# Coastal Flood Hazard Mapping and Risk Assessment

## District of Tofino

Understanding Risk – URBC 2020 Conference

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Keith Orchiston | Emergency Program Coordinator | District of Tofino

Silja Hund, PhD| Hydrologist | Ebbwater Consulting Inc.

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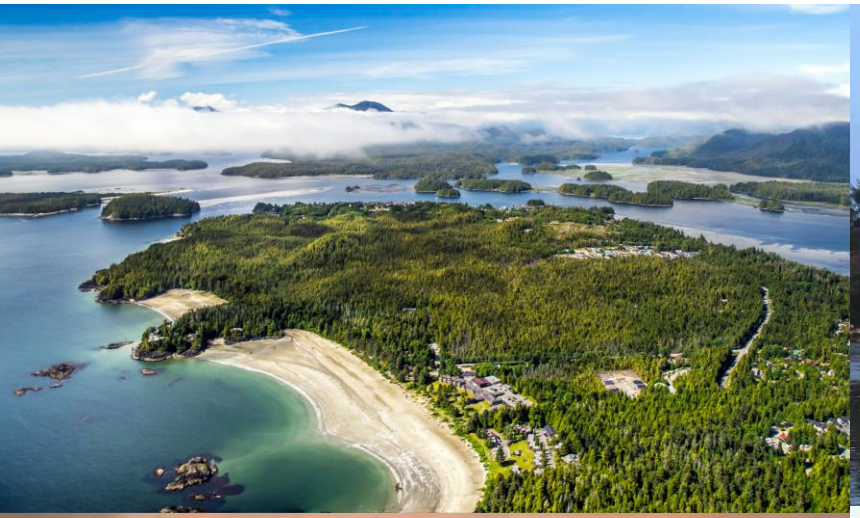
# Tofino – located within the Hahuulthii of the Tla-o-qui-aht Ha'wiih

Source: Jeremy Koreski

# Tofino's community…

… is shaped by its location on the edge of the Pacific Ocean and its wild beaches and forests.



Sources: Tofino Harbour Air, Ebbwater, Tofino Tourism, Tofino Marinas


*Key words from Tofino stakeholders on what living on the coast means to them.*
*From Ebbwater Tofino workshop.*

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# Tofino is exposed to coastal flood hazards….

*Coastal Storm*

*Tsunami*

…which will get worse with sea level rise.

*Icon Credit: UN OCHA*

Source: Ebbwater


# District of Tofino Coastal Flood Mapping (Coastal Storm & Tsunami)

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# Coastal storm flood scenarios

Flood in recent memory
(1:15 years; Ward et al. 2011*)

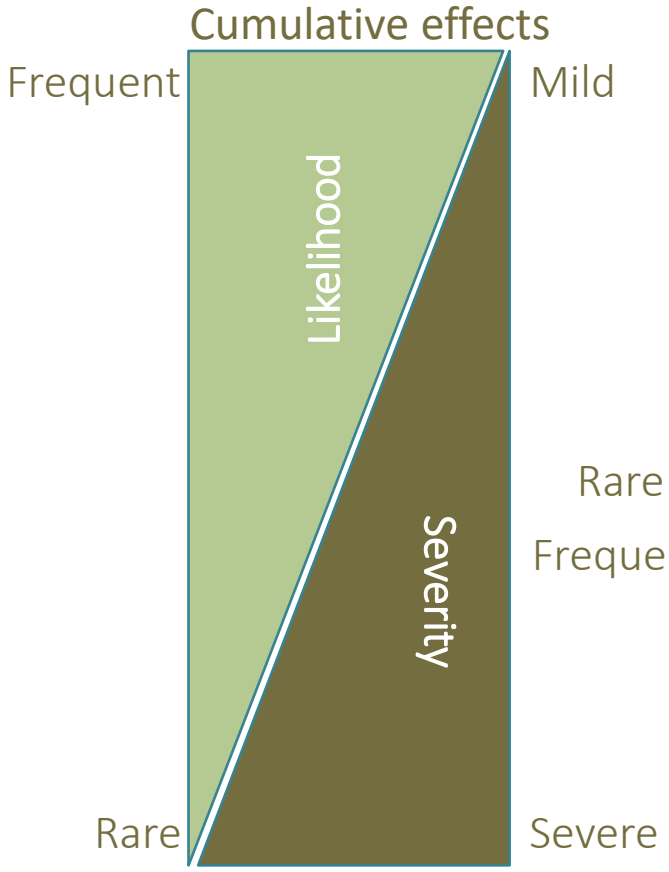
Range of likelihoods

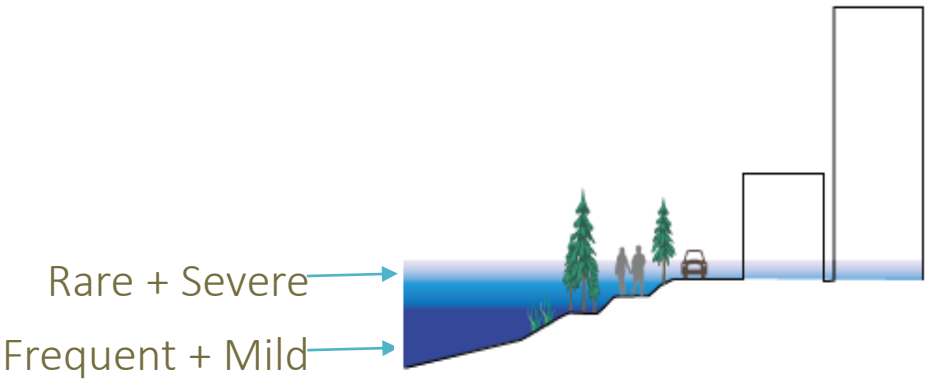
Regulatory Flood
(1:200 years;
Professional guidelines)

Extreme Flood

Likelihood

| | |
|---|---|
| 6.67% | Map |
| 2.0 % | Map |
| 1.0 % | Map |
| 0.5 % | Map |
| 0.2 % | Map |




*Likelihood presented as*
*AEP = Annual Exceedance Probability*

**Ward et al (2011); NHESS, 11 (12), 3181-3195*

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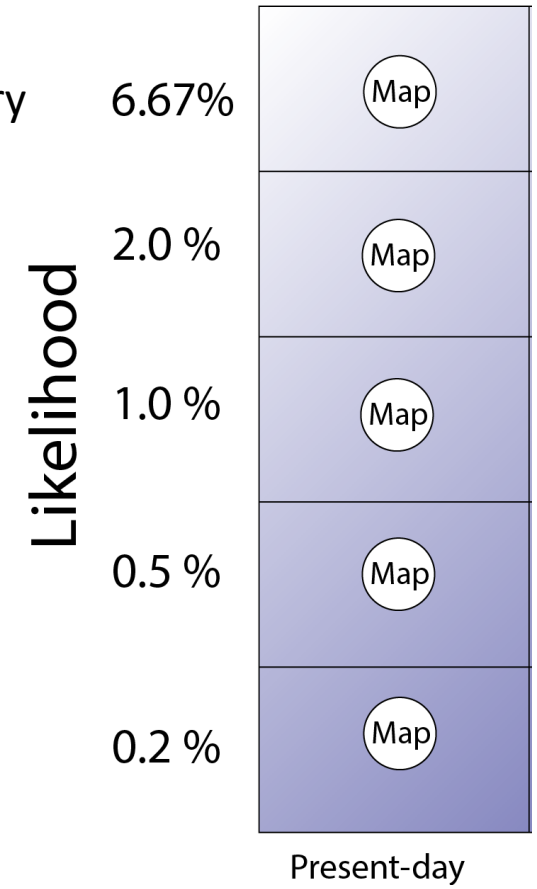
# Coastal storm flood scenarios

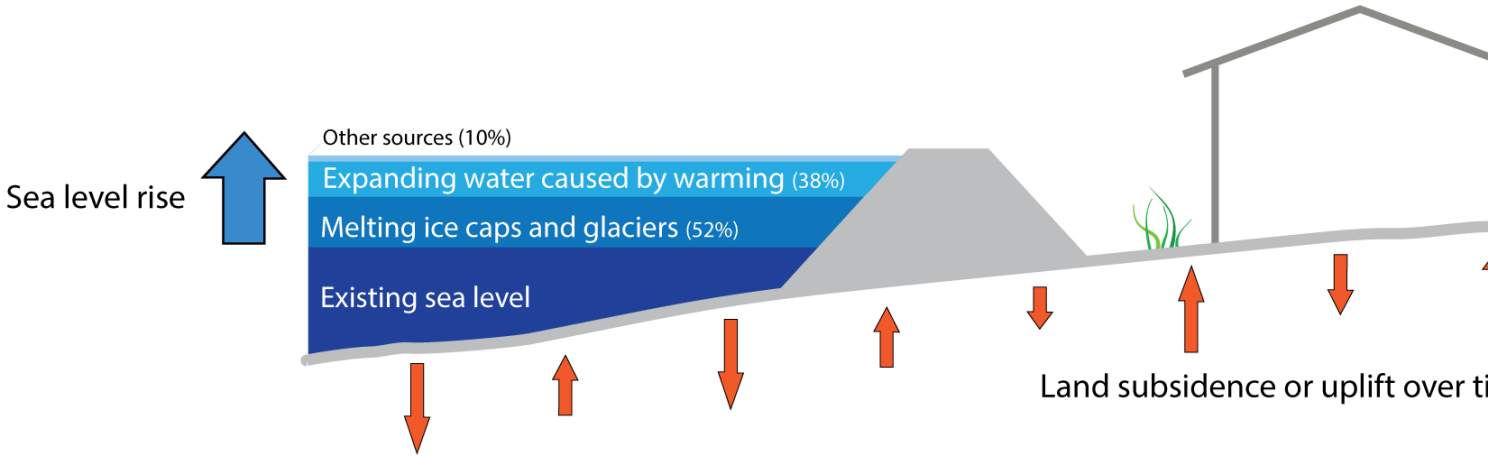
+ Climate Change and Rising Sea Levels

Flood in recent memory

Regulatory Flood
(1:200 years;
Prov guidelines)

Extreme Flood




*Likelihood presented as*
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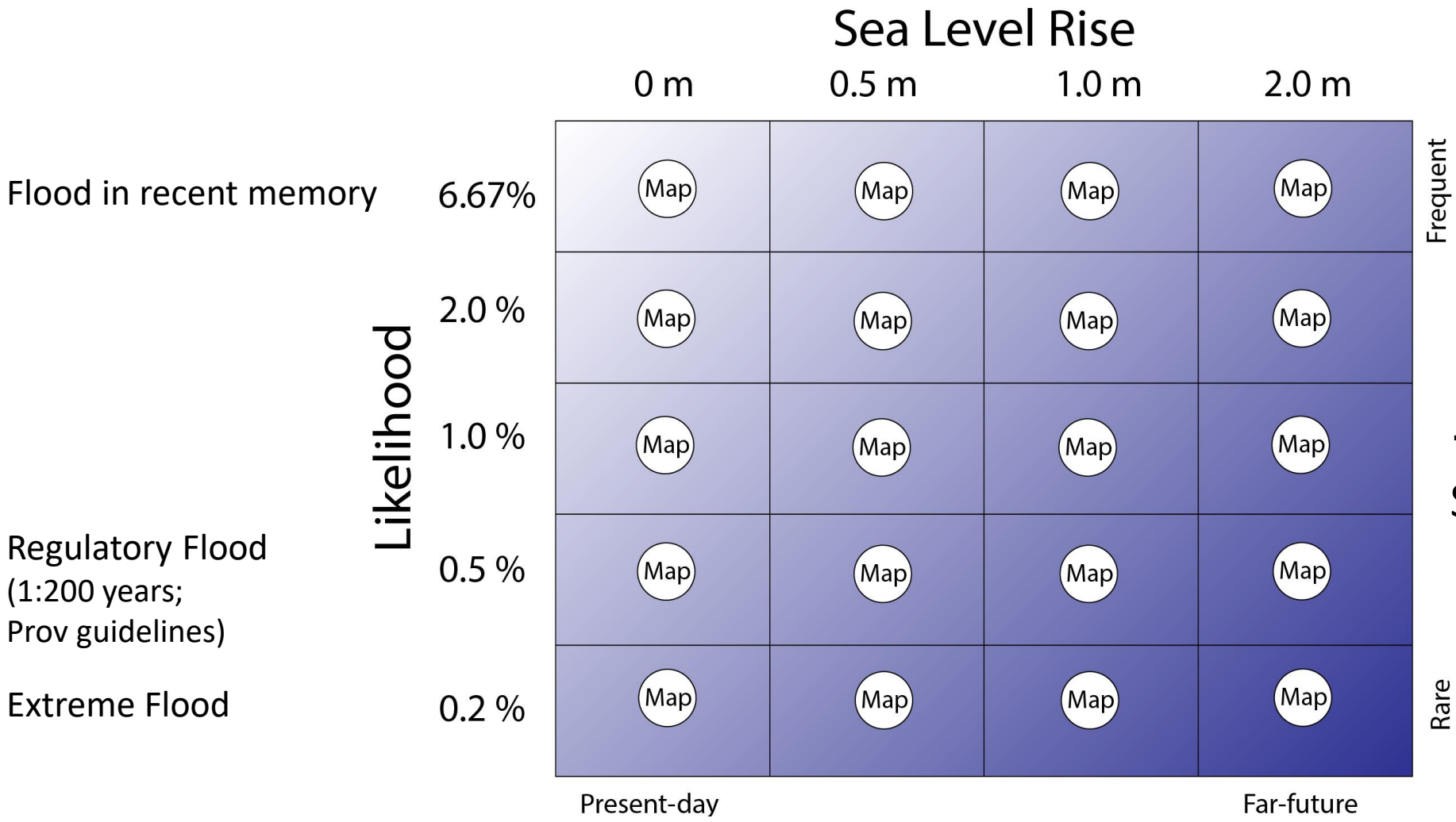
# Coastal storm flood scenarios




Flood in recent memory

Regulatory Flood
(1:200 years;
Prov guidelines)

Extreme Flood

→ Total of 20 Coastal Storm Flood Scenarios

*Likelihood presented as AEP = Annual Exceedance Probability*

*Sea Level Rise presented as relative SLR (RSLR); considered independent of year when it may occur*

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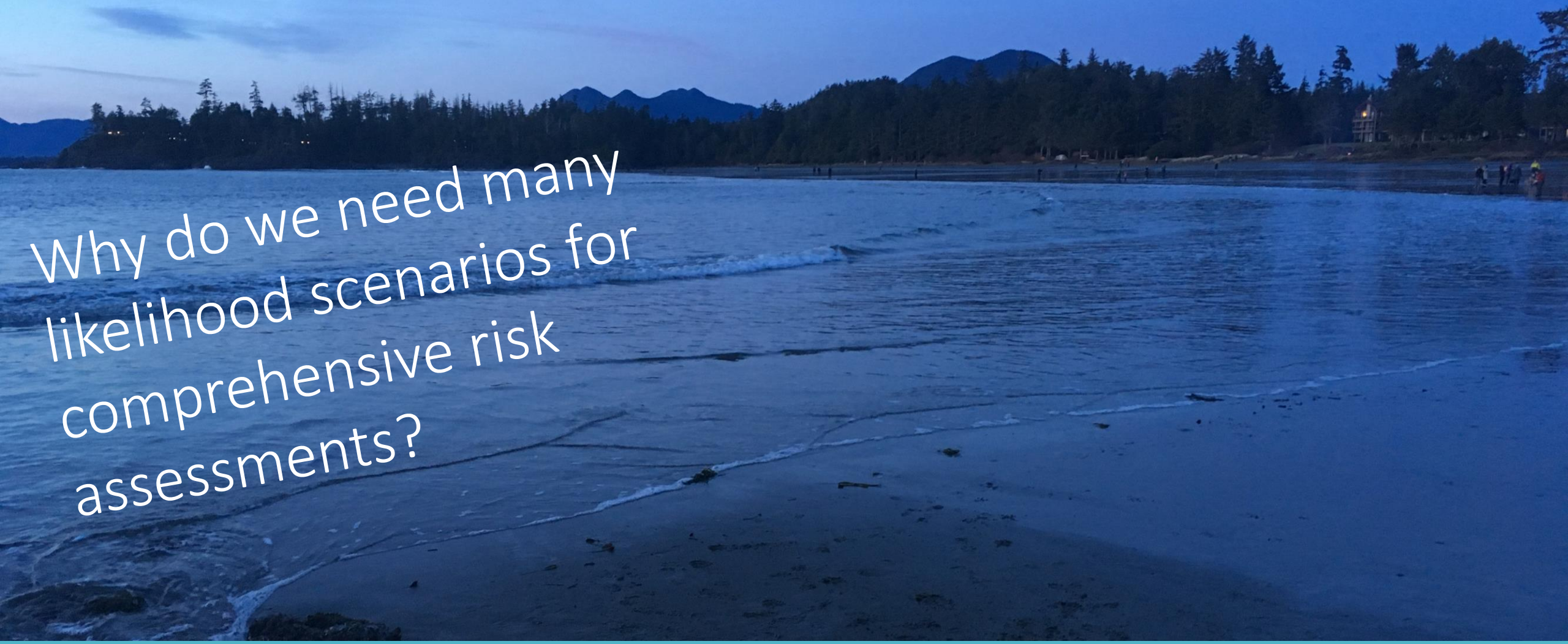
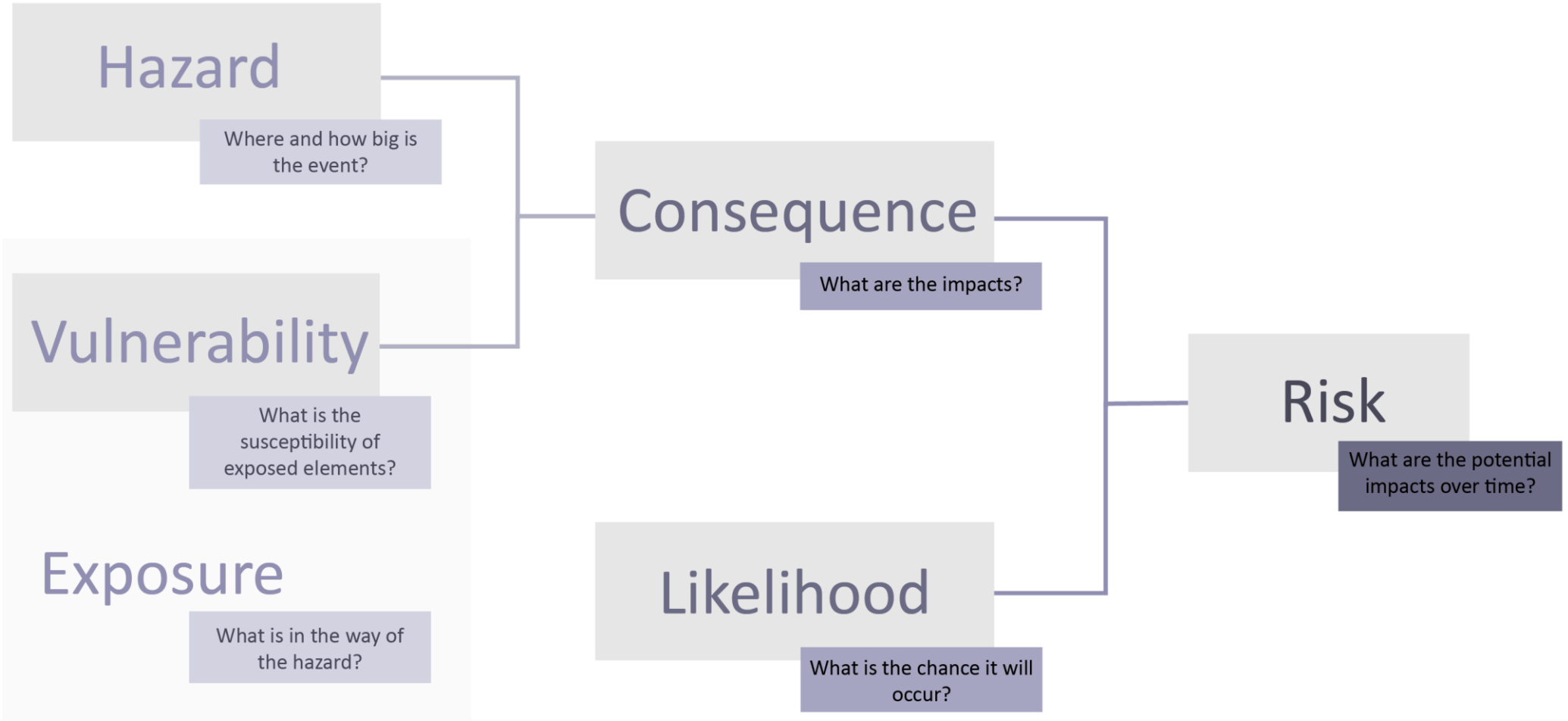



# District of Tofino Comprehensive Flood Risk Assessment

# Risk




→ Hazard scenarios as key input to risk assessments.

→ Along with exposure and vulnerability for holistic set of indicators.

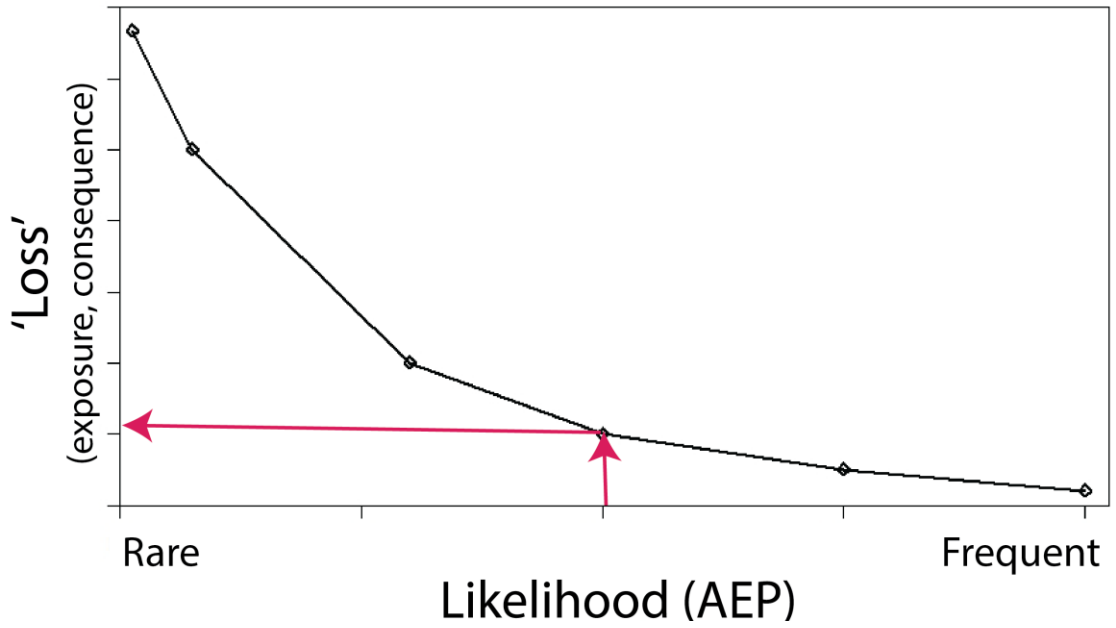
# Risk – Full Statistical Accounting of Risk

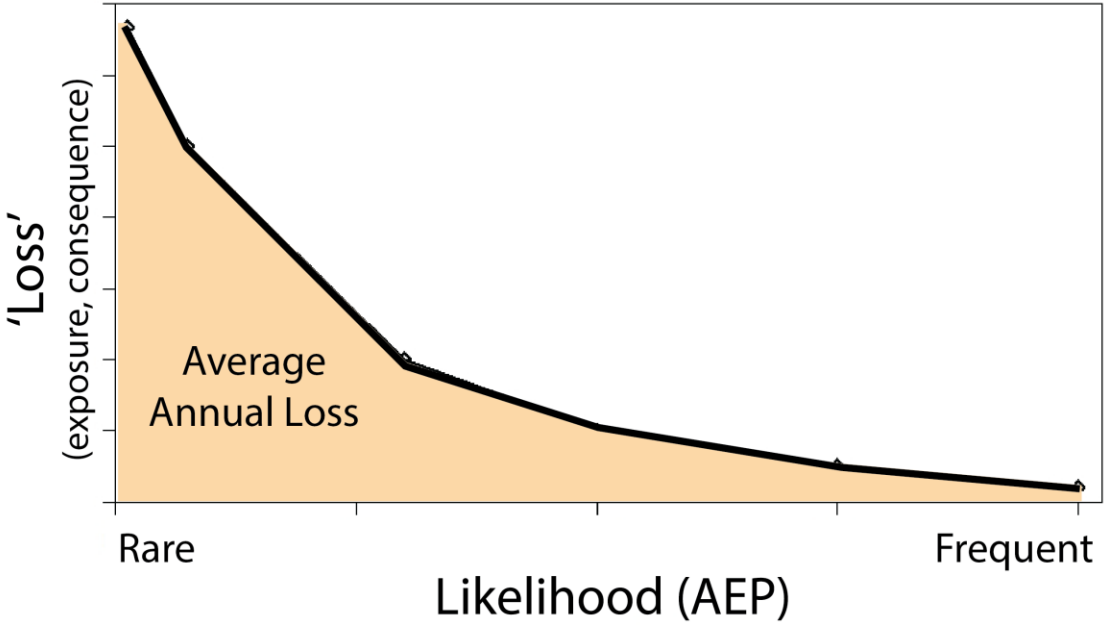
Estimate risk based on many possible likelihoods (not just 1 scenario), using exceedance probability curves:

Risk

Average Annual Loss

= approximate long-term average of flood consequences on an annualized basis (UNISDR, 2017).

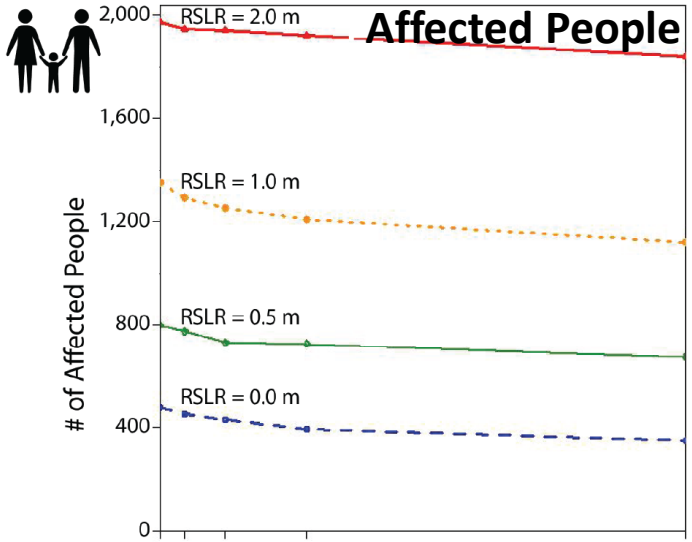


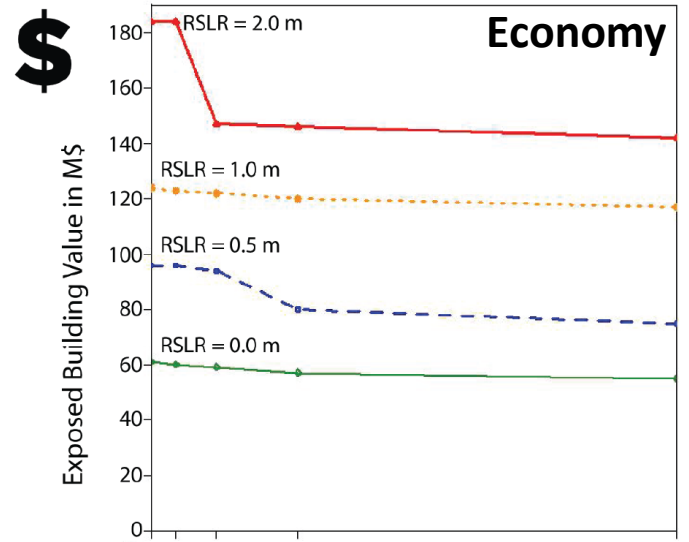



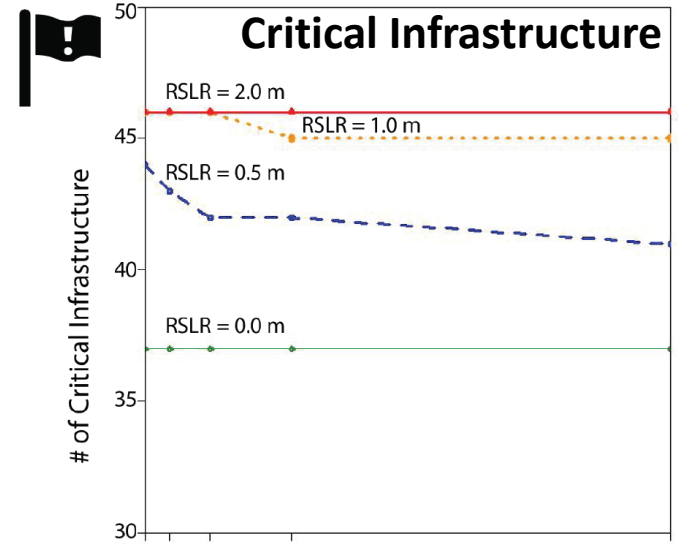

*Based on UNISDR (2017).*

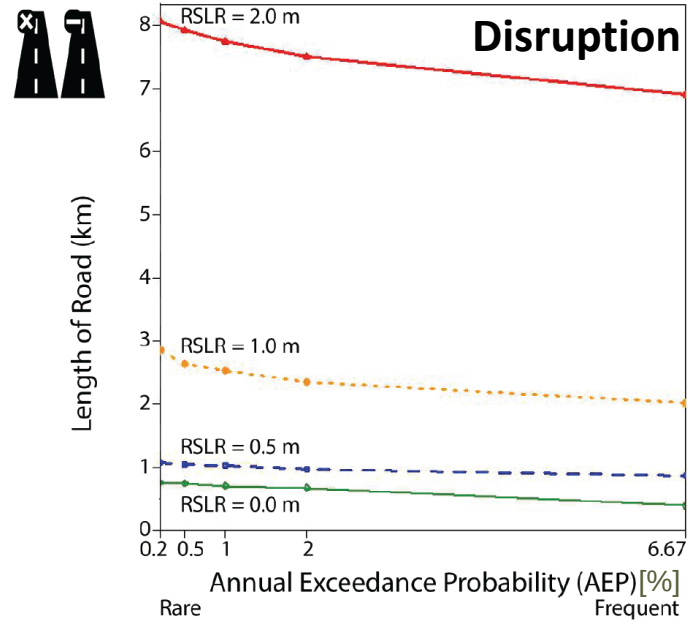
# Risk – Exceedance Probability Curves

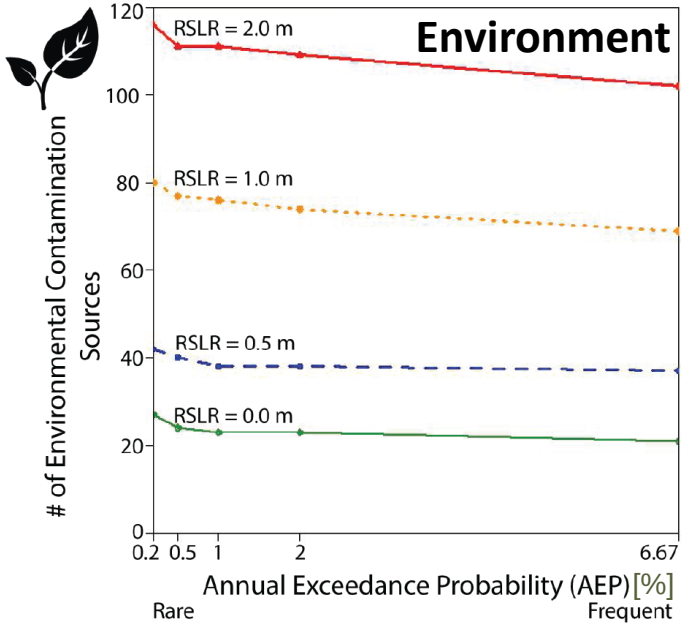
- More nuanced risk picture than only assessing one scenario (e.g., 0.5% AEP).
- Highlights need to consider full range of likelihoods.

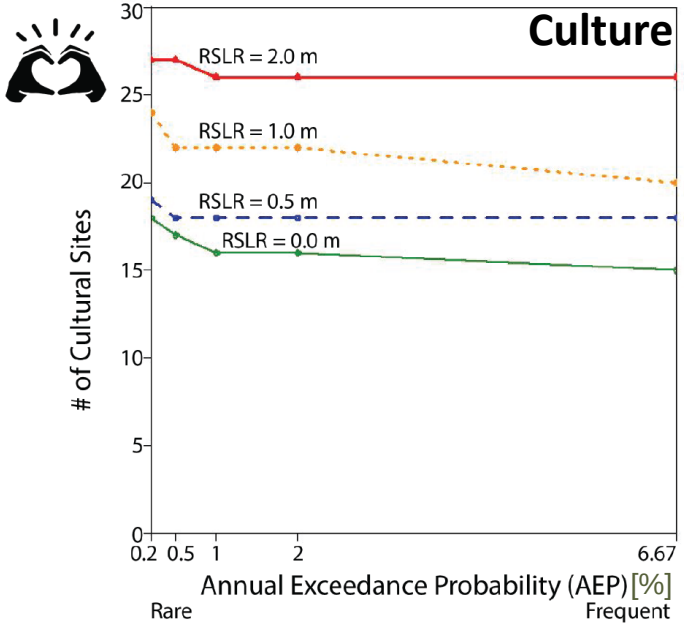


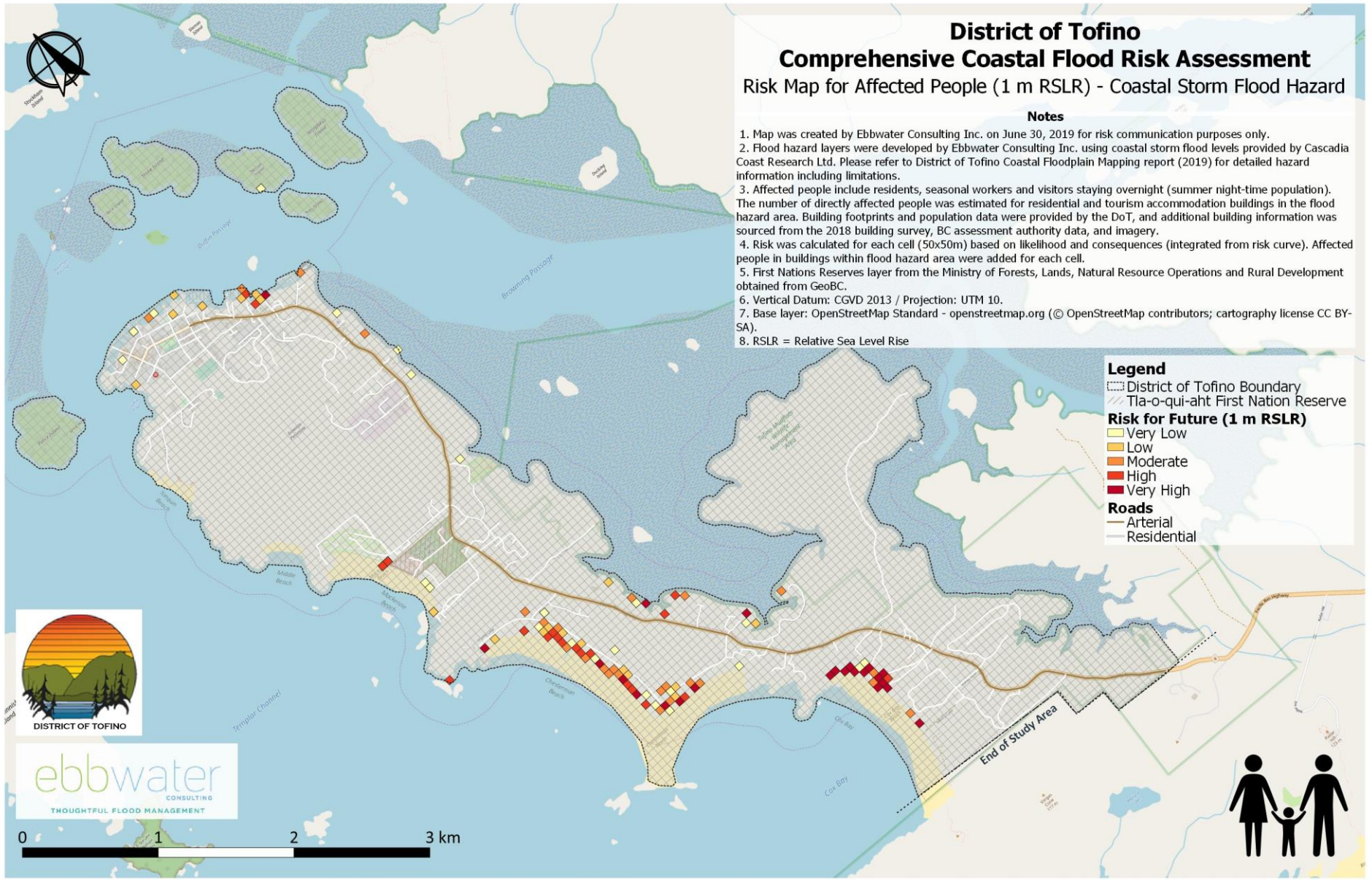



# Risk –Risk Maps

Affected People

- Actual **Risk** Map
- ➢ Highlights priority areas
- ➢ Accounting not only for catastrophic events but also for cumulative damages over time.



# Take Away Messages

# Scenarios for Risk Assessments & Policy

1. **Include 5+ likelihoods for comprehensive risk assessments.**
   - Well-distributed range of likelihoods needed to present full picture of risk.
   - Inclusion of frequent mild floods allows accounting of cumulative effects.

2. **Include quantitative climate change scenarios.**
   - The climate is changing, and we need to prepare → flood maps are key tools for that.

3. **Select the appropriate level of analysis for your project.**
   - High-level risk assessment to prioritize hazards for further assessment and highlight key areas of concern?
   - Detailed risk assessment for local government infrastructure planning or to inform risk mitigation decision-making?

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# Acknowledgements

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EPICentre

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