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Tooling Up to Design and Implement Tsunami Risk Reduction Strategies

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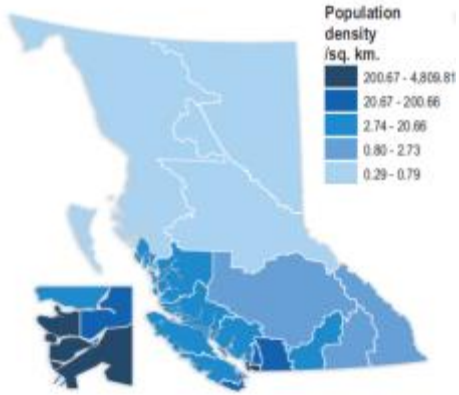
Tsunami – Fight or Flight?

Avoid

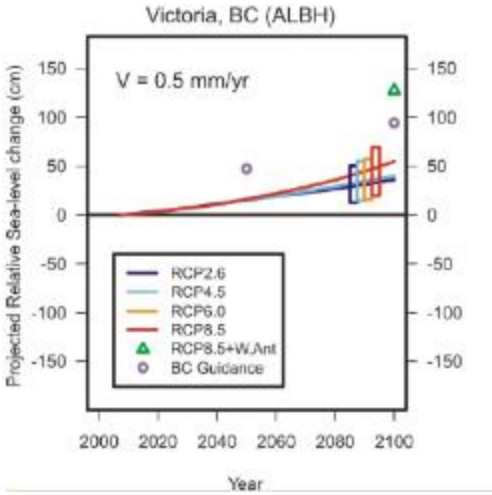
- Restrict development in high risk areas
- Community protection schemes
- Early warning systems
- Evacuation plans
- Safe routes to high ground

But is avoidance the only solution?

- 38% of Canadians live within 20km of the coast (Manson, 2005)
- Many remote coastal communities



Foster et al. (2014)



James et al. (2014)

Resist

- Places of refuge (e.g. vertical evacuation structures)
- Structural strengthening
- Piled structures, elevated living areas
- Scour protection
- Debris control
- Structural elements (openings, breakaway panels, mitigation walls, tie-downs, redundancy)
- Dryproofing
- Maybe even floatation?

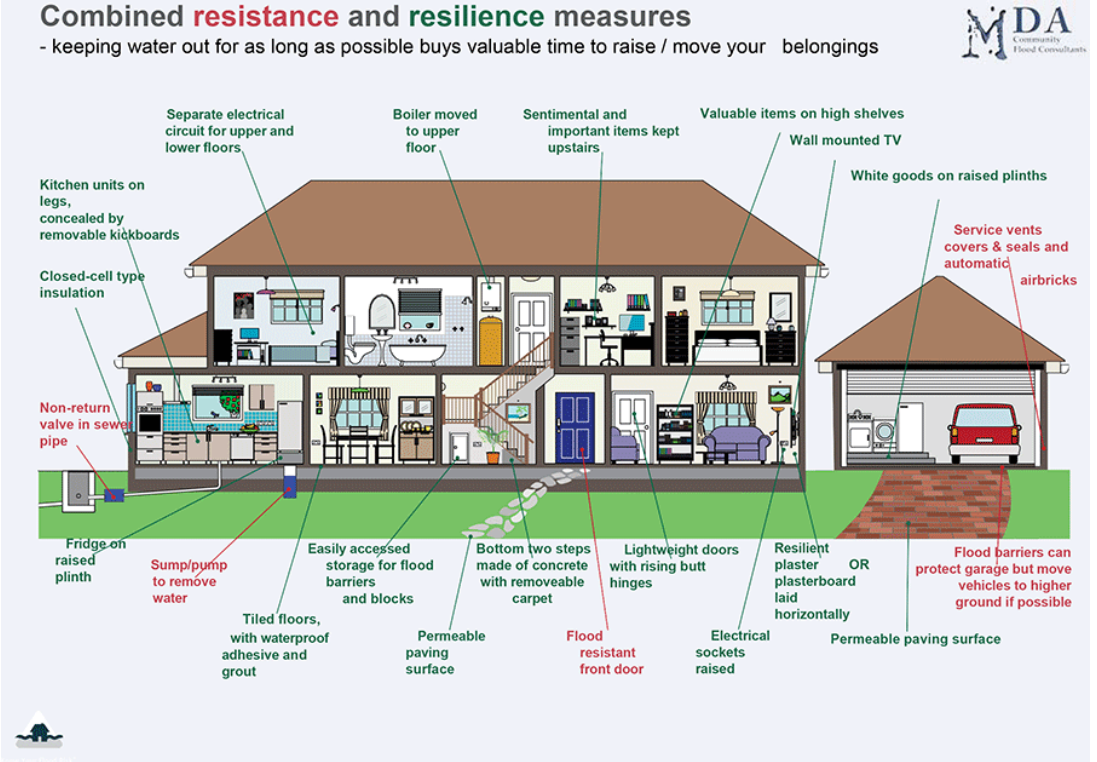
Build Resilience

- Speedy return to service
- Construction techniques
- Materials
- Finishes
- Limit damage
- Preserve functionality of critical infrastructure
- Facilitate (or at least don’t impede!) emergency response

Image source: Nyland and Nodelman (2017)

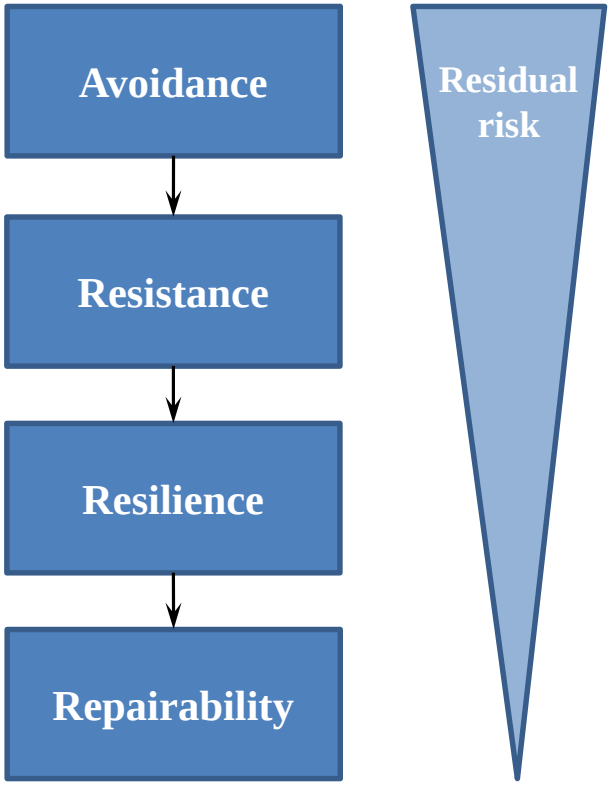
Repairability

- Materials
- Water retention
- Salt resistance
- Drying times
- Preserve structural integrity
- Bio-hazards
- Minimize needs for demolition during rebuilding
- Build back better



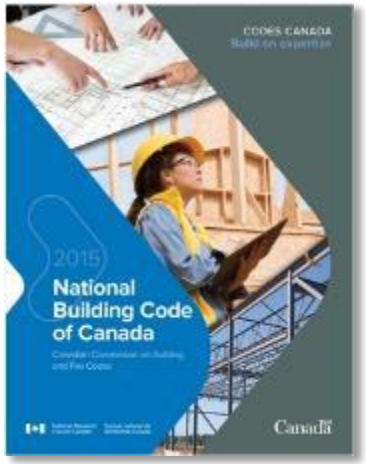
In summary – broaden our portfolio of responses

Strategies



Adapted from Bowker et al. (2007)

Implementation instruments



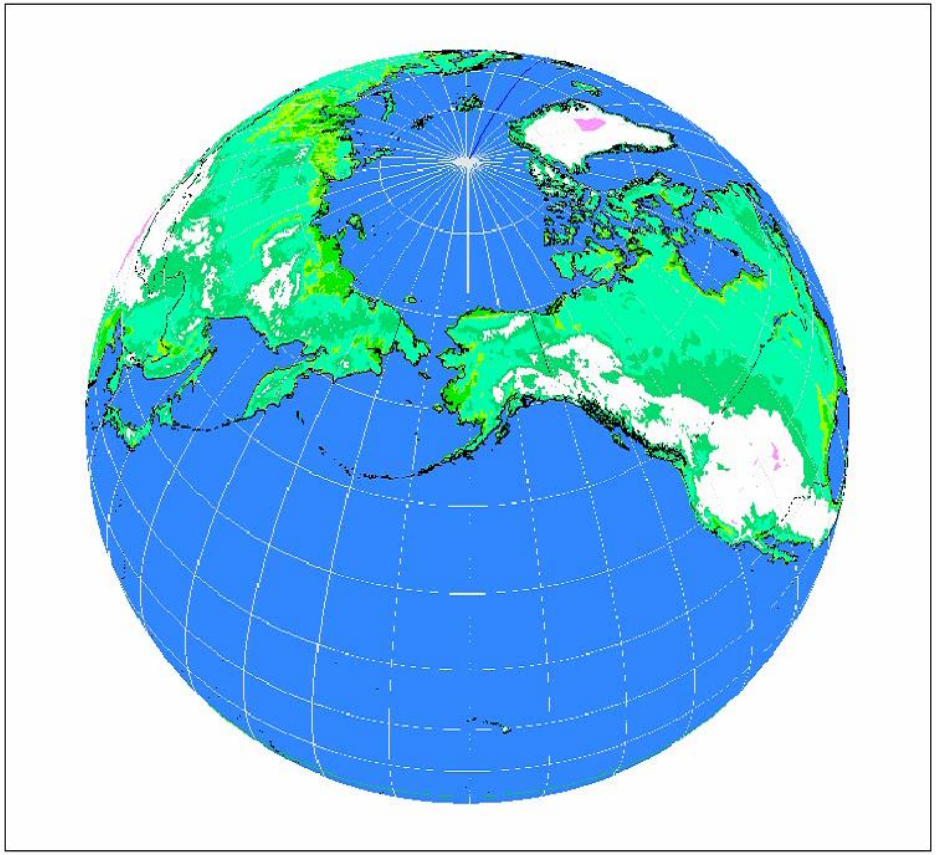
Understanding the Hazard

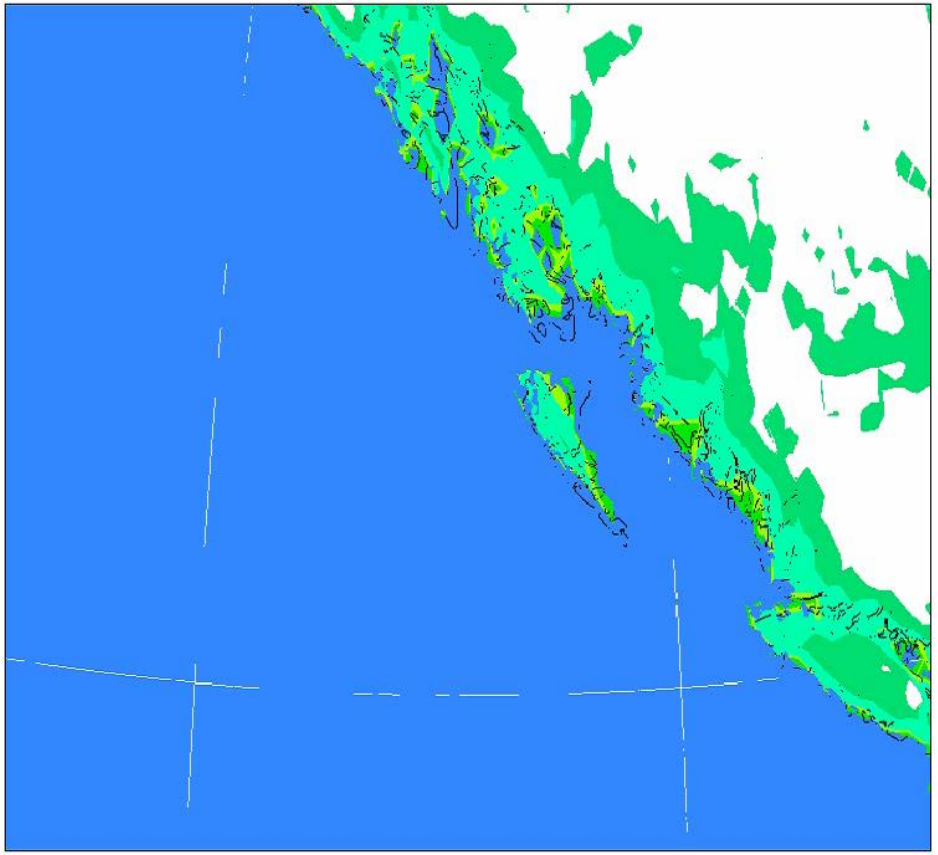
"Know your enemy…"

Zacharias Manuel de la Rocha (1991)

Tsunami Generation and Oceanic Propagation

(aka the Far Field)

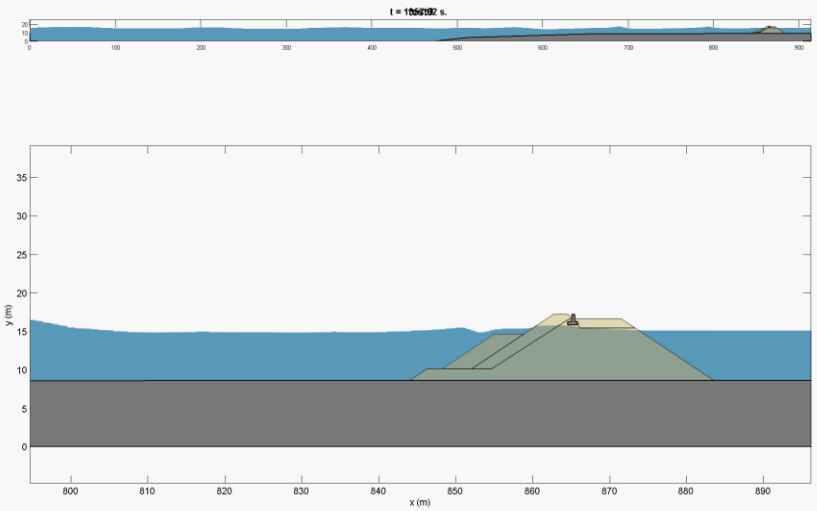




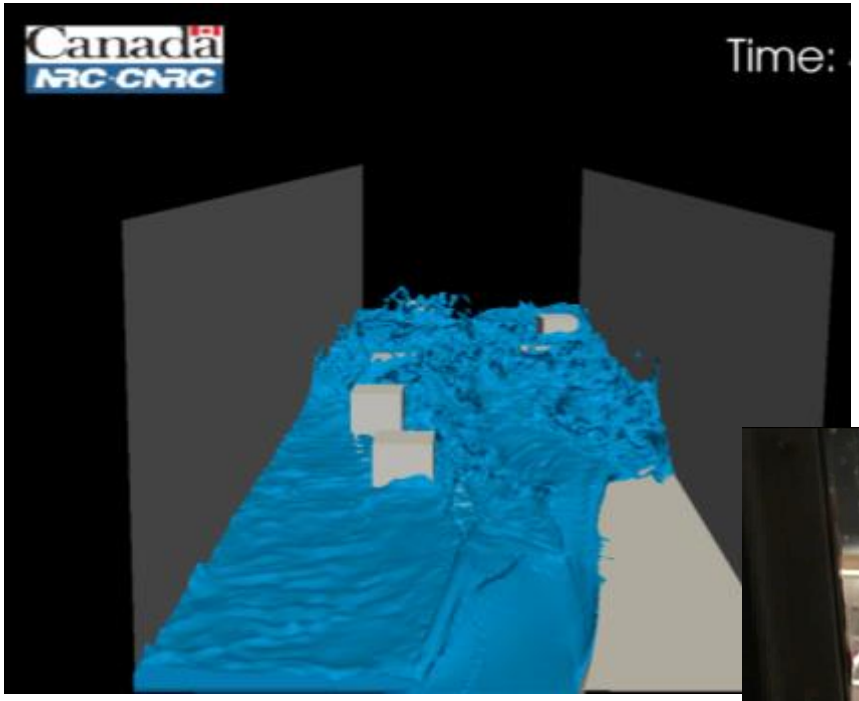
Propagation and Transformation in Coastal Waters

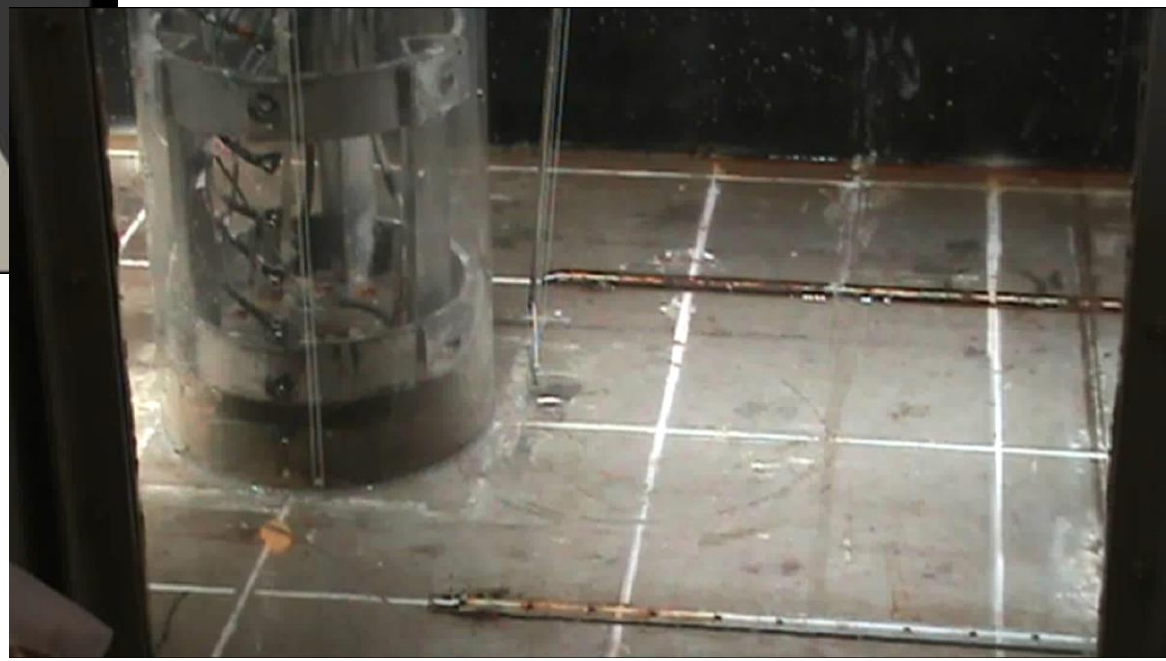
(aka the Near Field)

Hazard Pathways, Wave Run-Up

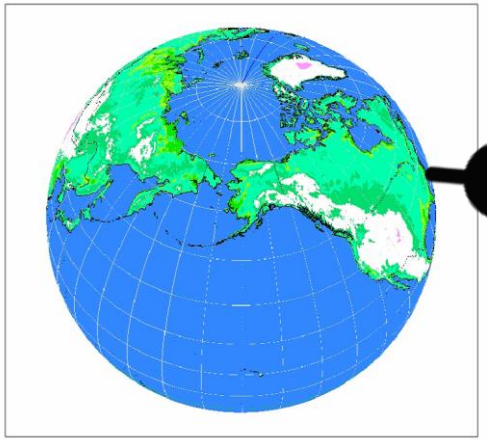


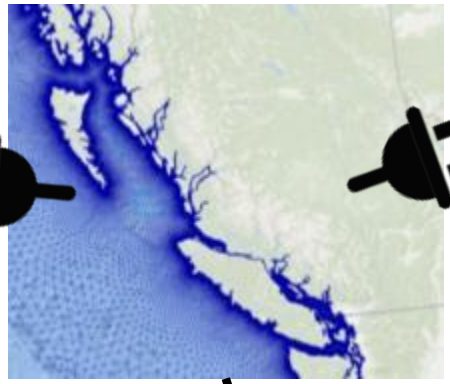
Loads and Effects

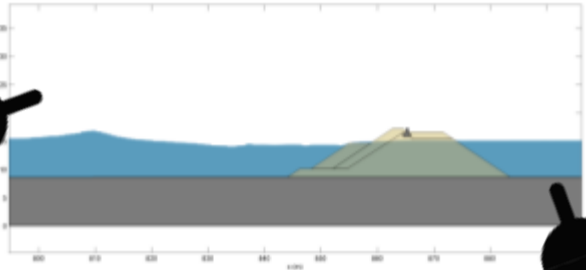


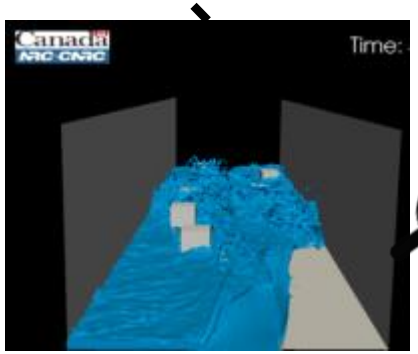


Integrated Modelling Systems









A word about uncertainty and inaction

To do nothing is often the best course of action…

…but history was not made by those who did nothing.

One way to reduce uncertainty – more data

More data needs

- Tsunami interactions with buildings and infrastructure
- Building and infrastructure vulnerability
- Test effectiveness of Resistance/Resilence/Repairability measures

Need for practical, useful tools

- Enhanced national hazard assessment – learn from mapping for ASCE 7-16
- Guidelines, codes and standards
- Improved communication tools (probably web-based)