Tsleil-Waututh Nation
COMMUNITY CLIMATE CHANGE RESILIENCE PLAN

Sarah Dal Santo, RPP, MCIP, Tsleil-Waututh Nation
Robin Hawker, RPP, MCIP, Kerr Wood Leidal

Supported with funding from:

Canada
Crown-Indigenous Relations and Northern Affairs Canada

WEST COAST Environmental Law

real estate foundation BRITISH COLUMBIA

Tsleil-Waututh Nation
PEOPLE OF THE INLET

ADAPTATION CANADA2020

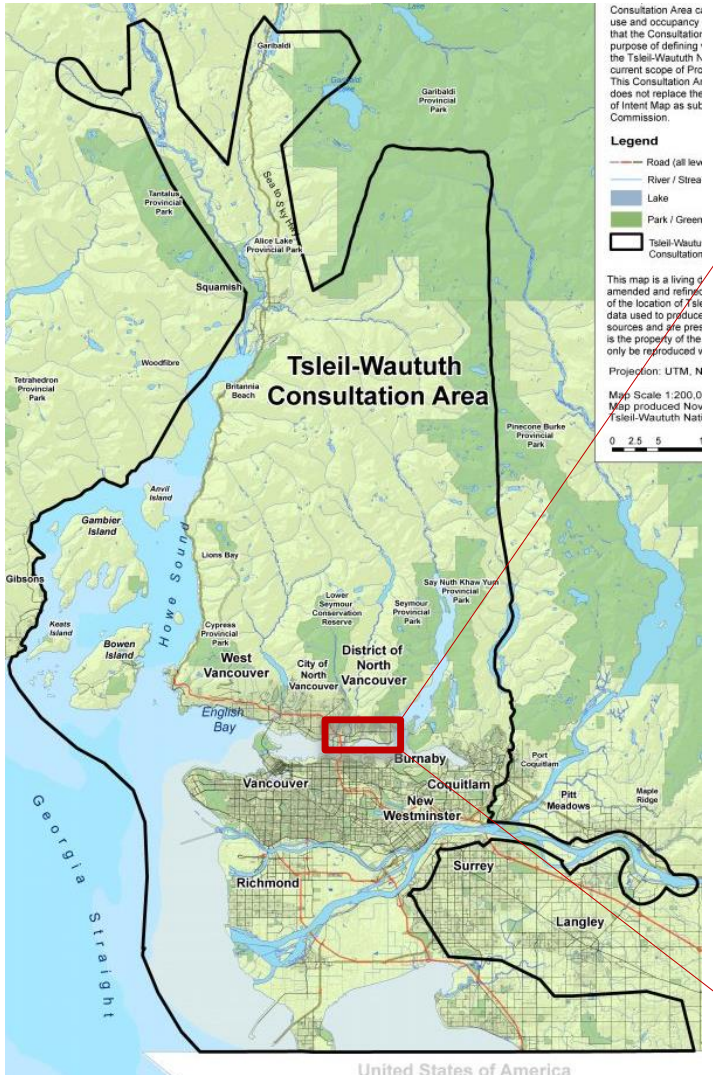
KERR WOOD LEIDAL
consulting engineers

February 19, 2020

Outline

1. **About Tsleil-Waututh Nation**
2. **About the Project**
   - Phase 1: Vulnerability Assessment
   - Phase 2: Resilience Plan
3. **Lessons Learned**

Tsleil-Waututh Nation: *People of the Inlet*



ADAPTATION CANADA2020

Climate Change Impacts Today

Cedar die-back; Wildfire smoke

Changing ocean conditions (e.g. temp., pH, salinity) + urban water quality issues

Flooding at creek crossings

Coastal storms & flooding

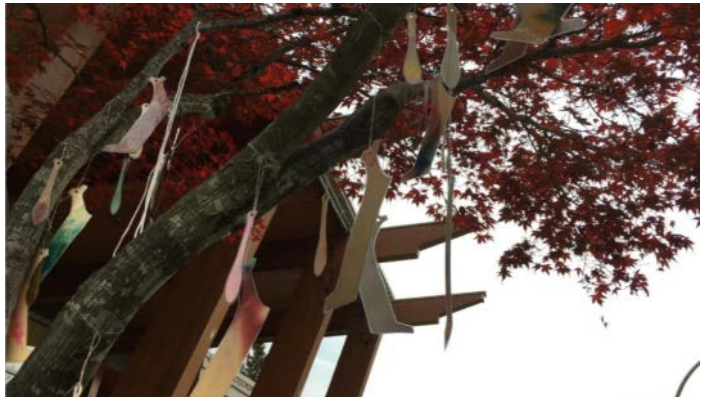
Coastal erosion

ADAPTATION CANADA2020

Culture of Environmental Stewardship

Climate Change Summit
Summer 2018

High Efficiency New
Administration Bldg



Youth & Community
Art Project

Community Shellfish
Restoration

Burrard Inlet Action Plan
October 2017

Community Solar
Panel

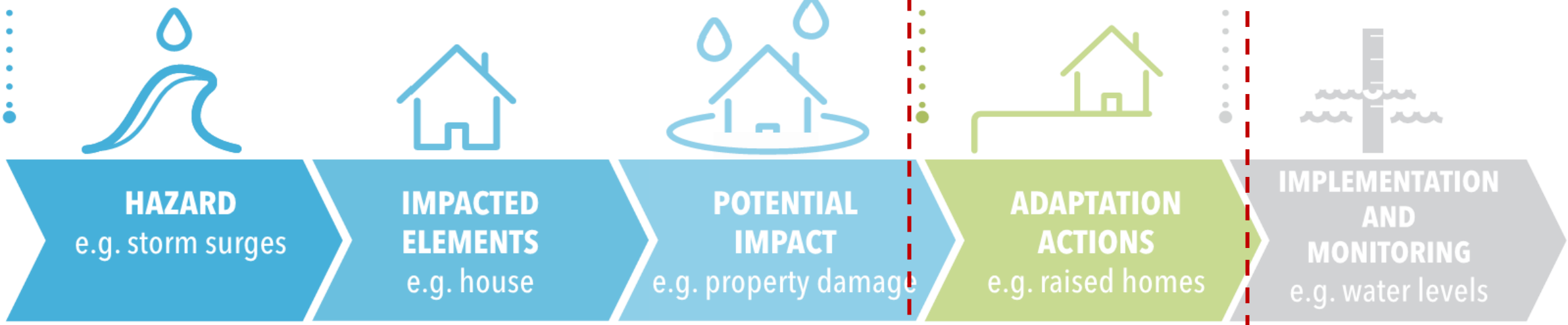
ADAPTATION CANADA2020

About the Project

Vulnerability Assessment Phase 1

Action Plan Phase 2

Implementation Phase 3



Assess the Hazard
What might major events and climate change look like in our region?

Define the Focus
What and who will be impacted?

Assess Impacts
How could hazards affect our lands and community?
What are our priorities?

Adaptation
What actions should we take to minimize or offset impacts?

Putting our Plan into Action
Are we meeting our goals?

ADAPTATION CANADA2020

Project Approach

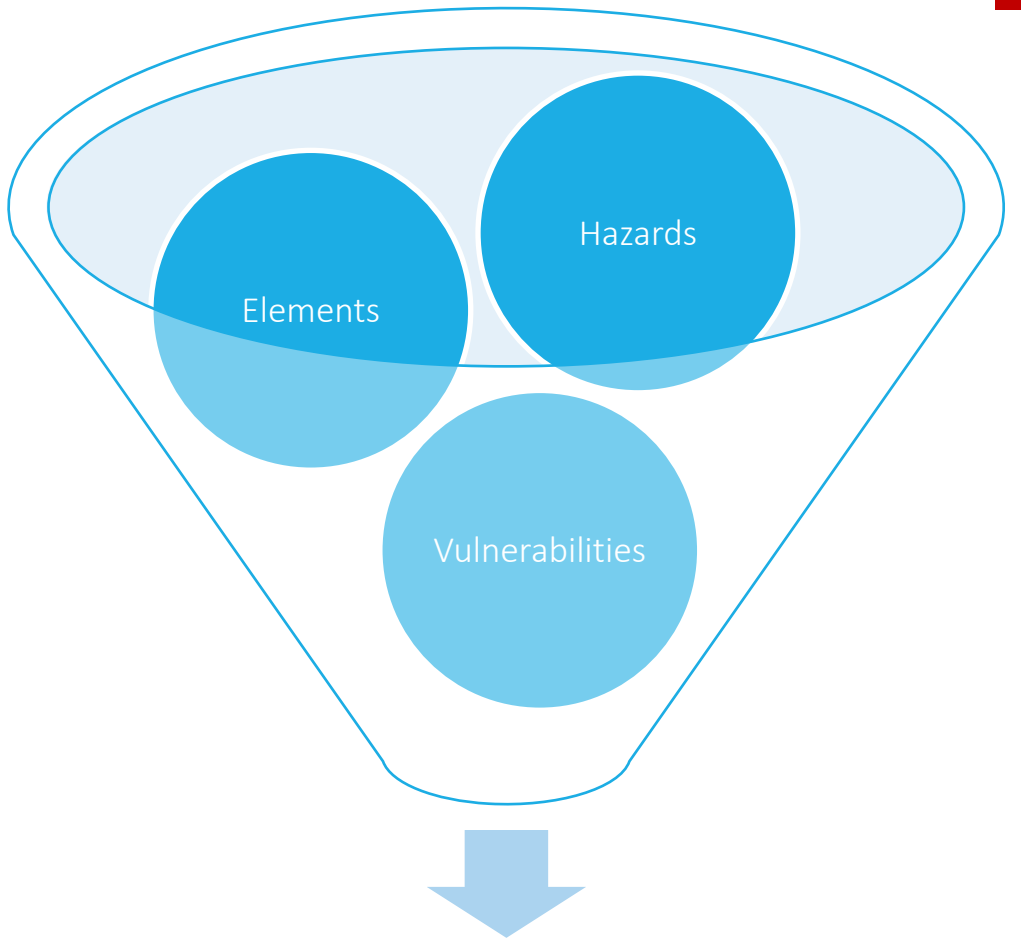
Phase 1 – Defining Hazards & Elements

Screening Assessment

Detailed Hazard & Vulnerability Assessment

Phase 2 – Setting a Vision & Goals

"Long-List" & Priority Actions



Values-Base Approach: *Guiding the Methodology*

Project Working Group & Climate Action Task Force
Input through Workshops

TWN Department Staff
Input through Workshops

Inlailawatash Limited Partnership
Archaeological assessment
Input through Workshops

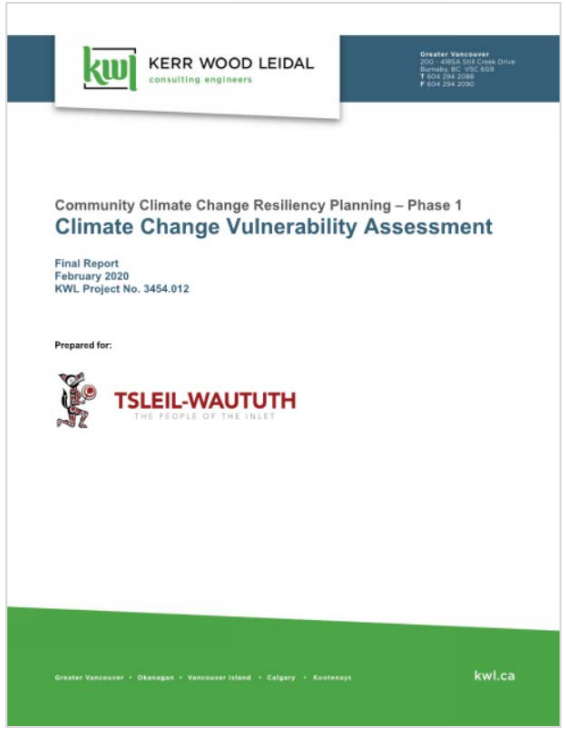
TWN Steering Committee & Project Manager
Ongoing meetings & comment on deliverables to guide project

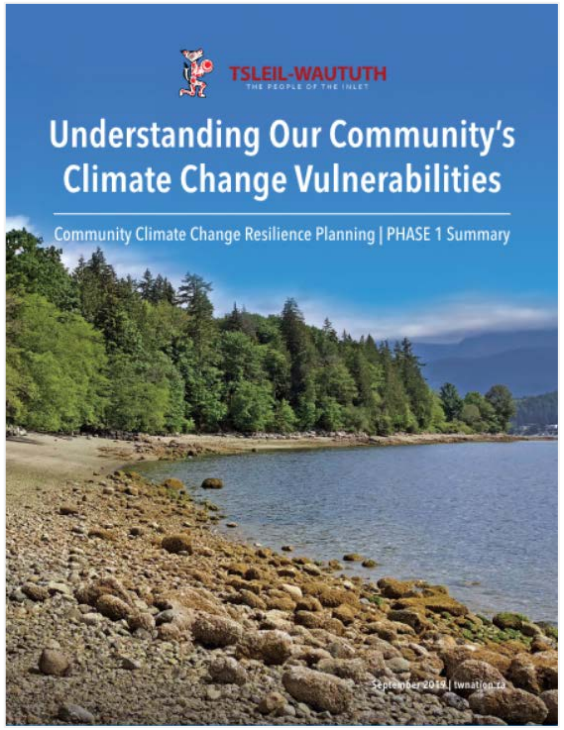
TWN Community Members
TWN Climate Summit
Community Art Project Land Use Plan Film Screening
Youth & Elder Shoreline Tour
Climate Change Video

ADAPTATION CANADA2020

PHASE 1: *Climate Change Vulnerability Assessment*

- What are the **climate change hazards** that will potentially impact the TWN community?
- What **aspects of the community ("elements")** should the vulnerability assessment focus on?
- What are **our most vulnerable elements**?





Step 1
Hazard Assessment

Step 2
Define Elements

Step 3
Vulnerability Assessment

Step 1
Hazard Assessment

Step 2
Define Elements

Step 3
Vulnerability Assessment

Analytical Assessment


COASTAL FLOODING


COASTAL EROSION


INTERTIDAL AREA CHANGE


CREEK FLOODING


CREEK EROSION


URBAN FLOODING

Literature Review Assessment


WILDFIRE


EXTREME HEAT

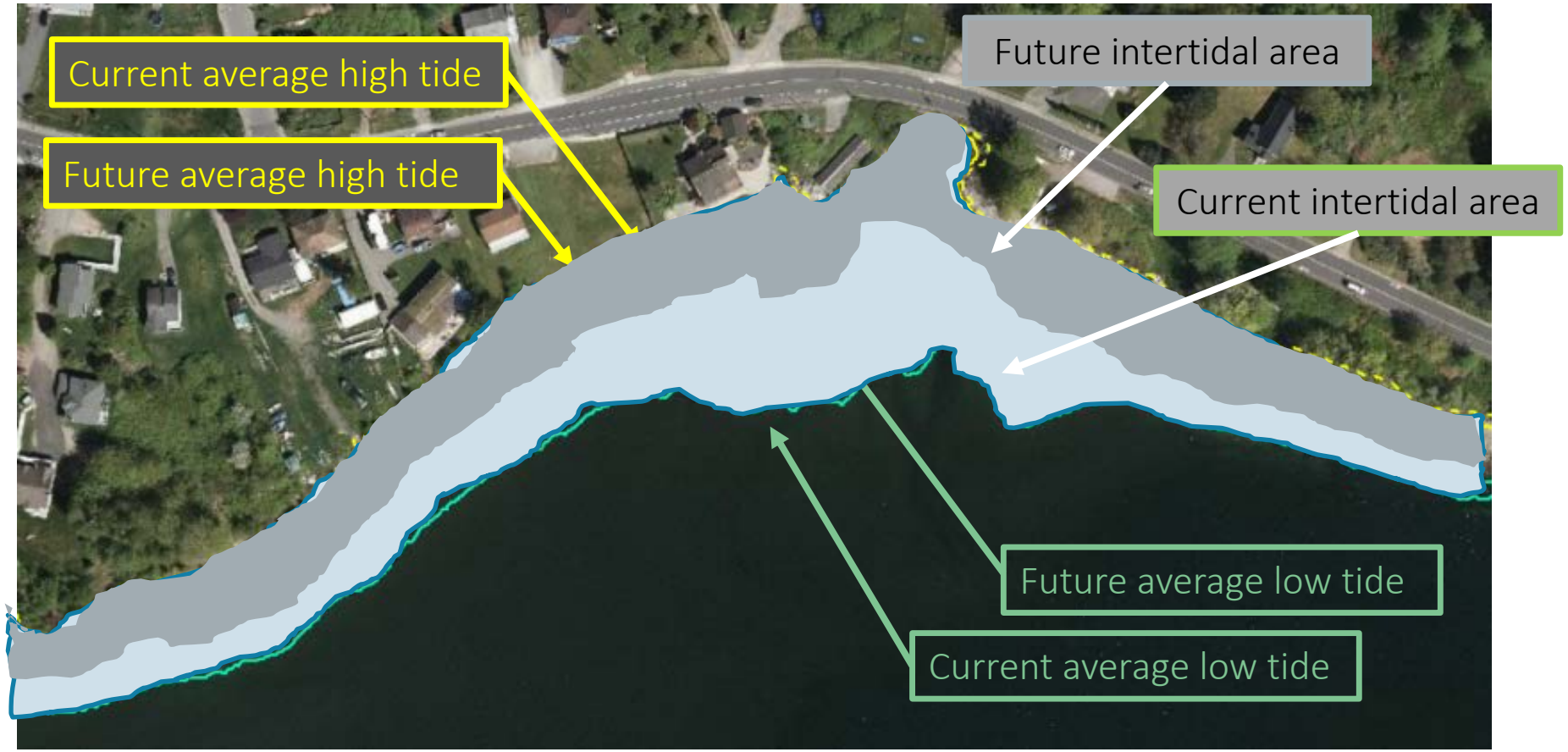

INVASIVE SPECIES

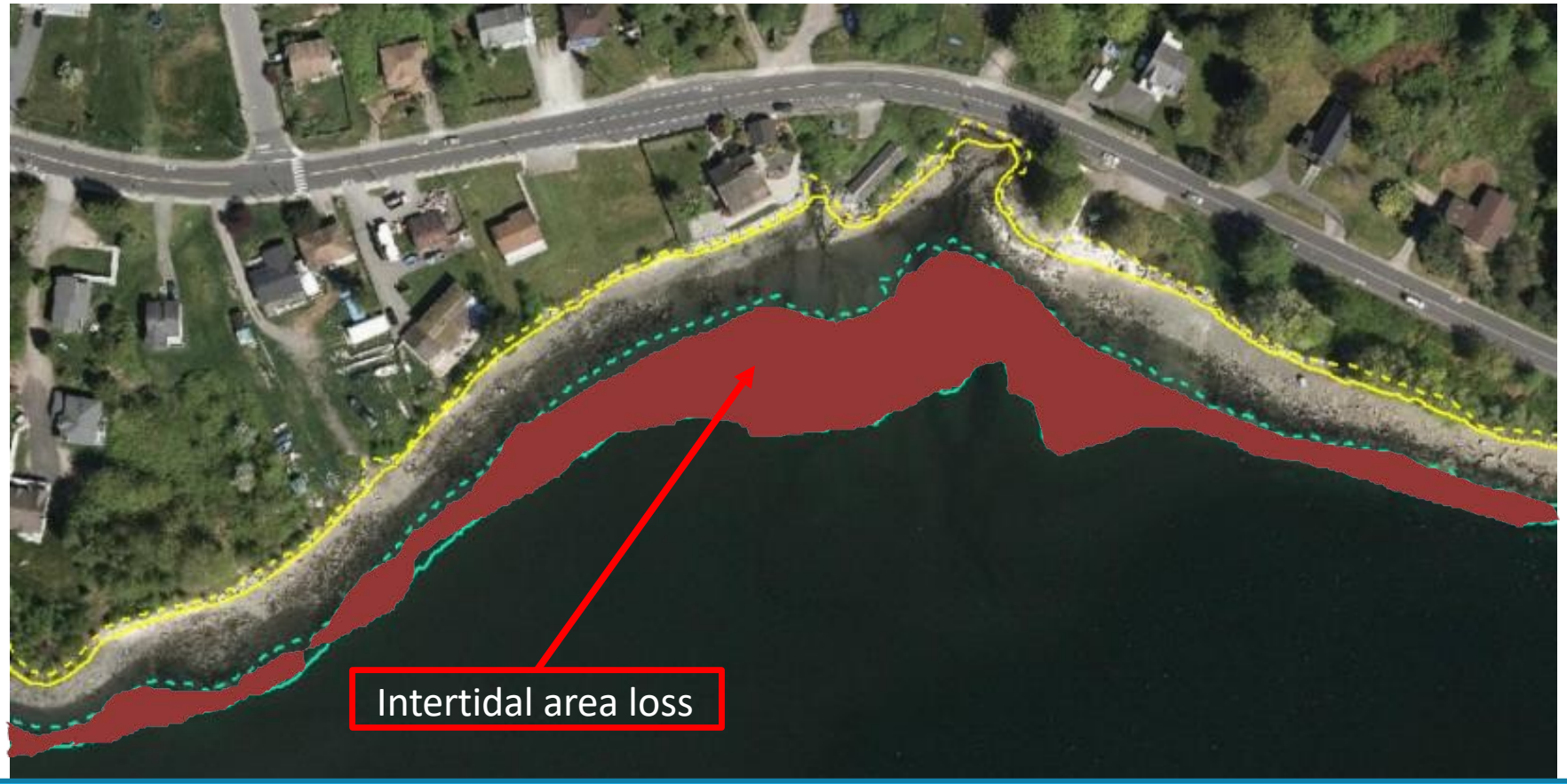

OTHER OCEAN HAZARDS

OCEAN ACIDIFICATION


HARMFUL ALGAL BLOOMS


VECTOR-BORNE DISEASE


Current average high tide
Future average high tide
Future intertidal area
Current intertidal area
Future average low tide
Current average low tide



Total estimated net intertidal area change: -20% (16 ha)

Step 1
Hazard Assessment

Step 2
Define Elements

Step 3
Vulnerability Assessment

Ecological Systems
(e.g., impacts to shellfish and beaches)

Land Use & Real Estate
(e.g., community housing and buildings)

Infrastructure & Community Services
(e.g., water infrastructure and emergency services)

Economy
(e.g., employment and business assets)

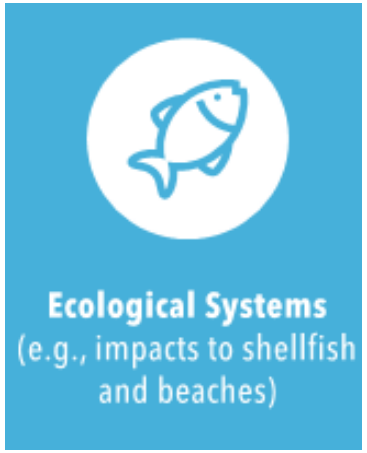
Community & Cultural Health
(e.g., physical health and well-being)

Archaeological & Cultural Heritage Sites
(e.g., archaeological sites and community cemetery)

Step 1
Hazard Assessment

Step 2
Define Elements

Step 3
Vulnerability Assessment



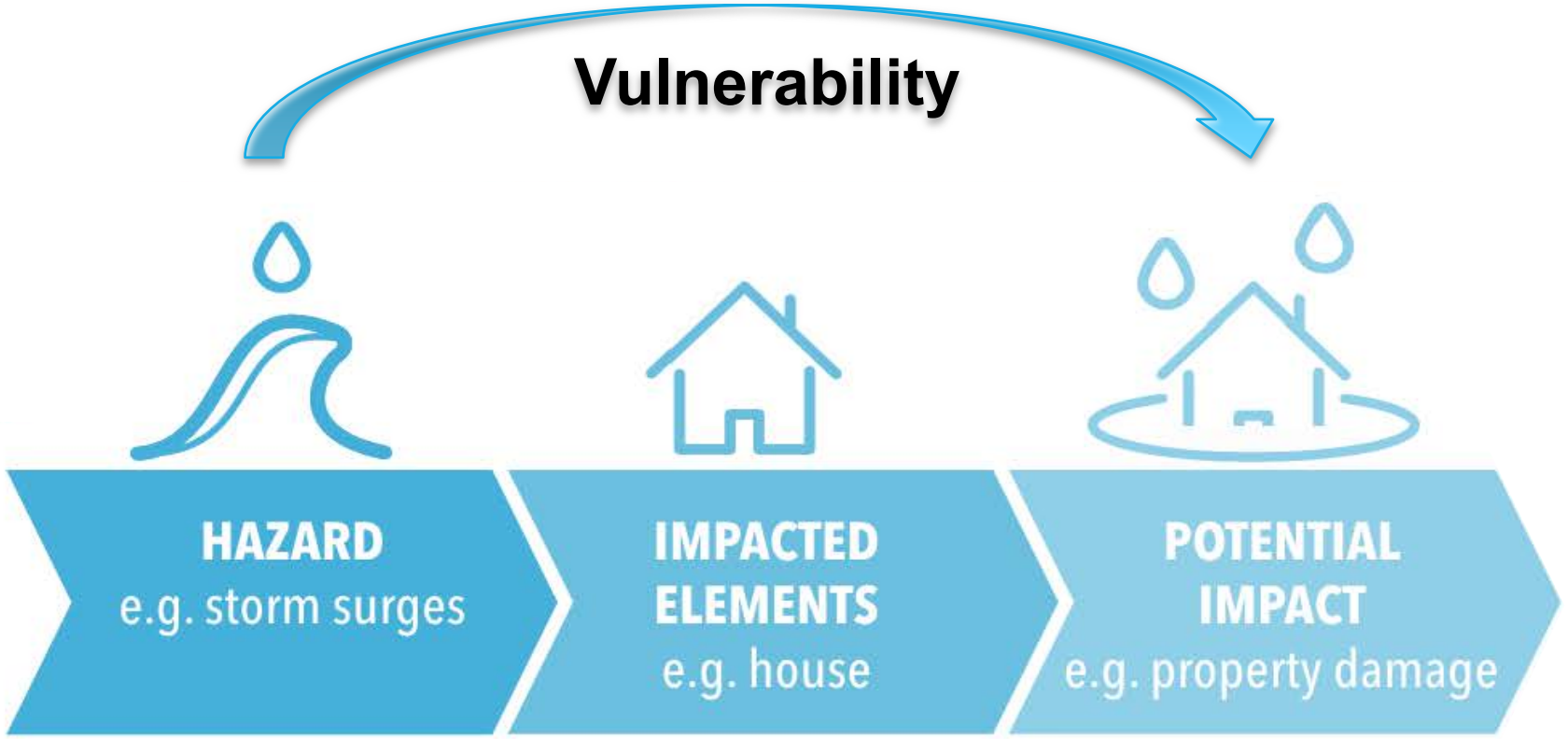
- Shellfish
- Salmon
- Forage fish
- Other finfish
- Marine birds and waterfowl
- Marine and semi-aquatic mammals
- Beaches and shorelines
- Tidelands and marine habitats
- Marine water quality
- Upland wildlife
- Forested areas & medicinal plants
- Freshwater creeks, streams, wetlands, groundwater
- Air quality

- Water and distribution system
- Wastewater collection system
- Stormwater system
- Roads & emergency access
- Energy and telecommunication systems

Step 1
Hazard Assessment

Step 2
Define Elements

Step 3
Vulnerability Assessment



Assess the Hazard
What might major events and climate change look like in our region?

Define the Focus
What and who will be impacted?

Assess Impacts
How could hazards affect our lands and community?
What are our priorities?

ADAPTATION CANADA2020

PART 1 – SCREENING ASSESSMENT

SECTOR	ELEMENT	SEA LEVEL RISE			OCEAN CHANGES			PRECIPITATION CHANGE			TEMPERATURE CHANGE				OUR MOST VULNERABLE ELEMENTS
		Coastal Flooding	Coastal Erosion	Intertidal Area Change	Ocean Acidification	Harmful Algal Blooms	Other Ocean Conditions	Creek Flooding	Creek Erosion	Urban Flooding	Extreme Heat Events	Wildfire	Vector-Borne Diseases	Invasive Species	
Ecological Systems	Shellfish		Med	High	High	Med	High		Low					Med	
	Salmon			High	Med	Med	High	Med	Low					Med	
	Forage fish		Med	High	Med	Med	High							Med	
	Other finfish			Med	Med	Med	High							Med	
	Marine birds and waterfowl		Low	High	Med	Low	High								
	Marine and semi-aquatic mammals		Low	Med	Med	Low	Med				Low				
	Beaches and shoreline	Med	High	High	Med				Med		Low	Med		Med	
	Tidelands and marine habitats	Med	Low		Med		High				Low			Med	
	Marine water quality	Low	Low			Med	High	Med	Low	Med	Low				
	Upland wildlife	Low	Low	Low	Low	Low	Low	Low	Low		Med	High			
	Forested areas and medicinal plants	Med	Med					Low	Low		High	High		Med	
	Freshwater creeks, streams, wetlands, and groundwater	Med	Low					Med	Low	Med	High	Low			
	Air quality										High	High			
	Near-shore lands	Low	Low					Low	Low	Med		Med		Med	
	TWN community housing														

Step 1
Hazard Assessment

Step 2
Define Elements

Step 3
Vulnerability Assessment

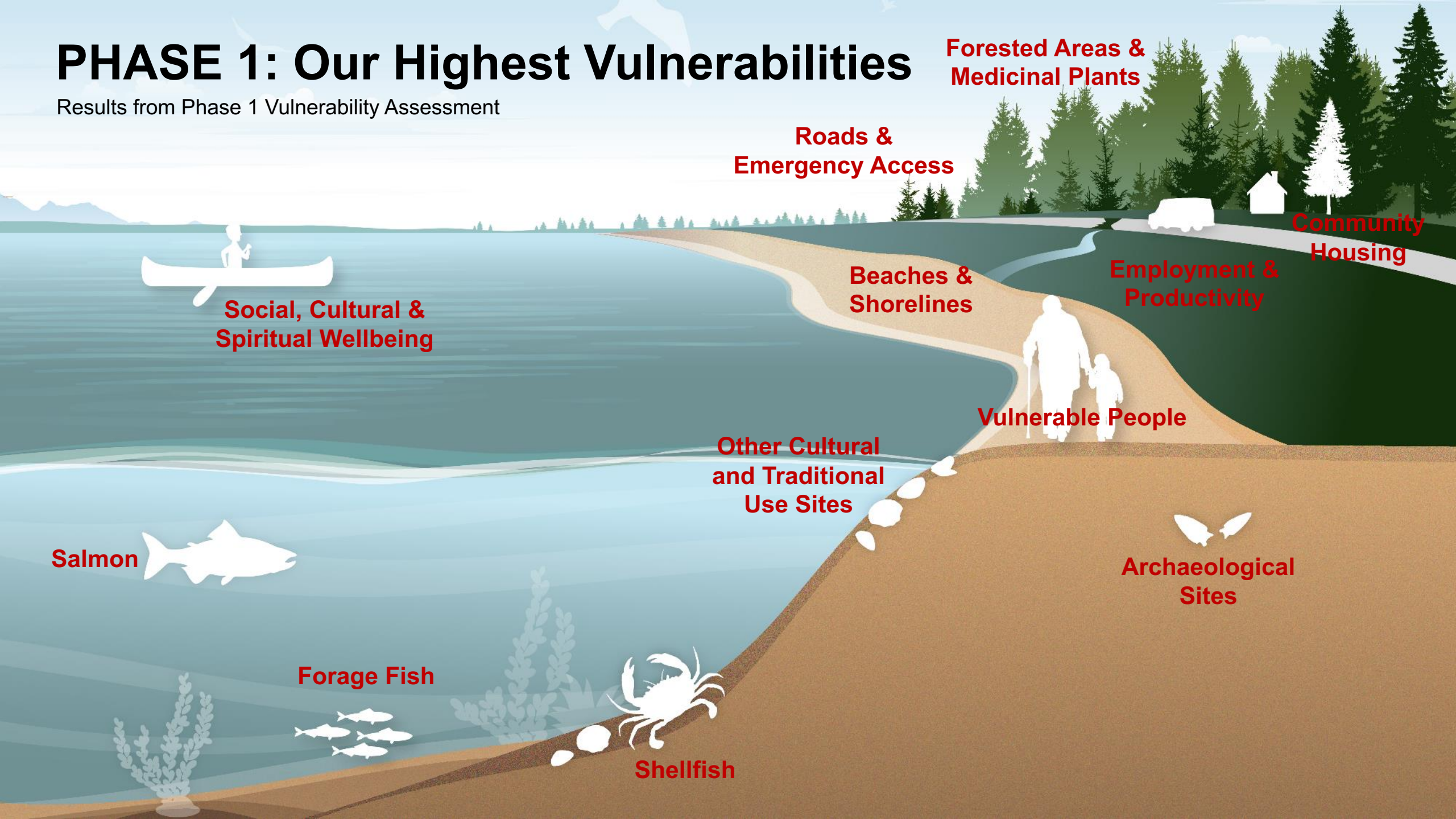
PART 2 – DETAILED ASSESSMENT

Exposure + **Sensitivity** − **Adaptive Capacity**

Three Point Scale for each Component: Low (1) / Medium (2) / High (3)

PHASE 1: Our Highest Vulnerabilities

Results from Phase 1 Vulnerability Assessment



PHASE 2: *Community Climate Change Resilience Plan*

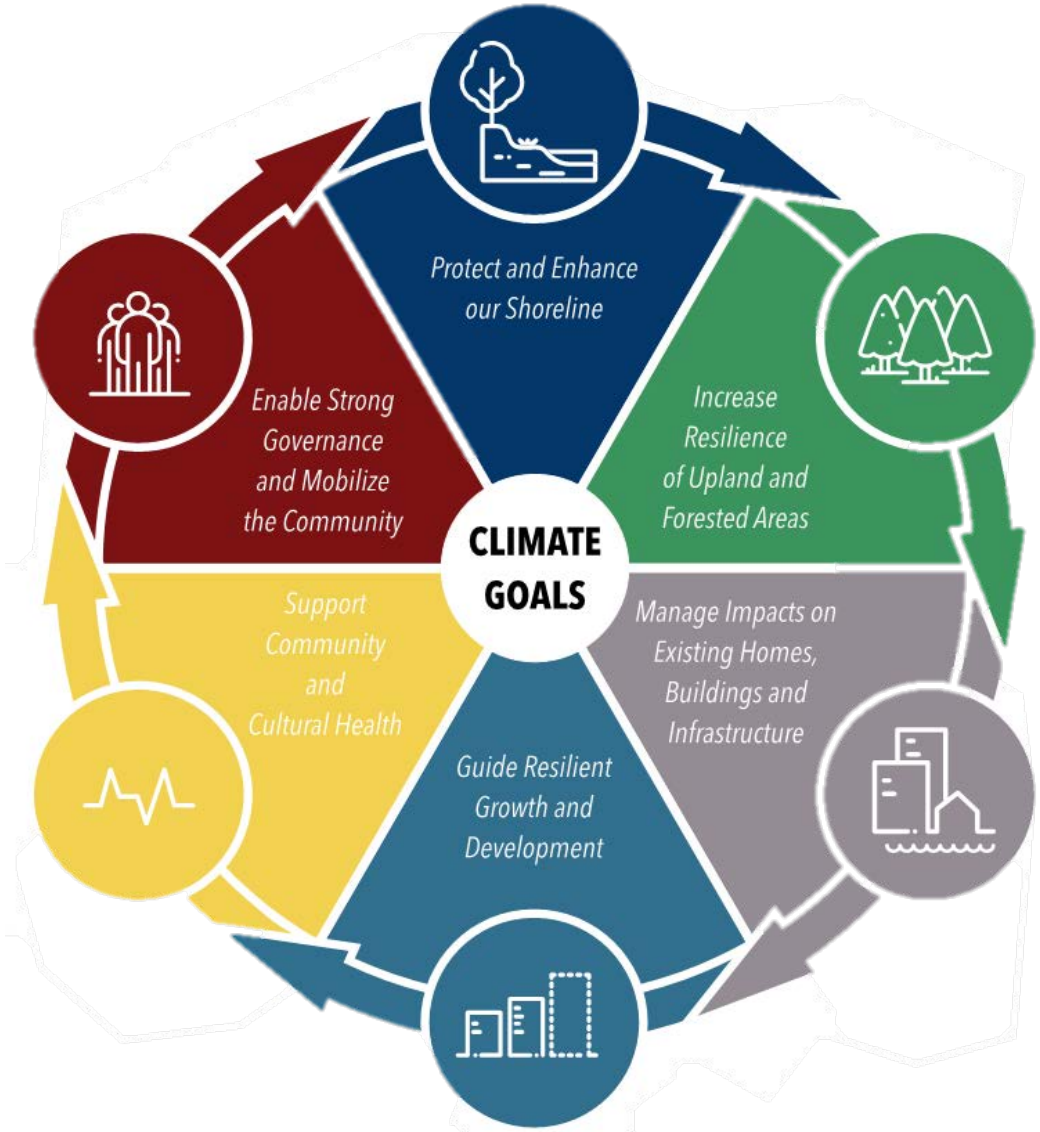
- What will a **climate resilient community** look like in the future?
- What **adaptation actions** will we take to build resilience over the next 10 years?
- How will we **implement** our plan?

Step 1
Setting our Vision

Step 2
Identifying Options

Step 3
Defining Priorities

Step 4
Writing the Plan



ADAPTATION CANADA2020

"Long-List" of Potential Adaptation Strategies	
Goal	**Adaptation Strategies**
G1. Protect and enhance our shoreline, including coastal and marine habitats, waterfront homes and infrastructure, and cultural places.	**Strategy 1.1 Understand Shoreline Dynamics**
	Strategy 1.2 Reduce Shoreline Erosion
	Strategy 1.3 Protect Community Spaces from Coastal Flooding
	Strategy 1.4 Preserve Intertidal and Marine Habitats
G2. Increase the resilience of natural spaces and habitats in upland and forested areas.	**Strategy 2.1 Support Healthy Forests and Green Spaces**
	Strategy 2.2 Support Healthy Creeks & Aquatic Habitats
G3. Manage climate change impacts on existing homes, buildings, and critical infrastructure.	**Strategy 3.1 Strengthen TWN-owned infrastructure resilience to climate change impacts**
	Strategy 3.2 Support Resilient Buildings
	Strategy 3.4 Integrated Watershed Management
	Strategy 3.5 Build Community Resilience to Wildfires

Structural Works

Policy, Planning, and Partnerships

Education

Resilient Infrastructure & Nature-Based Concepts

Community Preparedness

Scientific and Traditional Knowledge

Lessons Learned – Values-Based Approach

1. **Community values provide a starting point** - Focus on what members care most about

3. **Understanding community goals** and what we're working toward

3. **Community engagement** (working group, building awareness, sustaining interest)

Lessons Learned

4. **Vulnerability-based Approach** enabled indigenous lens
5. **Multi-disciplinary team** for detailed hazard analysis and adaptation approaches
6. **Climate change opportunities** (co-benefits)
7. **Moving from planning to action**
8. **Managing costs of adaptation**

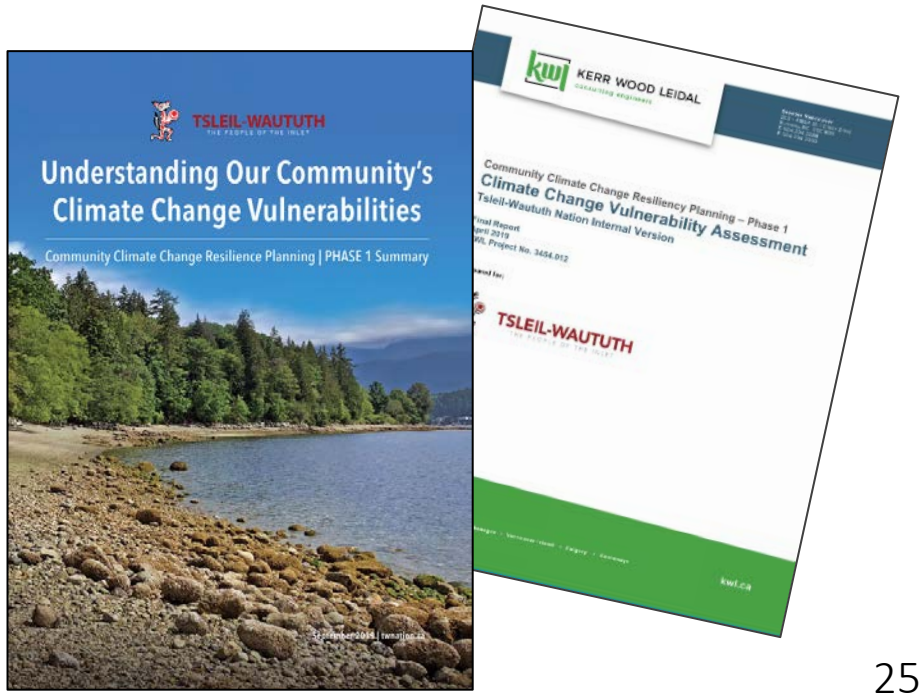
Want to learn more?

July 2018 TWN Climate Change Summit Presentations

https://twnation.ca/climate-summit/

Phase 1 Summary Report (Technical Report pending)

https://tinyurl.com/to63tyz



Thank You

Sarah Dal Santo, RPP, MCIP
Natural Resources Planning Manager
Tsleil-Waututh Nation
sdalsanto@twnation.ca

Robin Hawker, RPP, MCIP
Climate Adaptation Planning Lead
Kerr Wood Leidal Associates
rhawker@kwl.ca

Example Vulnerability Assessment

Element: **SHELLFISH**

SIGNIFICANT HAZARD	EXPOSURE	+	SENSITIVITY	-	ADAPTIVE CAPACITY	=	VULNERABILITY
 INTERTIDAL AREA CHANGE	High (3)		Moderate (2)		Moderate (2)		**Moderate (3)**
 OCEAN ACIDIFICATION	High (3)		High (3)		Low (1)		**High (5)**
 OTHER OCEAN HAZARDS	High (3)		High (3)		Low (1)		**High(5)**
						CUMULATIVE	**13**

PHASE 1 – Step 3: Vulnerability Assessment - Example

SECTOR	ELEMENT	SEA LEVEL RISE			OCEAN CHANGES			PRECIPITATION CHANGE			TEMPERATURE CHANGE				OUR MOST VULNERABLE ELEMENTS
		Coastal Flooding	Coastal Erosion	Intertidal Area Change	Ocean Acidification	Harmful Algal Blooms	Other Ocean Conditions	Creek Flooding	Creek Erosion	Urban Flooding	Extreme Heat Events	Wildfire	Vector-Borne Diseases	Invasive Species	
Ecological Systems	Shellfish		Med	High	High	Med	High		Low					Med	✓
	Salmon			High	Med	Med	High	Med	Low					Med	✓
	Forage fish		Med	High	Med	Med	High							Med	✓
	Other finfish			Med	Med	Med	High							Med	
	Marine birds and waterfowl		Low	High	Med	Low	High								
	Marine and semi-aquatic mammals		Low	Med	Med	Low	Med				Low				
	Beaches and shoreline	Med	High	High	Med				Med		Low	Med		Med	✓
	Tidelands and marine habitats	Med	Low		Med		High				Low			Med	
	Marine water quality	Low	Low			Med	High	Med	Low	Med	Low				
	Upland wildlife	Low	Low	Low	Low	Low	Low	Low	Low		Med	High			
	Forested areas and medicinal plants	Med	Med					Low	Low		High	High		Med	✓
	Freshwater creeks, streams, wetlands, and groundwater	Med	Low					Med	Low	Med	High	Low			
	Air quality										High	High			
	Near-shore lands	Low	Low					Low	Low	Med		Med		Med	
	TWN community housing														✓