



MEOPAR

MARINE ENVIRONMENTAL OBSERVATION
PREDICTION & RESPONSE NETWORK

IP1.2 & Prediction Core: SoG Risk Indicators and Impact Scenarios

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MEETING THE CHALLENGES OF OUR CHANGING OCEAN

Project and Personnel

FOCUS	Socio-economic dimensions of risk to coastal communities deriving from marine hazards
AIM	To develop tools to help link MEOPAR hazards information to impacts on coastal communities
OUTCOME	Risk/vulnerability indicator tools, pilot-tested in SoG
EFFORTS	<ol style="list-style-type: none">1. (with City of Vancouver) development of robust, modeled scenarios of coastal flooding impacts2. development of suite of socio-economic risk indicators for SoG, with mapping/analysis
PERSONNEL	Jackie Yip (PhD), Shona van Zijl de Jong (PDF), Rebecca Chaster (MAP), Ashley Lowcock (MScP), Christopher Carter (MAP)

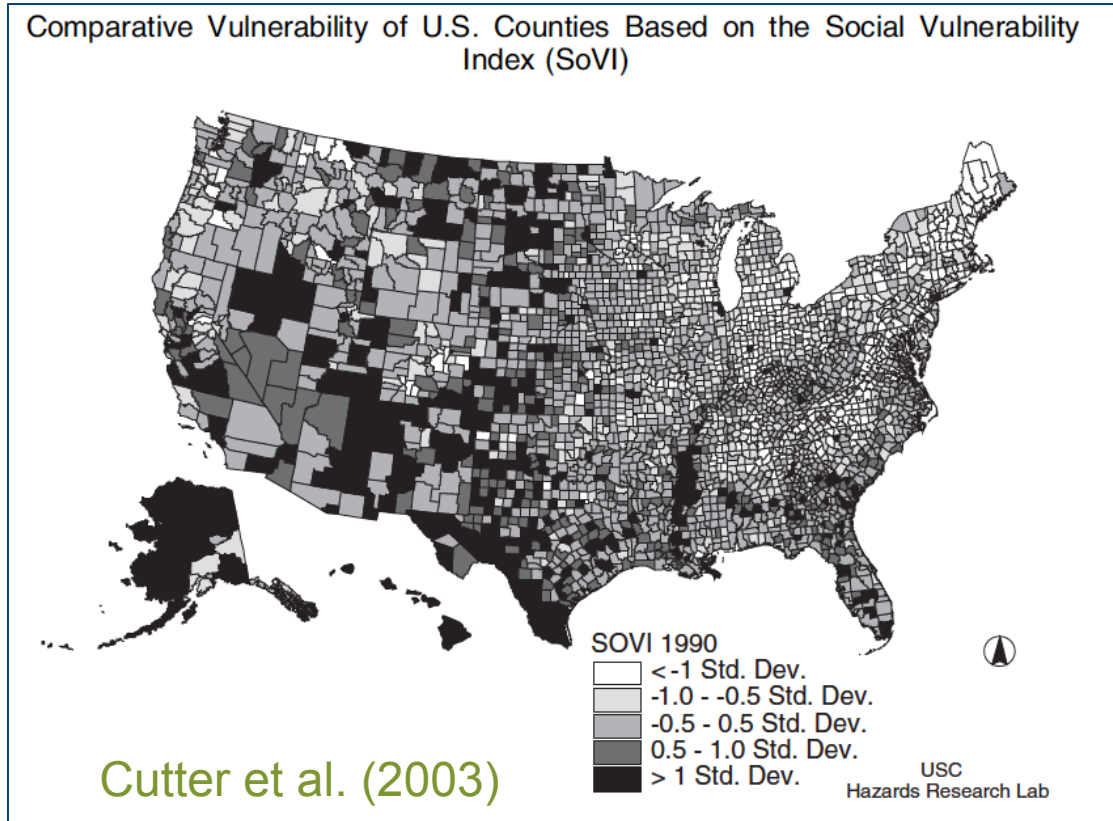
Milestones and Accomplishments

(2. Indicators Effort)

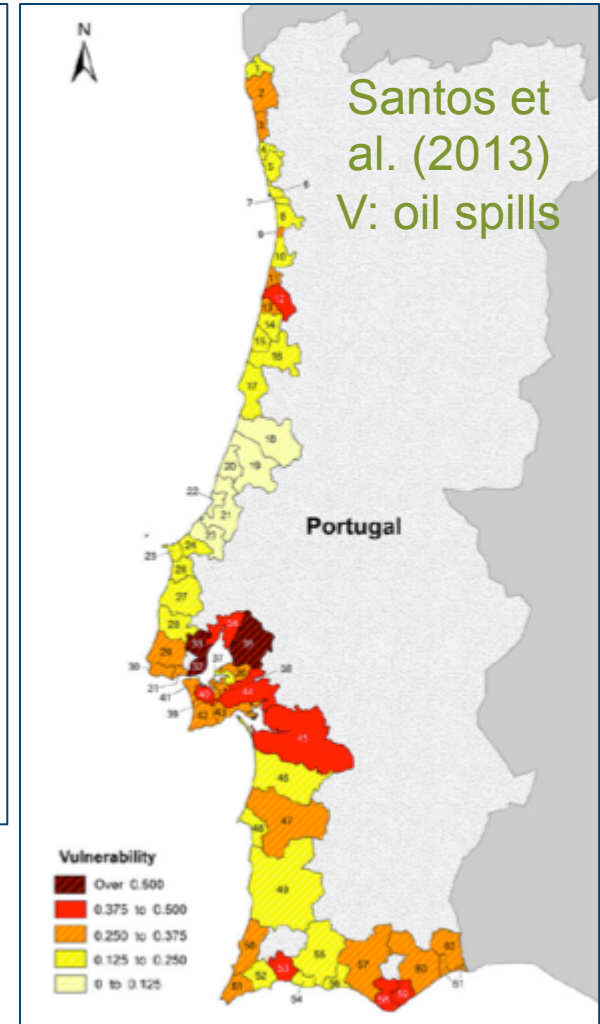
	To Date	Upcoming Year
End user engagement	Workshop 1	Workshop 2
Main effort	Literature reviews GIS data collection Vision & approach	SoG pilot
Outcomes	Vision & approach Oil spill paper* Unpublished lit. reviews Resource catalog	Framework paper Application paper SoG demo

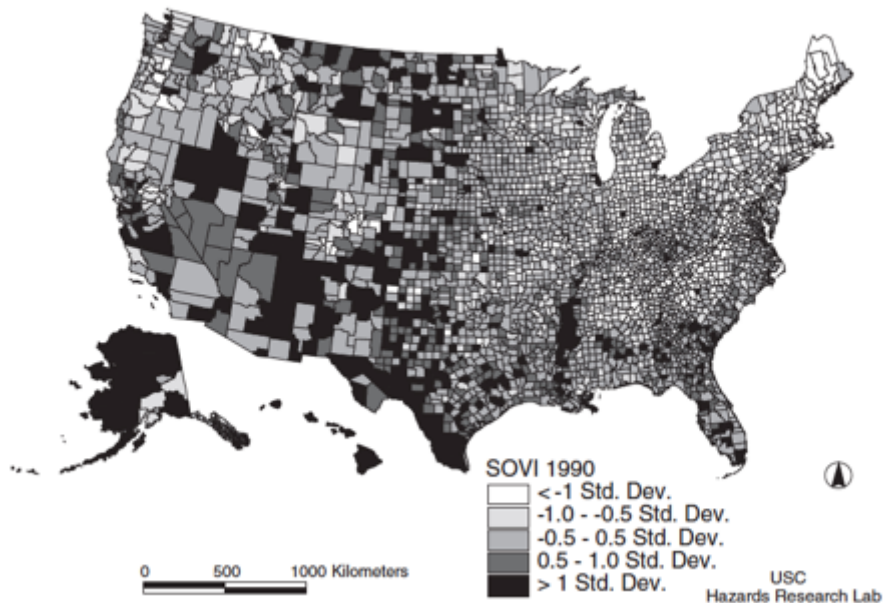
*Chang, SE et al. 2014. "Consequences of Oil Spills: A Framework for Scenario Planning," *Ecology and Society* 19(2): 26.

Vulnerability Indicators



Q: Which places are **most** vulnerable?





Important to refine for:

- Coastal community factors
 - Coastal hazards
 - Physical geography
 - Resource links (fisheries)
 - Transport access
 - Coastal infrastructure
- Change over time
- Planning, emerg. mgmt., ...

Approach:

250+ variables from literature

→ 42 independent variables

→ 11 factors

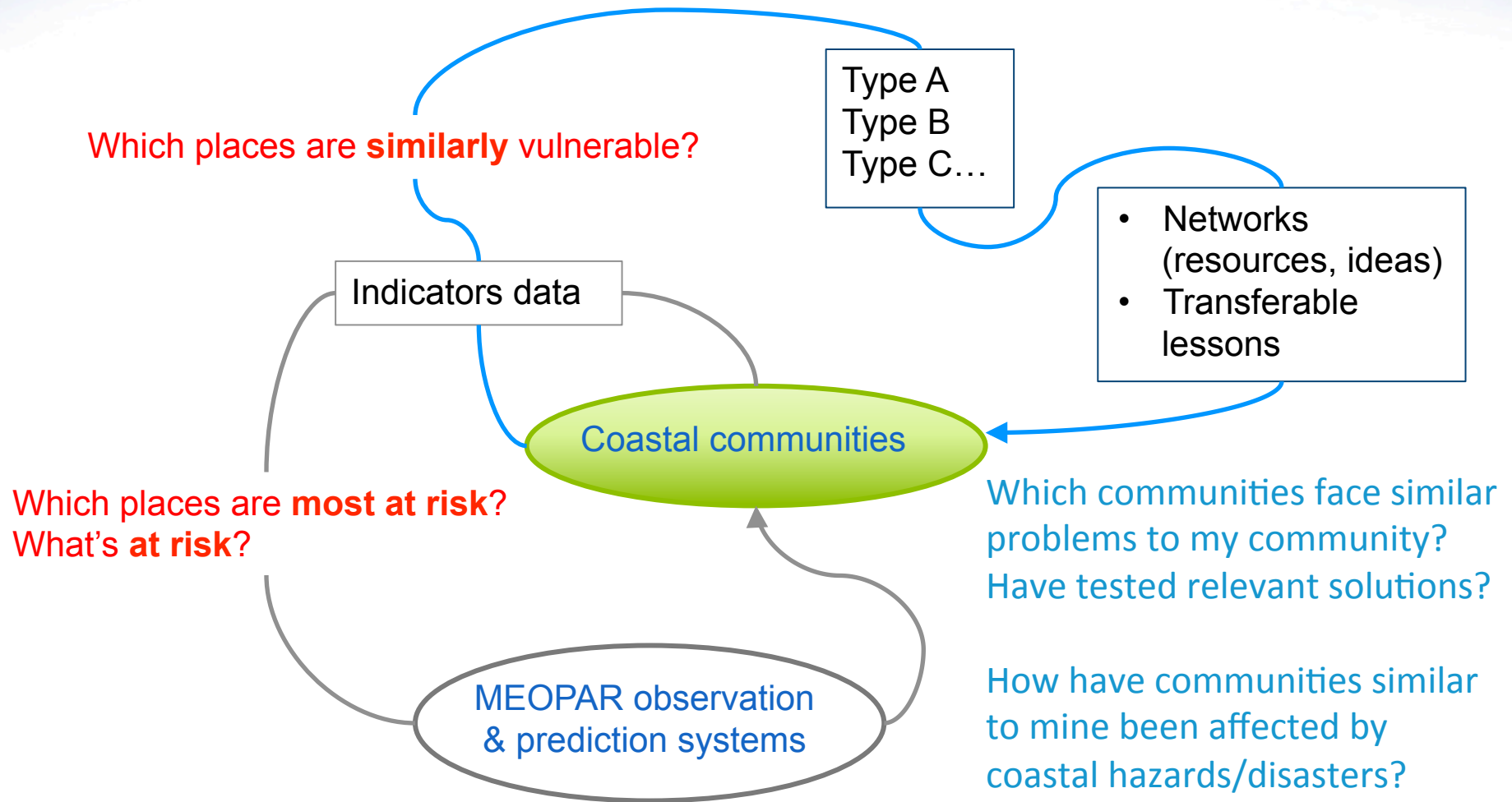
→ 1 Social Vuln. Index (SoVI)

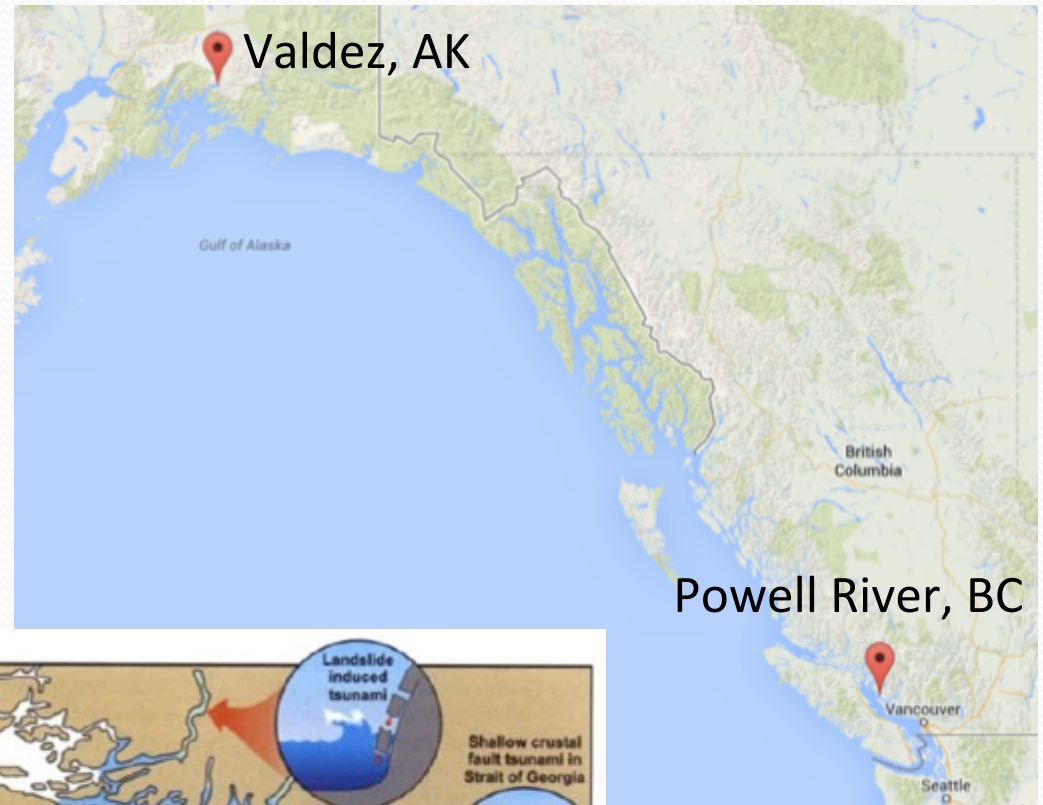
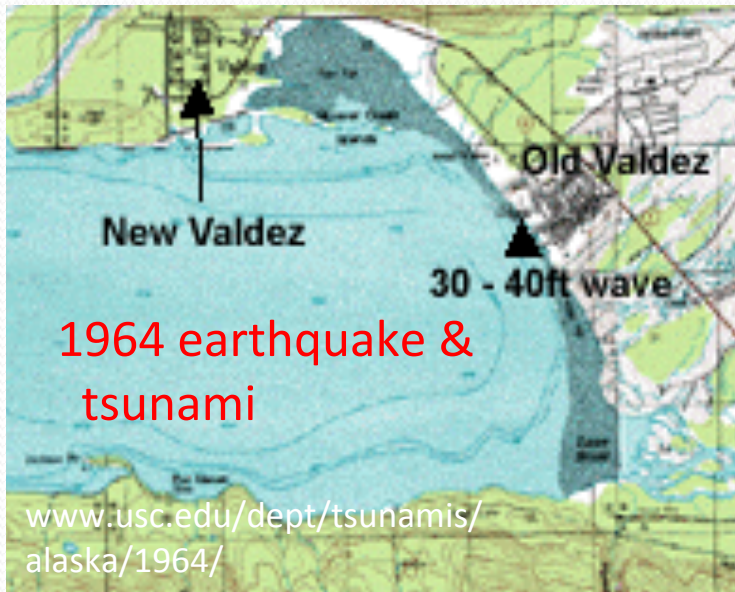
Example variables:

- Percent of pop. over 65 years
- Percent females
- Percent African American
- Per capita income
- Percent of housing units that are mobile homes
- No. physicians per 100,000 pop.
- General local government debt to revenue ratio

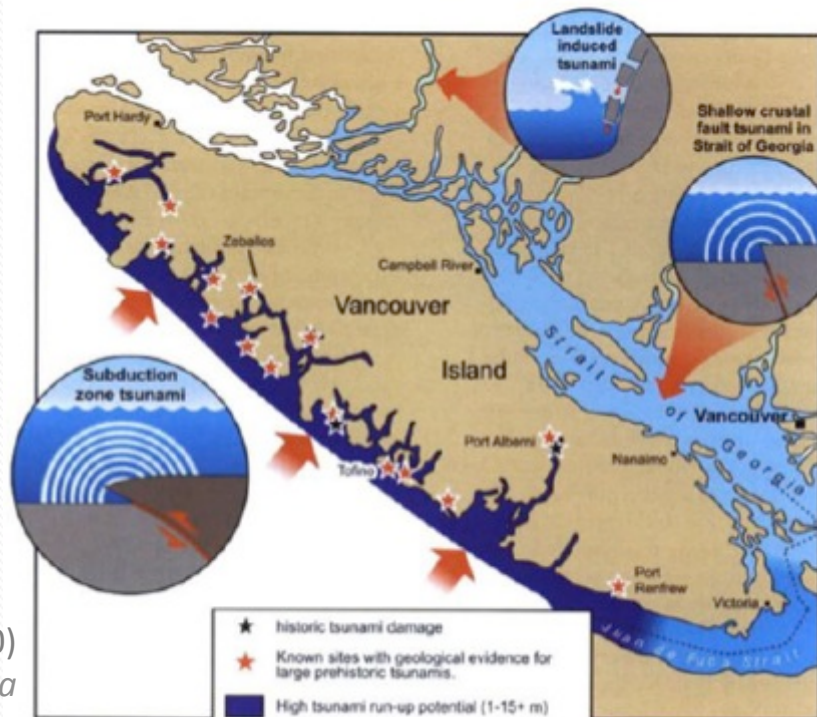
Cutter et al. (2003) in *Social Science Quarterly*

Vision: MEOPAR Sea-Link'D Platform





Example



Clague and Bobrowski (2010)
in *Geoscience Canada*

Similarly Vulnerable?

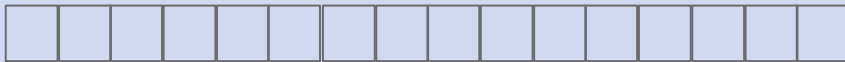
	Powell River, BC	Valdez, AK
Coastal hazard	- tsunami	- tsunami
History and location	- Strait of Georgia - traditional territory of Coast Salish F.N.	- Prince William Sound - traditional territory of Eyak Native Americans
Demographics	- pop. 18,000	- pop. 4,000
Transportation	- marine - small airport	- marine - small airport - land (to Anchorage)
Economy	- pulp and paper mill - forestry - fishing (commercial & recreational) - tourism	- oil (Trans-AK Pipeline) - fishing (commercial & recreational) - tourism

Vision: MEOPAR Sea-Link'D Platform

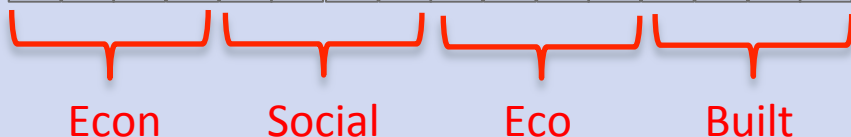
- 💧 AIM: Create an interactive platform that can identify communities that share **similar vulnerability** characteristics to support sharing of lessons learnt, resources, mitigation capacity
- 💧 HOW: Use simple similarity measures (e.g. cosine similarity) to measure similarity between two communities' profiles of vulnerability indicators

Comparing similarity of two vectors (A and B) of vulnerability indicators

Community A:



Community B:



$$\text{similarity} = \cos(\theta) = \frac{A \cdot B}{\|A\| \|B\|} = \frac{\sum_{i=1}^n A_i \times B_i}{\sqrt{\sum_{i=1}^n (A_i)^2} \times \sqrt{\sum_{i=1}^n (B_i)^2}}$$

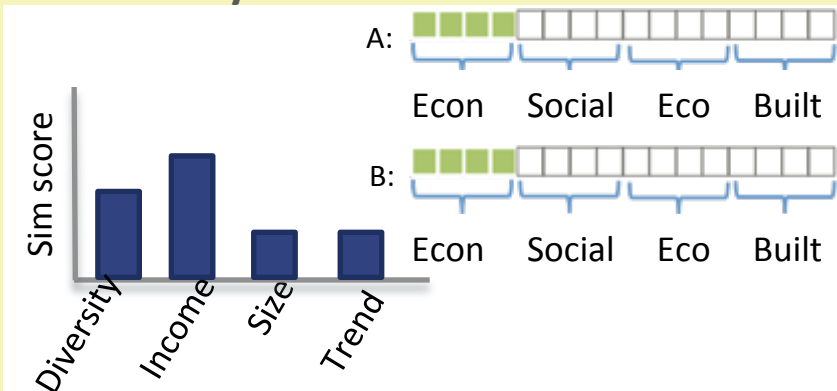
Vision: MEOPAR Sea-Link'D Platform

1. Profile comparison of user's community to multiple communities

Community	Econ	Social	Eco	Built	Overall
Victoria	0.5	0.1	0.7	0.2	0.81
Sidney	0.4	0.2	0.6	0.4	0.77
Ladysmith	0.8	0.1	0.1	0.2	0.50
Sechelt	0.1	0.1	0.8	0.2	0.41
Gibsons	0.1	0.2	0.3	0.6	0.20



2. Comparing economic vulnerability similarity



3. Community profile

Ladysmith



Population: 7921

Density: 660.6/km²

Elevation: 40m

Key vulnerability: Economy; ecology

Hazards: Flooding; oil spills

Adaptation/mitigation activities:

- *Economic*
 - Small business support plan [link]
- *Health*
- *Ecology*
- *Infrastructure*

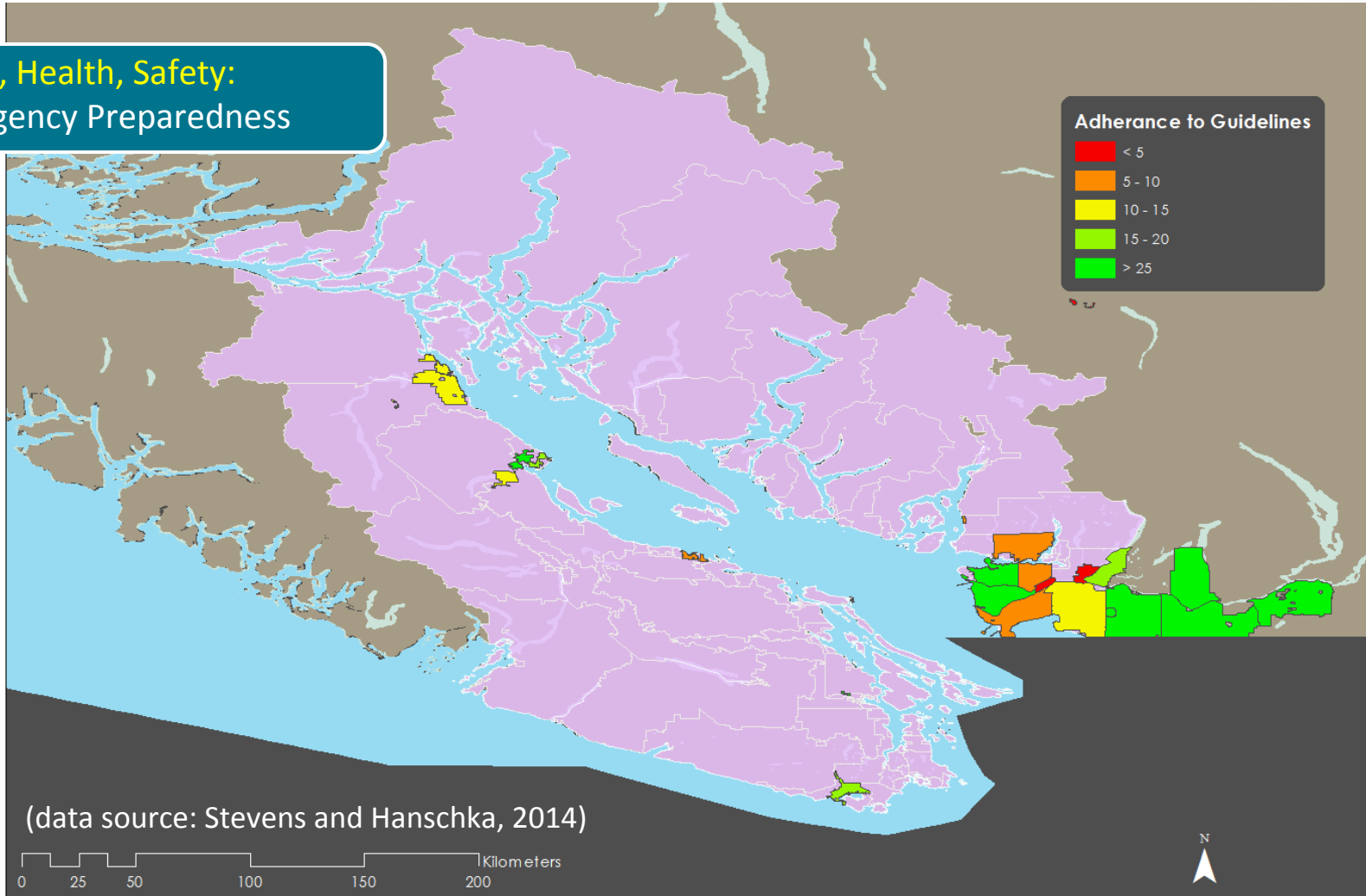
Contact:



Single Variable Example

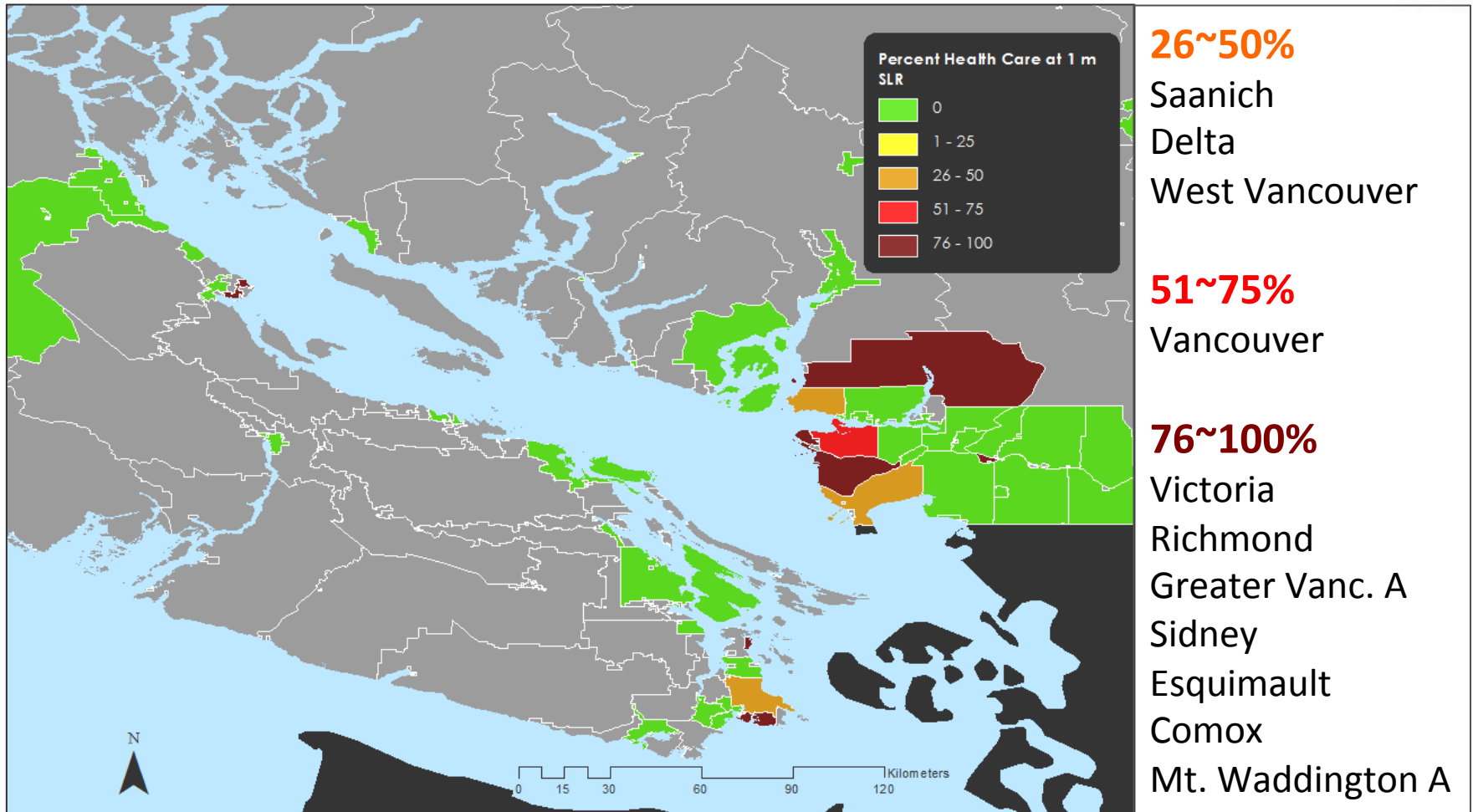
Quality of Flood Bylaws, by Municipality

Social, Health, Safety:
Emergency Preparedness



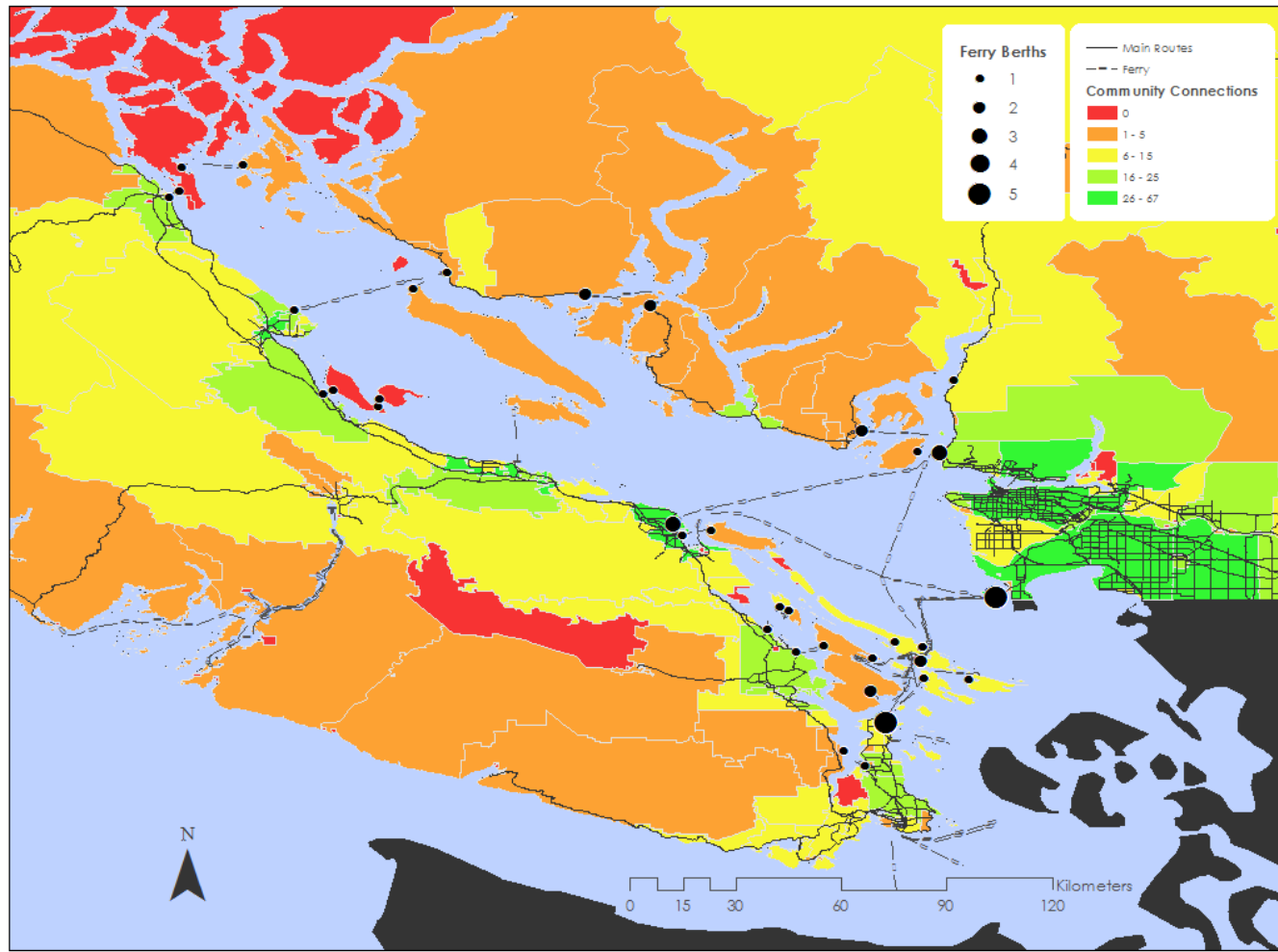
Single Variable Example

Healthcare Facilities within 1m of Sea Level



Single Variable Example

Transport Connectivity (road, marine)



What Success Will Look Like in 2017

1. Sea-Link'D platform

- live, hosted at MEOPAR (?)
- functional for Strait of Georgia and Halifax Harbor cases
- full range of indicators; similarity indices
- links to disaster cases
- linked to MEOPAR observing/prediction systems (?)

2. Platform being used by communities

- ideally, communities sharing their info

3. Coastal flooding method and Vancouver scenarios; used

- linked to MEOPAR observing/prediction systems

4. Students graduated, 2 PhD dissertations

5. Papers published



Questions?



MEOPAR

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