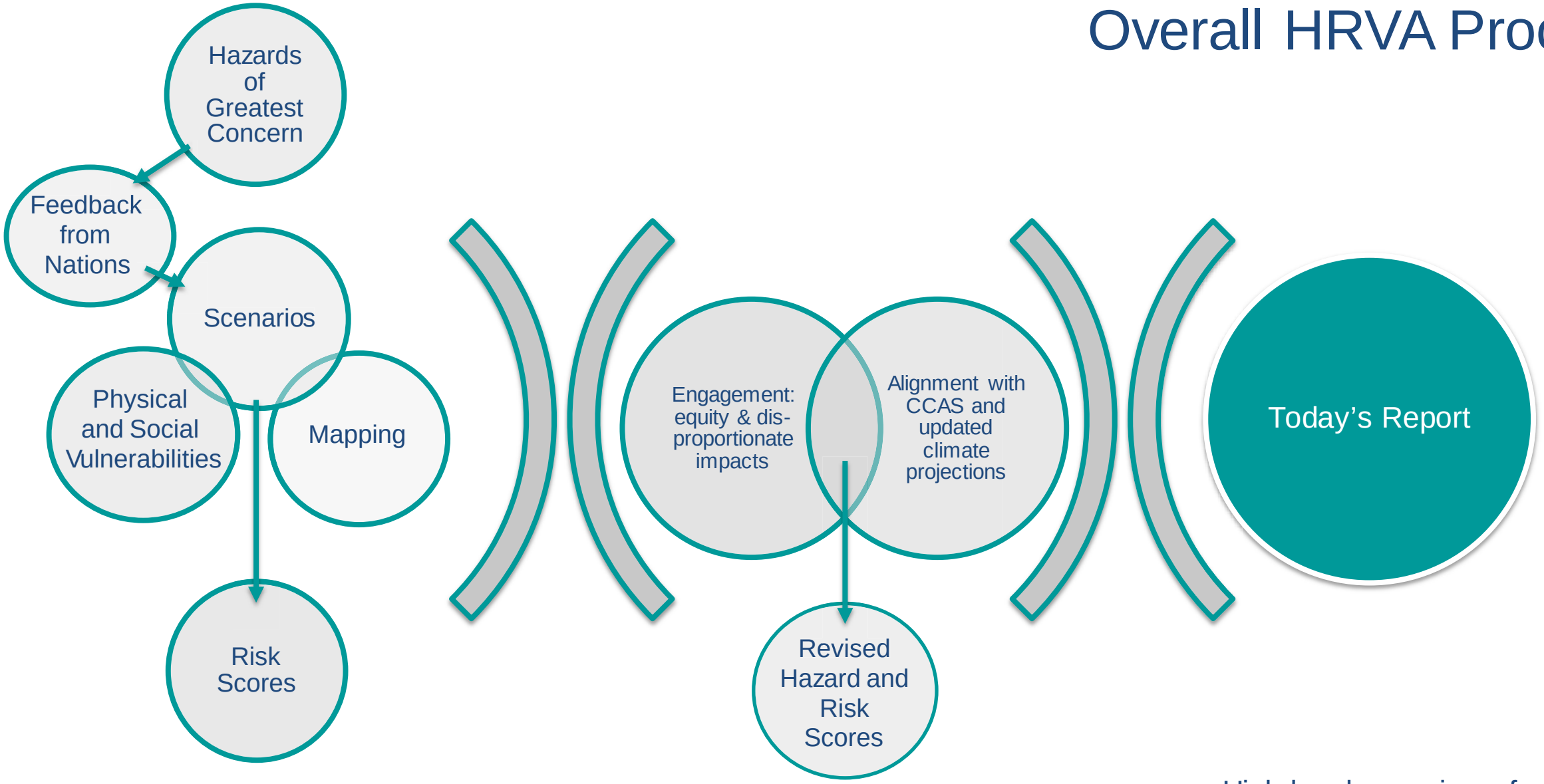
*Hazards **not** listed here in order of risk.*

HRVA scope

1. Extreme Heat
2. Droughts
3. Wildfire Smoke / Poor Air Quality
4. Extreme Rainfall
5. Coastal Flooding and Sea Level Rise
6. Windstorm / Power Outage
7. Snowfall / Extreme Cold
8. Earthquake
9. Large Structure Fires
10. Disease Outbreak
11. Coastal Spills
12. Hazardous Materials Release
13. Public Disturbance

Climate Change Adaptation Strategy (CCAS)

Overall HRVA Process



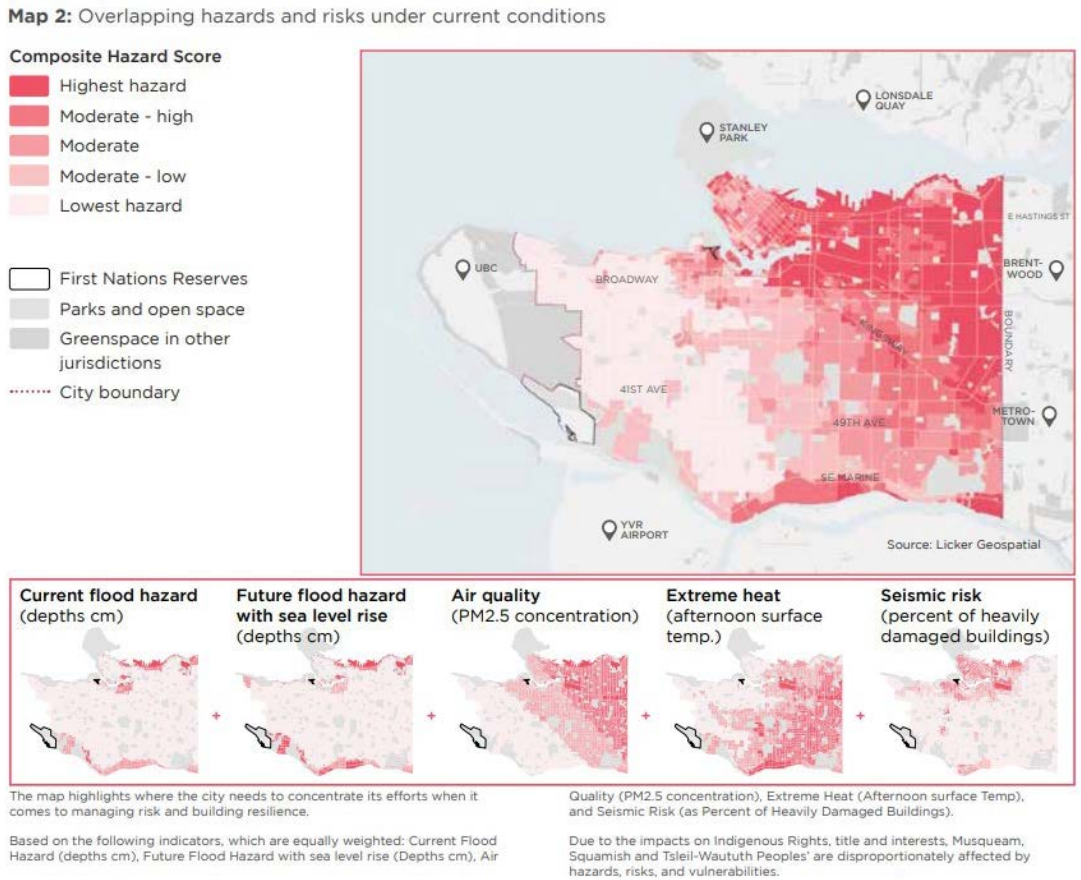
Phase 1:
2021-2022

Phase 2:
2022-2023

High-level overview of hazards, vulnerabilities, and overall risks

Underlying Conditions: Physical

1. Climate Change
   i. Frequency and severity of hazards
   ii. Added uncertainty and pressures
2. Aging and Vulnerable Buildings
   i. Private/homes and businesses
   ii. Public/civic facilities
3. Aging and Vulnerable Infrastructure
   i. Local
   ii. Regional
4. Ecological Degradation
   i. Insufficient green space
   ii. Loss of natural protections

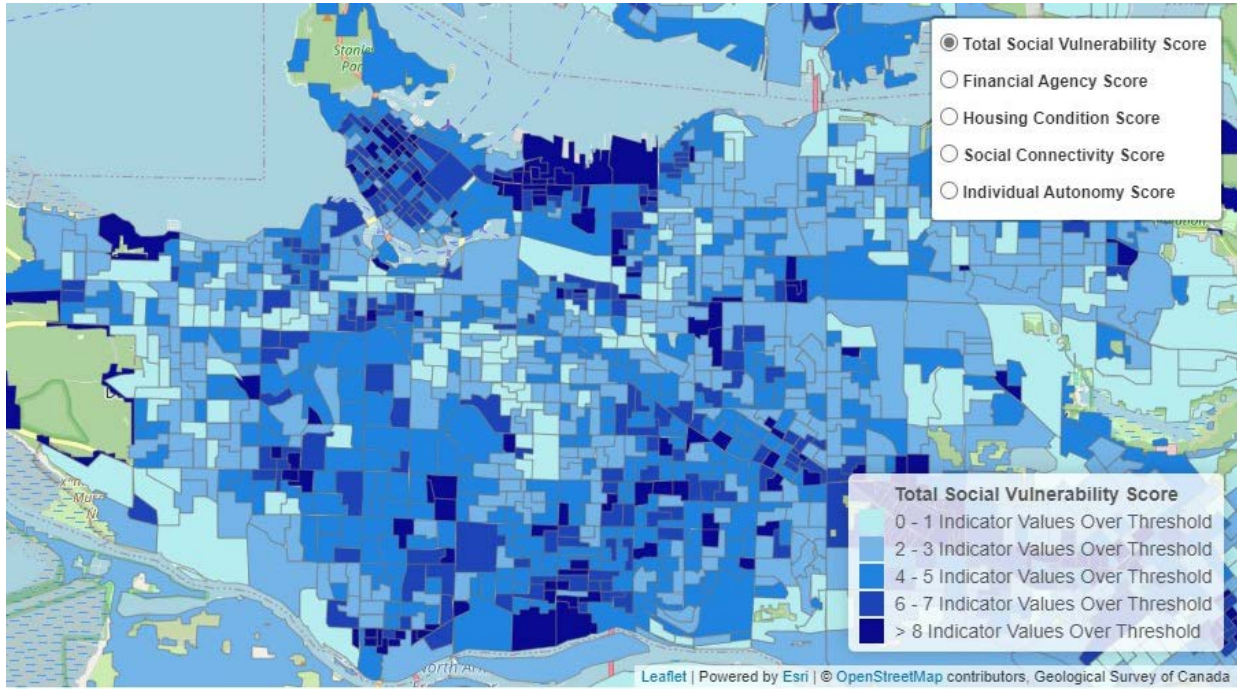


Example of Physical Mapping from Vancouver Plan (2021)

Underlying Conditions: Social

Disasters lay bare our deepest inequities.

1. 1/4 of residents feel socially isolated
2. Monthly major expenses for households in Vancouver are estimated to be over $7,500 while median household income is just over $5,400
3. 50% of persons with disabilities report experiencing barriers that limit their ability to move around public buildings
4. 46% of Vancouver's population has a mother tongue other than English



Natural Resources Canada: Social Fabric and Capacity Thresholds

Equity and Disproportionate Impacts

“[In COVID-19] there was a huge gap in services for people of colour. Lack of access to medical care due to healthcare racism. Racism permeates all government services.”

"So many of us are isolated in our homes - with nobody to check on us or help. Not everyone has family around...”

"Windstorms and power outages are scary. I get $20,000 of medications delivered each week including insulin. It needs to be refrigerated."

“I passed out three times during the heat dome and I live alone. It was terrifying.”

Engagement

500 people

8 workshops and public presentations

6 surveys and polls

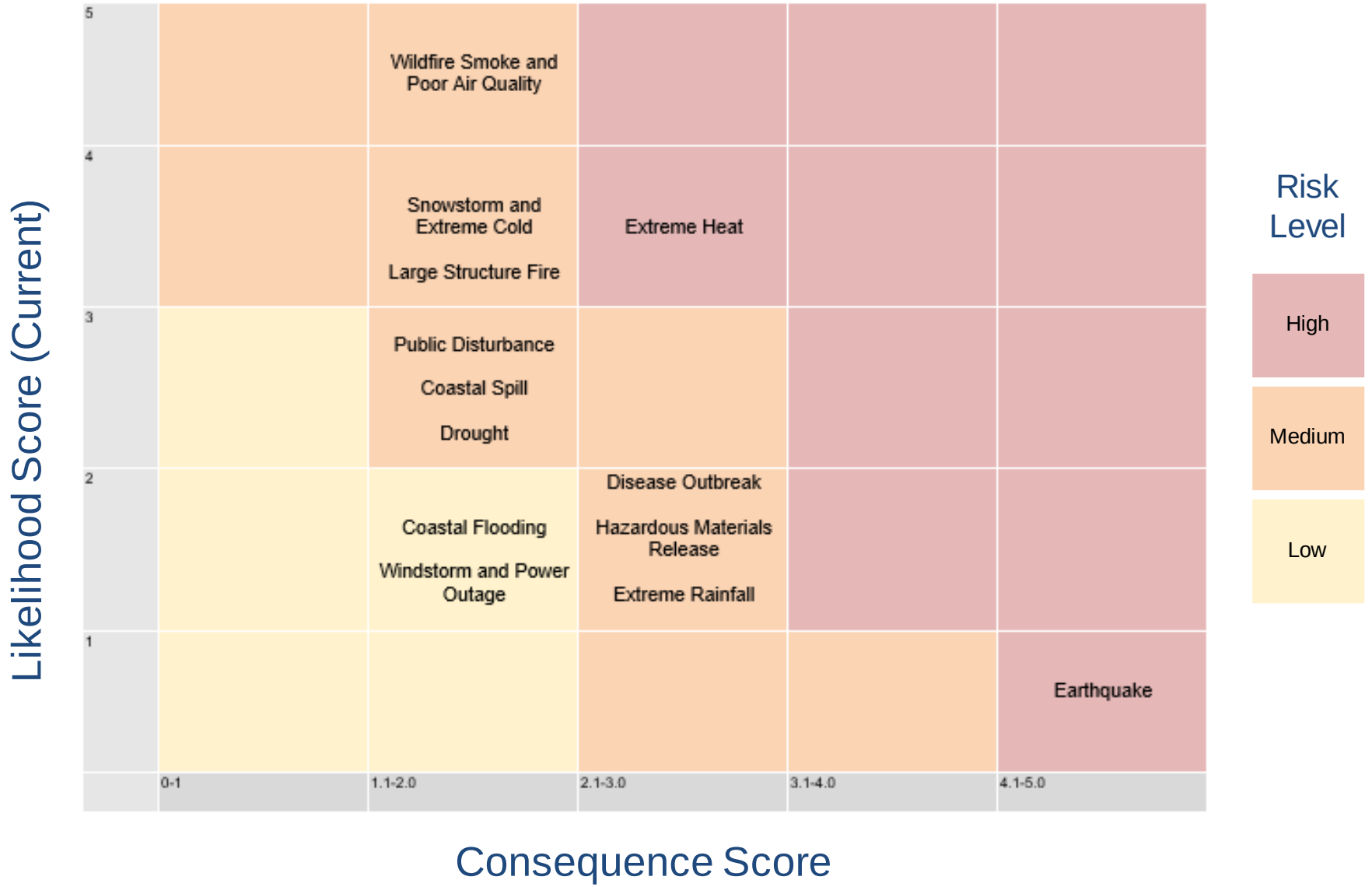
3 engagement booths

5 interviews

28 organizations

Risk Scores

Hazard Risk Scores (Today)



Future Likelihood

1. Most climate-related hazards are increasing in likelihood
2. Increase in likelihood changes overall risk ratings
3. Only hazard decreasing in likelihood is snowstorm and extreme cold
4. For some hazards no data to suggest change in likelihood

2050 Likelihood

Wildfire Smoke & Air Quality	↑
Extreme Heat	↑
Large Structure Fire	
Coastal Spill	↑
Drought	↑
Snowstorm & Extreme Cold	↓
Public Disturbance	
Disease Outbreak	↑
Extreme Rainfall	↑
Coastal Flooding	↑
Windstorm & Power Outage	↑
Hazardous Materials Release	
Earthquake	

Examples of Hazard Profiles

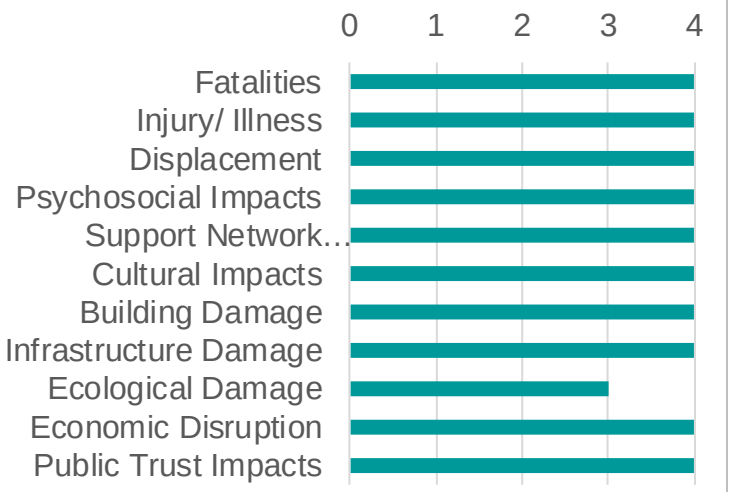
Earthquakes

RISK:

HIGH

Likelihood:	Low
Consequences:	High
Trend:	Unknown
Seasonality:	None

Consequence Factors



1. Projected damage would result in years to decades-long recovery with long-term displacement and impacts to housing affordability.

2. Direct financial losses from building damage alone estimated at $17 billion+ (Magnitude 7.2 Georgia Strait earthquake model).

3. Vancouver has a high-risk of fire-following-earthquake with limited reach of dedicated fire protection system.

4. Significant damage to buildings and infrastructure resulting in mass displacement for residential and commercial spaces, with disproportionate impacts to the DTES, DT, and West End.

> *"We need storage for supplies. There is very limited space in the DTES, much less space that is earthquake proof."*

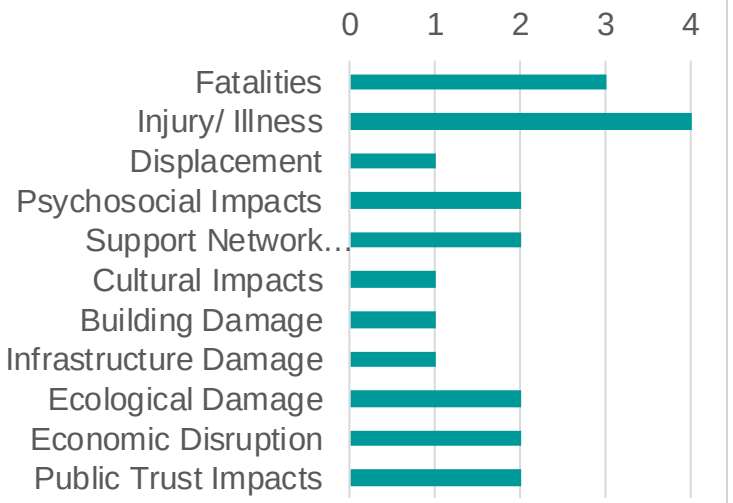
Extreme Heat

RISK:

HIGH

Likelihood:	High
Consequences:	Medium
Trend:	Increasing
Seasonality:	Spring, Summer

Consequence Factors



1. Responsible for more deaths than any other weather-related hazard in Canada (117 in Vancouver during 2021 heat dome).

2. 2021 Heat Dome: 911, VFRS, BCEHS, and VPD overwhelmed (~12,000 calls to 911 in one day - double regular volume).

3. Most buildings in Vancouver are not designed for our rising temperatures and lack adequate cooling, and inadequate access to green space which aligns with emergency room visit data.

4. Disproportionately affects seniors, people with disabilities, people who take certain medications, those who are isolated, people who are homeless or living in housing with inadequate cooling.

> *"From where we stand, seniors can't use Cooling Centres. We often don't have easy access to transportation and can't sit for long periods of time."*

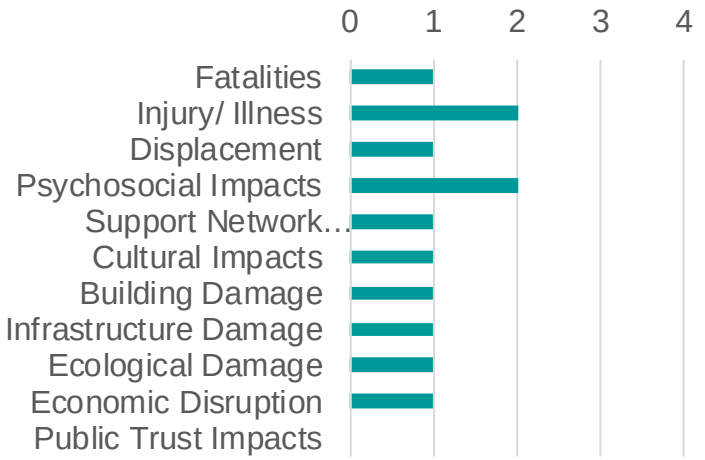
Wildfire Smoke and Poor Air Quality

RISK:

MEDIUM

Likelihood:	High
Consequences:	Low
Trend:	Increasing
Seasonality:	Spring, Summer, Fall

Consequence Factors



1. Metro Vancouver has seen a sharp increase in poor air quality events associated with wildfire smoke since 2014.

2. Potential disruption to summer tourism over time, potential cancellation of outdoor events, park use and recreation.

3. Even at low concentrations wildfire smoke can be harmful to health in the short term, and chronic wildfire smoke exposure can produce long-term health impacts.

4. Homeless residents and outdoor workers are subject to increased exposure and may face barriers to accessing indoor cleaner air spaces. People with respiratory conditions as well as seniors and children are also disproportionately affected.

> *"Air quality is one of the most concerning things. Respiratory issues mean it's hard to go out even if you have [an air] filter. We end up even more isolated."*

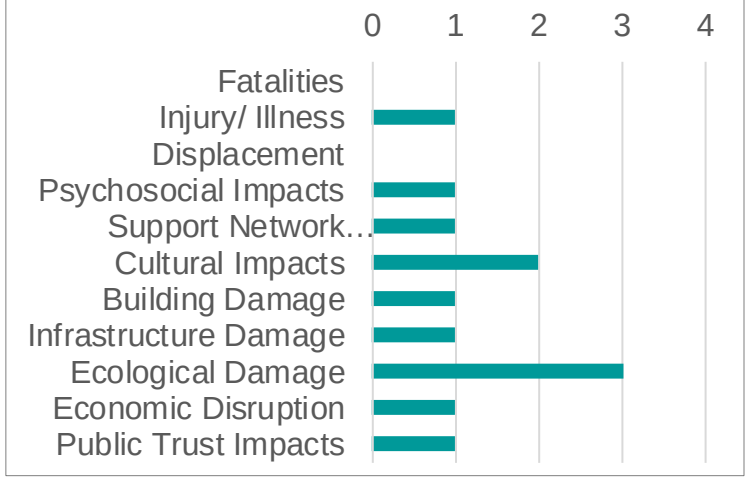
Drought

RISK:

MEDIUM

Likelihood:	Medium
Consequences:	Low
Trend:	Increasing
Seasonality:	Spring, Summer, Fall

Consequence Factors



1. Increasing due to climate change. Snowpack decreasing, evapotranspiration increasing, earlier snowmelt and changing precipitation patterns.

2. Can have serious impacts on access to water, and food and agricultural systems (including urban farmers and temporary foreign workers).

3. Chronic drought conditions weaken some trees making them more vulnerable to breakage in winter storms.

4. Fish are at particular risk when summer and fall drought cause low stream levels and warmer river temperatures that correspond with spawning season.

> *"It is unlike any kind of drought conditions the province has ever faced and, in my opinion, truly is a sleeping giant..."*
> *- Minister Bowinn Ma*

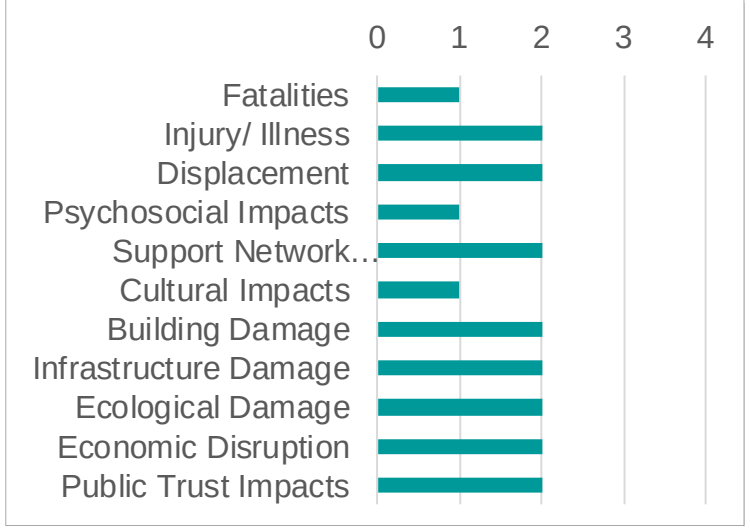
Extreme Rainfall

RISK:

MEDIUM

Likelihood:	Low
Consequences:	Medium
Trend:	Increasing
Seasonality:	Fall, Winter

Consequence Factors



1. Heavy and/or prolonged rains can overwhelm the capacity of drainage systems, resulting in localized flooding around the city.

2. Impacts to transportation through flooding streets, flooding of basements and ground-level floors, damage property and waterlog parks and recreation spaces.

3. Soil erosion and water quality implications of flooding can impact cultural practices, traditional food harvesting and loss of traditional sites by Tsleil-Waututh Nation.

4. People who are experiencing homelessness or living in inadequate housing, and renters in basement suites leading to increase in Emergency Support Services needs.

“We live in a basement suite and worry about heavy rains and poor drainage.” “We’ve experienced flooding and know with climate change it will get worse.”

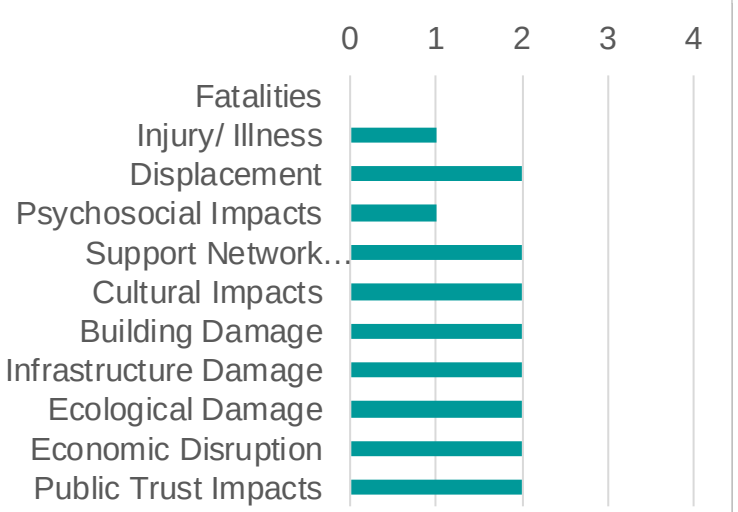
Coastal Flooding

RISK:

Low

Likelihood:	Low
Consequences:	Low
Trend:	Increasing
Seasonality:	Fall, Winter

Consequence Factors



1. Impacts are localized, not citywide – but can be highly destructive along the coastline.
2. Piers, docks, seawalls, and other marine infrastructure is vulnerable to coastal flooding and storm conditions.
3. An estimated $28.6B of community and City land and buildings will become vulnerable to flooding in Vancouver with one metre of sea level rise and a major storm surge without flood protection in place.
4. Impacts for both public and private property are expected to increase, and some assets and areas may become uninsurable.

> *"Changes to the intertidal area "will have significant impacts on species that live in the intertidal zone… these species are critically important as sources of food…"*
> *- staff from Tsleil-Waututh Nation*

Conclusions and Next Steps

Conclusions

1. All hazards have serious consequences in at least one consequence category (fatalities, infrastructure, etc.)

2. Earthquakes, extreme heat, disease outbreaks and hazardous materials releases have the greatest potential to cause immediate harm to health of people

3. Wildfire smoke and poor air quality has annual occurrences and will likely have cumulative impacts to health and wellbeing over time. It is the most likely hazard.

4. Climate change will have a profound impact on risk ratings as all climate-related hazards increase in frequency and severity

5. Nearly all hazards have significant, disproportionate impacts on people who are low-income, precariously housed and homeless, people with disabilities, seniors, renters, and racialized communities

Next Steps

1. Annual Update to Hazard Risk and Vulnerability Analysis

   i. Incorporate new requirements from EDMA into updated HRVA
      a. Re-engage with the xʷməθkʷəy̓ əm (Musqueam), Sḵwx̱ wú7mesh (Squamish) and səlilwətaɬ (Tsleil-Waututh)
      b. Engage further with disproportionately impacted communities

   ii. Further examine how climate-related hazards will change over time

   iii. Incorporate data and information about additional hazards like tsunami and wildfire

   iv. Communicate hazard information to the public through a story map

2. Reduce hazard risk and build resilience

   i. Collaborate with departments across the City to develop a balanced and proactive approach to risk reduction and resilience, and embed risk-sensitive planning into City processes (e.g. Vancouver Plan)

   ii. Incorporate actions in Emergency Management Plan for Council endorsement

   iii. Climate Change Adaptation Strategy – addressing five climate-related hazards and risks

Questions

Credit: Justin Langlois – Artist in Residence at City of Vancouver