Integrated Tsunami Scenario Simulation

The Second Workshop

October 29 & 30, 2004

San Francisco

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Agenda: October 29, Friday

1:00 - 1:10: Introduction

1:10 - 1:30: Summary of the 2003 Corvallis Workshop

1:30 - 1:40: Workshop Objectives

1:40 - 2:10: Katada's Model

2:10 - 3:00: Current Tsunami Research Activities (Lindell; Borrero; McCreery; Hansen; Gonzalez)

3:00 - 3:20: *Coffee*

3:20 - 4:20: Current Tsunami Research Activities - continued (Lynett; Pancake; Walsh; Yim; Fritz; Liu)

4:20 - 4:35: Presentation of several real coastal communities that will be used as a basis for the "hypothetical" virtual communities

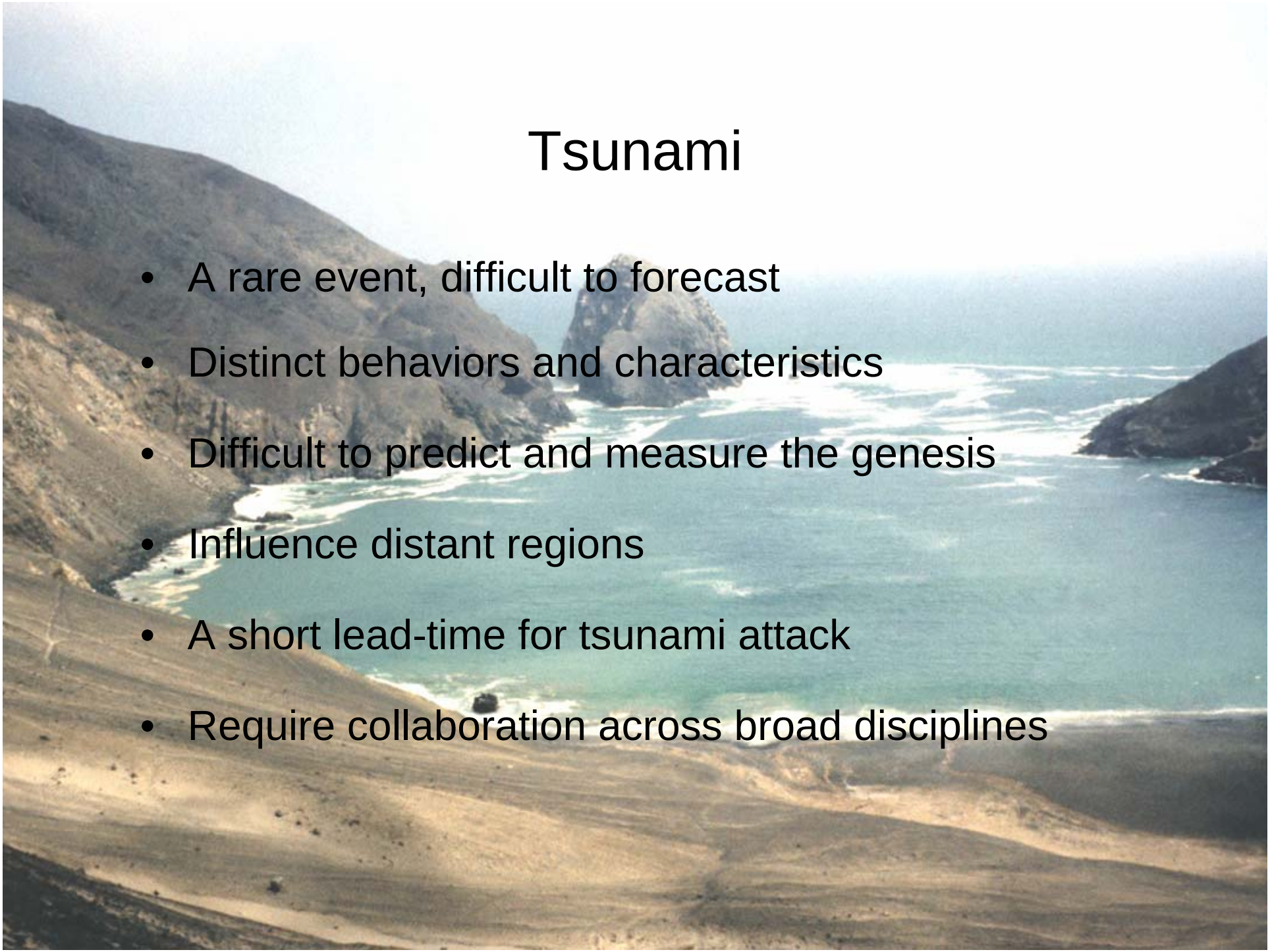
4:35 - 4:50: A shared portal that will be used for integration of scenerio simulations - (Pancake)

4:50 - 5:00: Summary & Homework for the next day

6:00 - 8:00: *Dinner at Downstairs*

Workshops for Tsunami Scenario Simulation

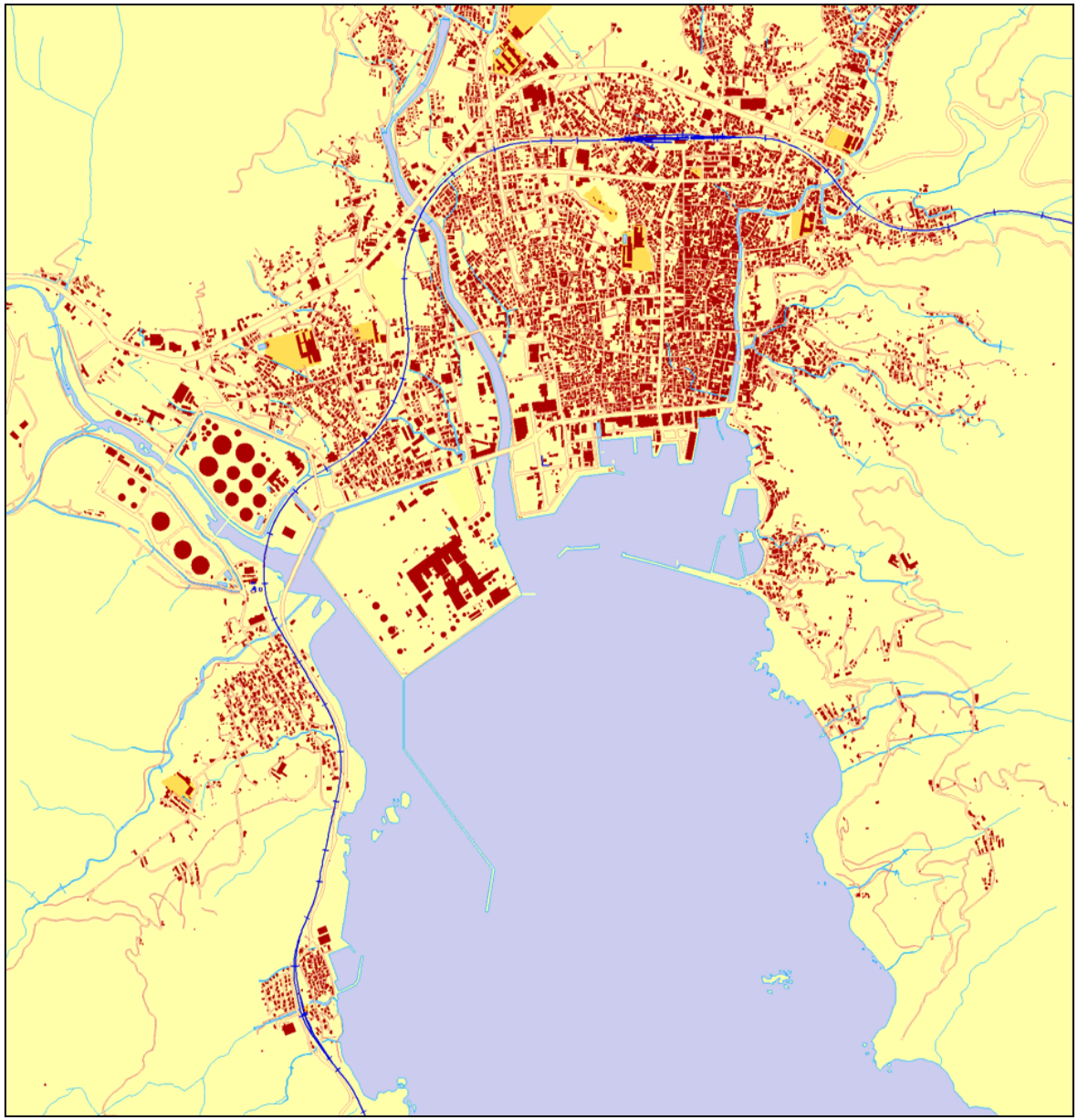
- September 21, 2002 at University of Washington
  - (NSF Grant CMS-0237039)
- August 8, 2003 at Oregon State University
  - (NSF Grant CMS-0321889)



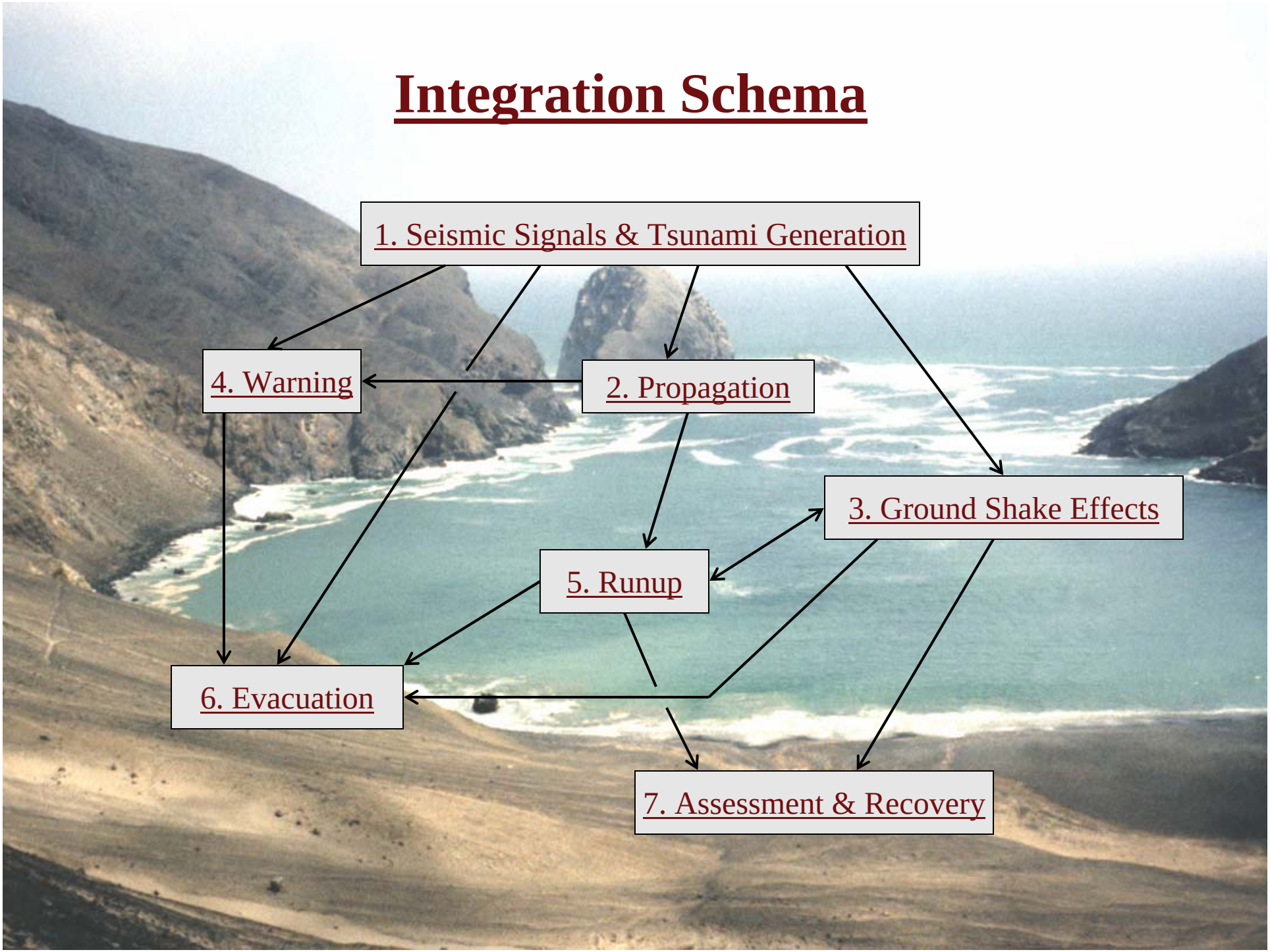
Tsunami

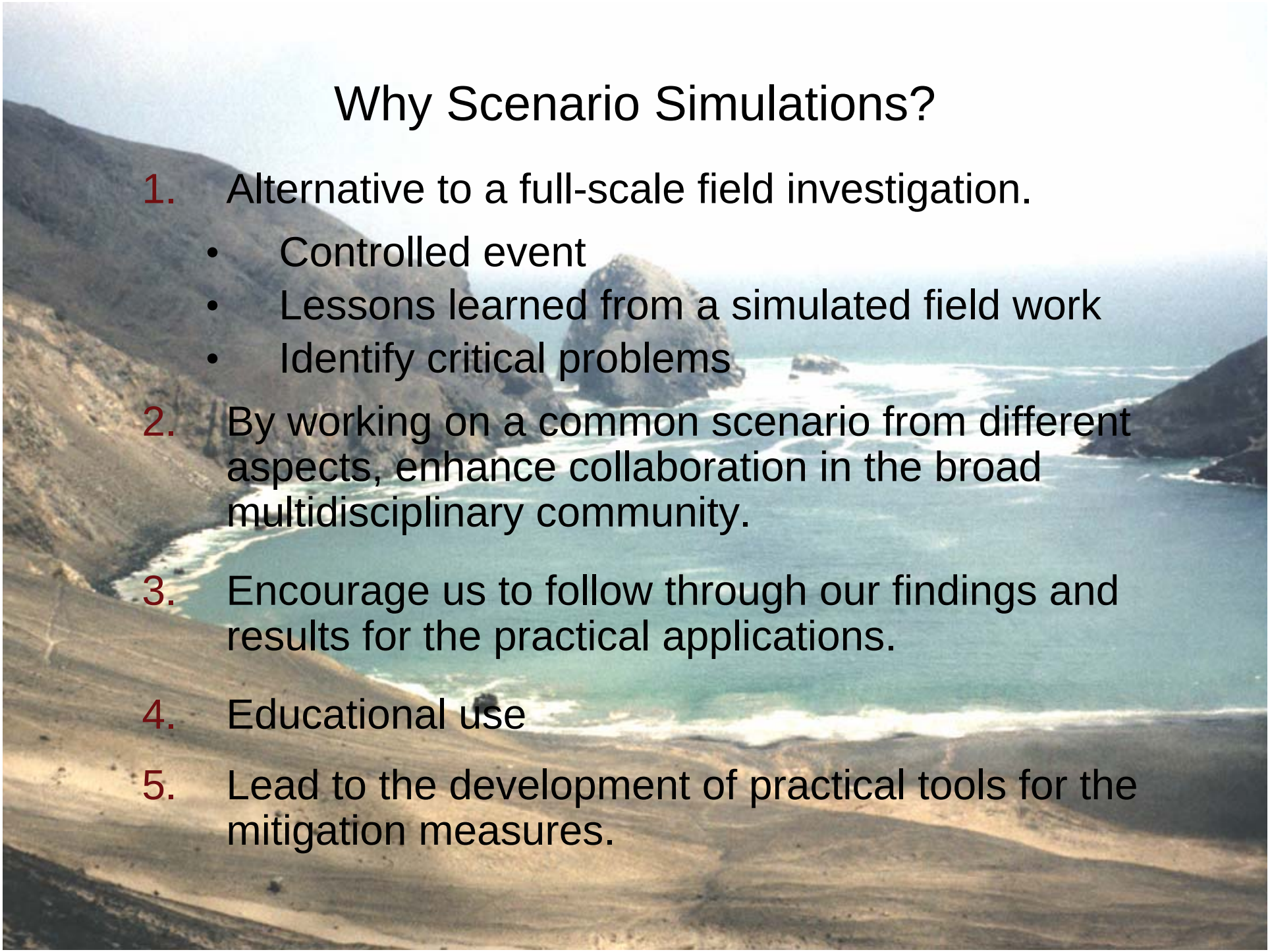
- A rare event, difficult to forecast
- Distinct behaviors and characteristics
- Difficult to predict and measure the genesis
- Influence distant regions
- A short lead-time for tsunami attack
- Require collaboration across broad disciplines

Coastal Community



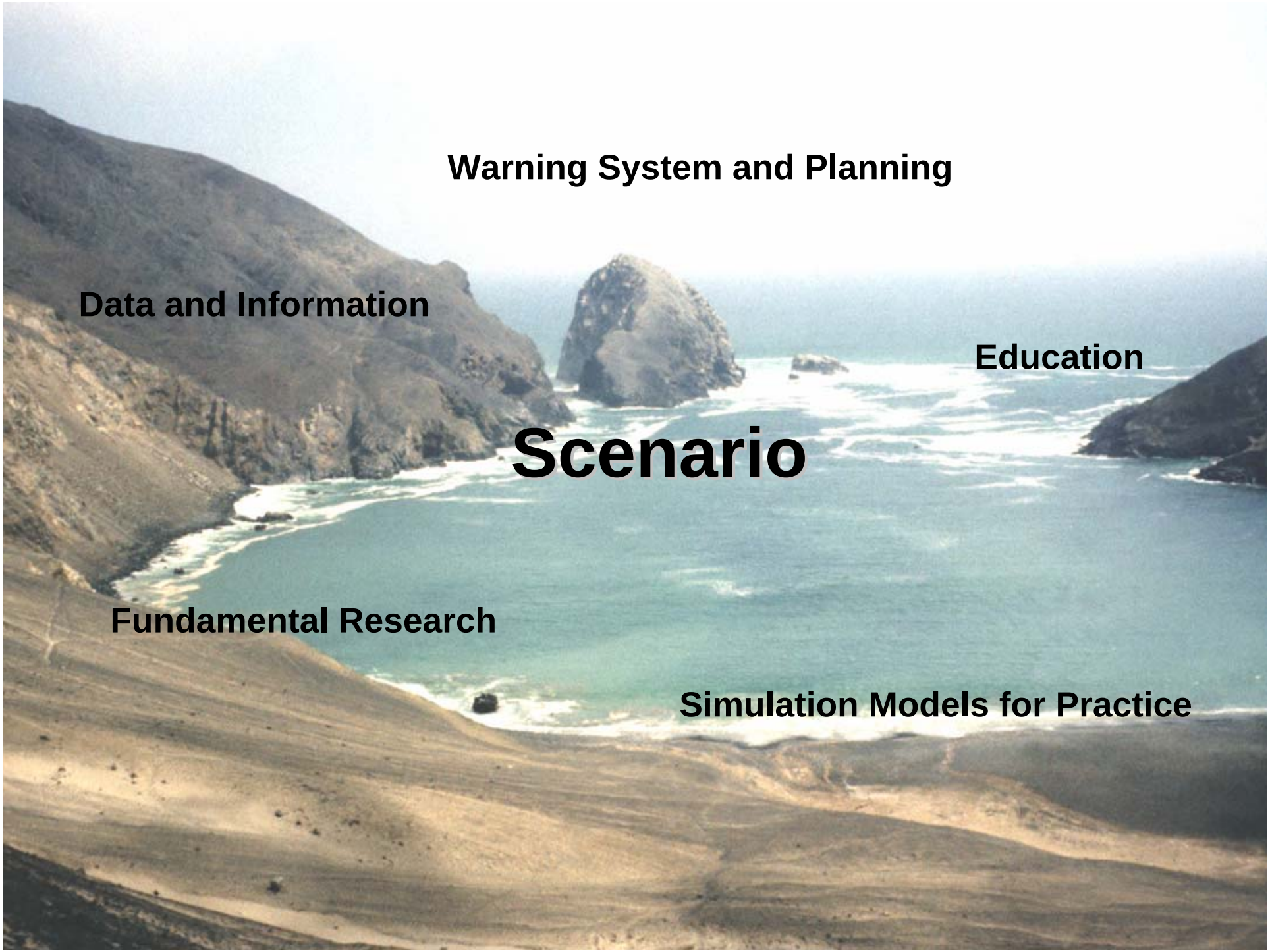
Integration Schema





Why Scenario Simulations?

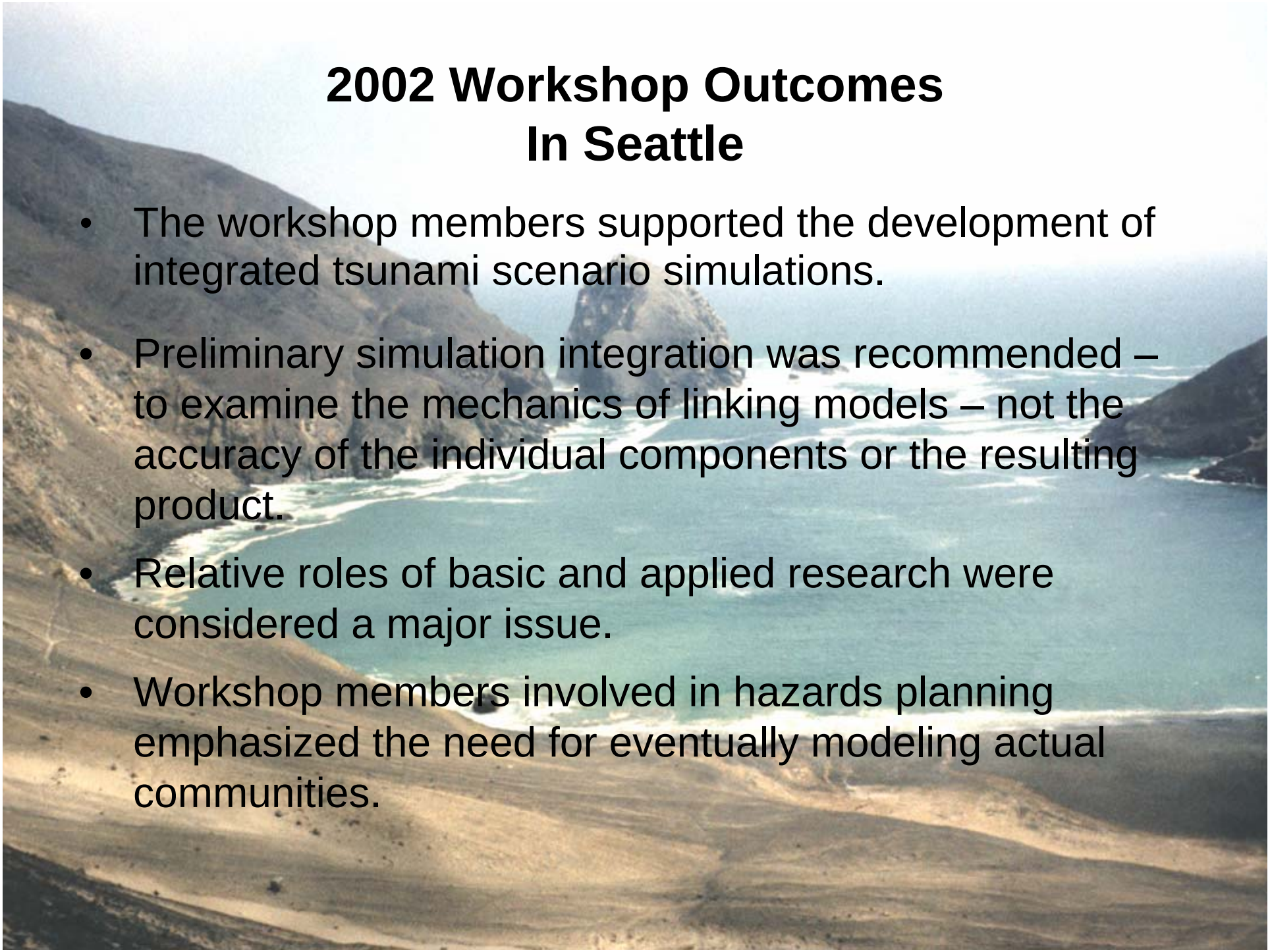
1. Alternative to a full-scale field investigation.
   - Controlled event
   - Lessons learned from a simulated field work
   - Identify critical problems
2. By working on a common scenario from different aspects, enhance collaboration in the broad multidisciplinary community.
3. Encourage us to follow through our findings and results for the practical applications.
4. Educational use
5. Lead to the development of practical tools for the mitigation measures.


Warning System and Planning
Data and Information
Education
Scenario
Fundamental Research
Simulation Models for Practice

⇒ The simulation exercise should be based on a hypothetical but realistic coastal situation

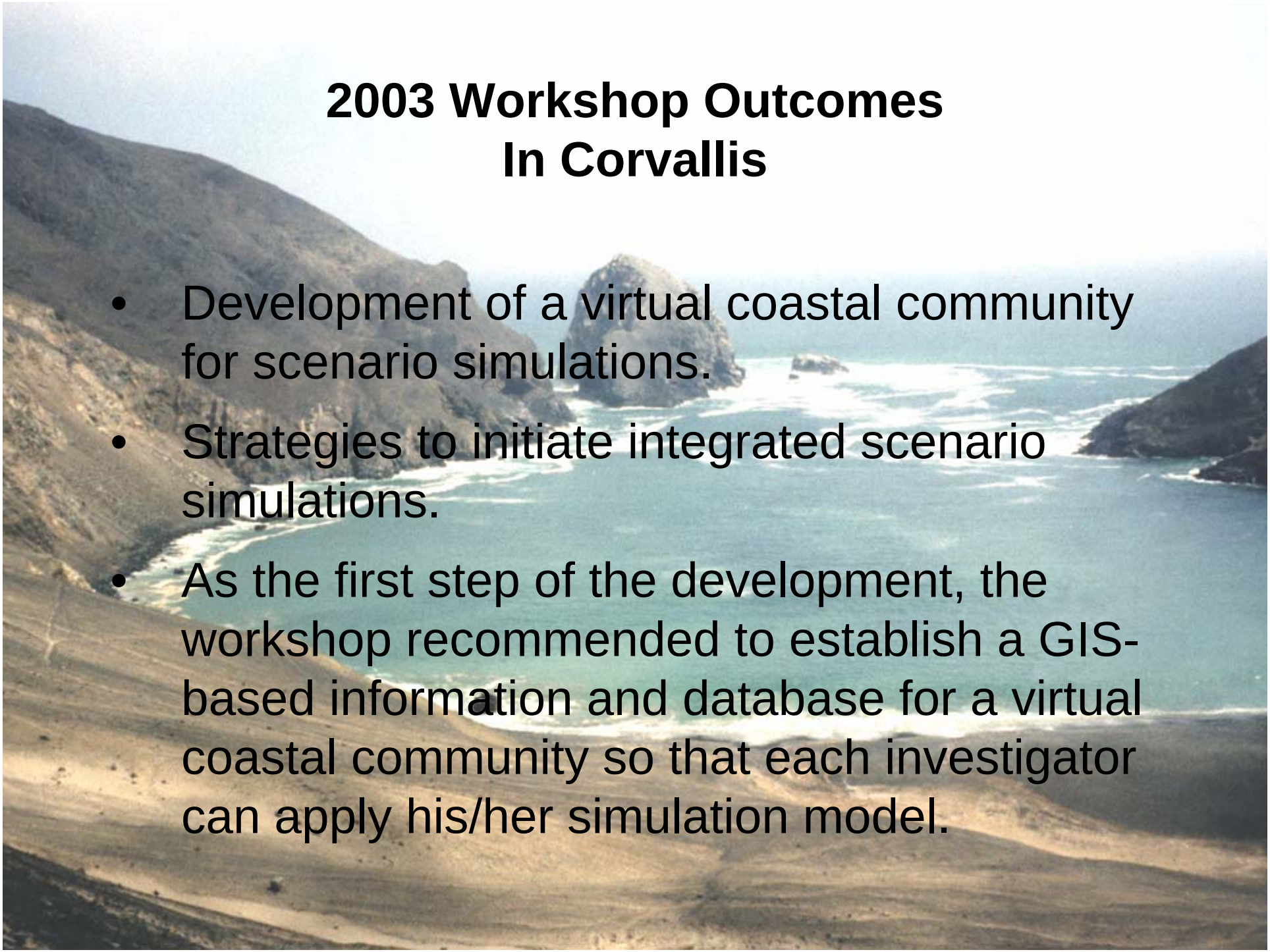
Circumvent the potential social and political concerns of a direct study of a specific location.

Provide an ideal setup for research activities.



2002 Workshop Outcomes In Seattle

- The workshop members supported the development of integrated tsunami scenario simulations.
- Preliminary simulation integration was recommended – to examine the mechanics of linking models – not the accuracy of the individual components or the resulting product.
- Relative roles of basic and applied research were considered a major issue.
- Workshop members involved in hazards planning emphasized the need for eventually modeling actual communities.

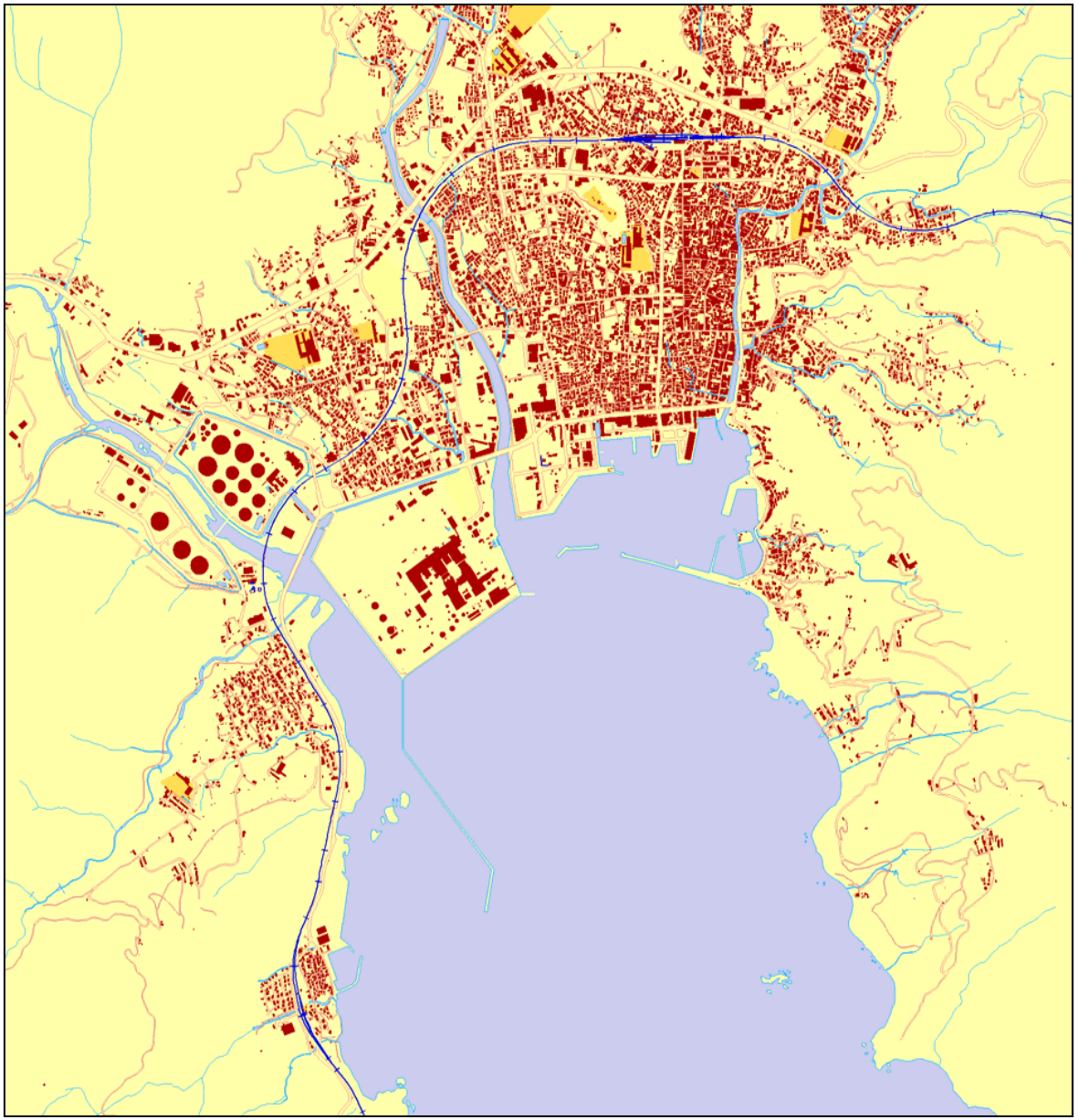


2003 Workshop Outcomes In Corvallis

- Development of a virtual coastal community for scenario simulations.
- Strategies to initiate integrated scenario simulations.
- As the first step of the development, the workshop recommended to establish a GIS-based information and database for a virtual coastal community so that each investigator can apply his/her simulation model.

Virtual Coastal Community

- Bathymetry
- Topography
- Coastal Infrastructures
- Residential Buildings
- Population
- Land-Use Information
- Geotechnical Data
- Vegetation
- Societal Data



Agenda for the Workshop

- **How can we encourage the participation?**
- **How can we support the core activity?**
  - Provide and maintain complete data available for virtual coastal community
  - “Scenario manager” is able to identify a particular disaster scenario
  - Modelers download data as input to their simulations; the data can be initial data, or might be the results of a prior step in the modeling pipeline
  - Results are uploaded back to the shared site and disseminated
  - Entire system will be developed as a framework: so it can be adapted to other coastal communities, real or virtual.

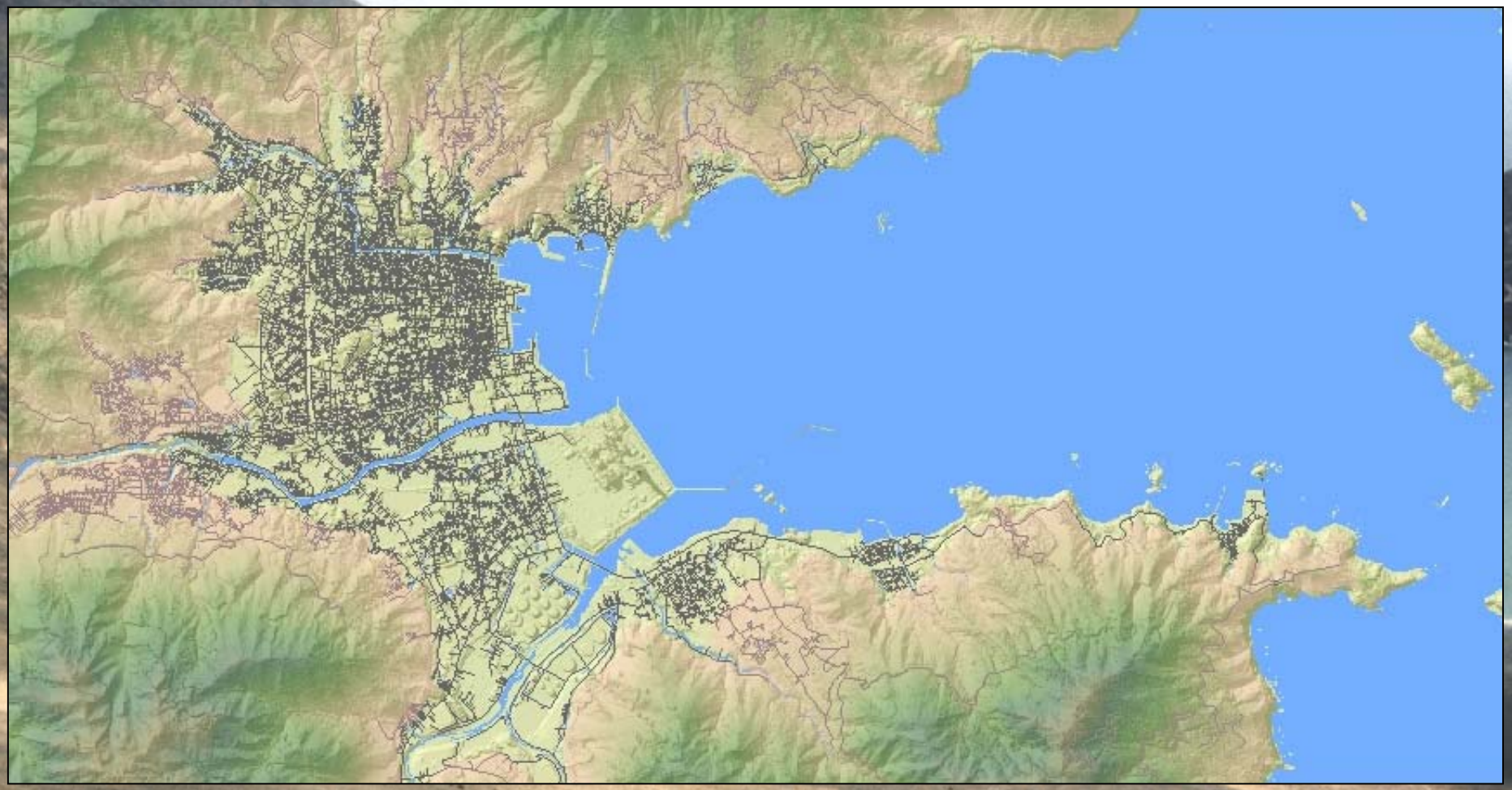
Current Research Activities

- Simulation Models for Information Transmission and Evacuation (Gunma U., OSU)
- Decision Making and Response (TAM – NSF)
- Economical Impacts (USC)
- Tsunami Warning System (NWS, NOAA)
- Tsunami Forecasting (PMEL, NOAA)
- TWEAK (UAF – NOAA)
- Integration of Hydrodynamic Models (TAM, Cornell – ITR/NSF)
- Community Computational Portals (OSU, UAF – NOAA/AK).
- Seismic/Tsunami Construction (OSU, UH – NTHMP)
- Tsunami Structure Interactions (UW, SMU, OSU, Cornell – NSF)
- Landslide Generated Tsunamis (CIT, USC, NWU, Cornell, URI, GT – NSF)
- Tsunami Soil Interactions – Scour (OSU, U. Tokyo, NILIM – NSF)
- 3-D tsunamis (OSU, PSU, UW – NSF)

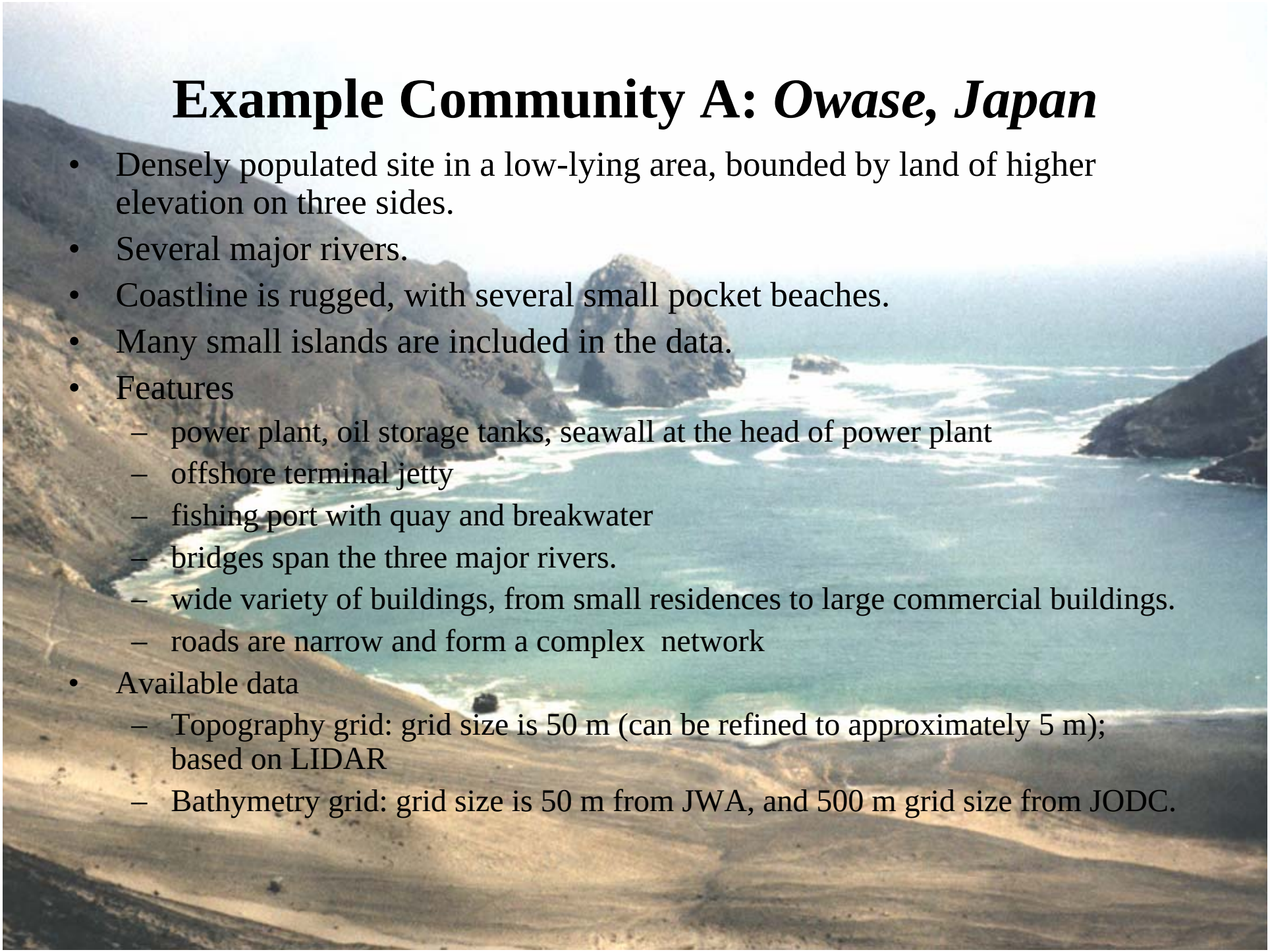
Potential Support

- National Tsunami Hazard Mitigation Program
- NSF -- NEES Research Program
- NOAA -- Sea Grant
- Proactive municipalities and cities in preparing evacuation plans and educational materials (e.g., Oahu, Hawaii; Eureka, California; Newport, Oregon; Lincoln City, Oregon; Greys Harbor/Pacific Co., Washington)

Example Community A: *Owase, Japan*

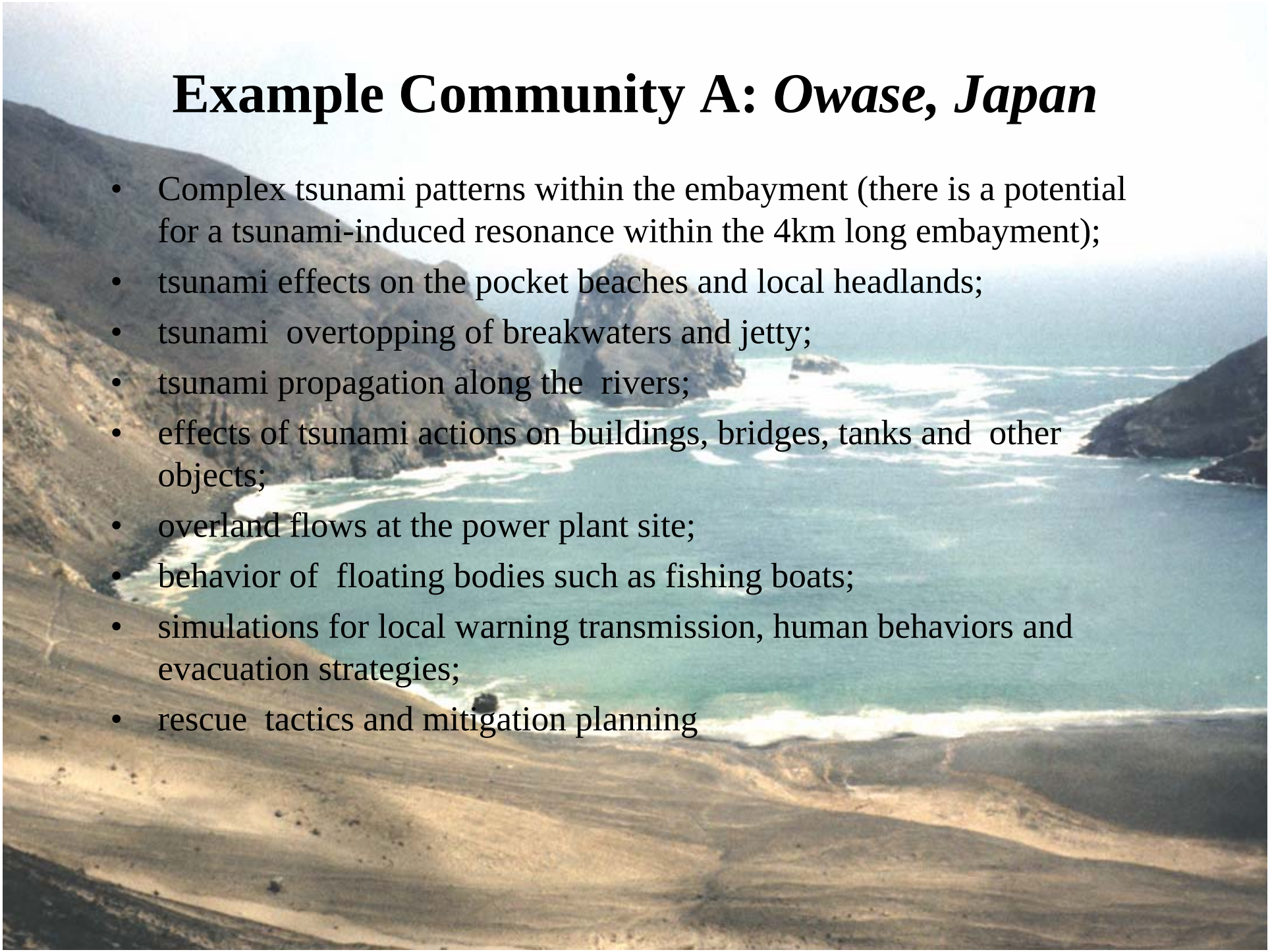


Example A, generated using available GIS data; area approximately 8 x 4 km



Example Community A: *Owase, Japan*

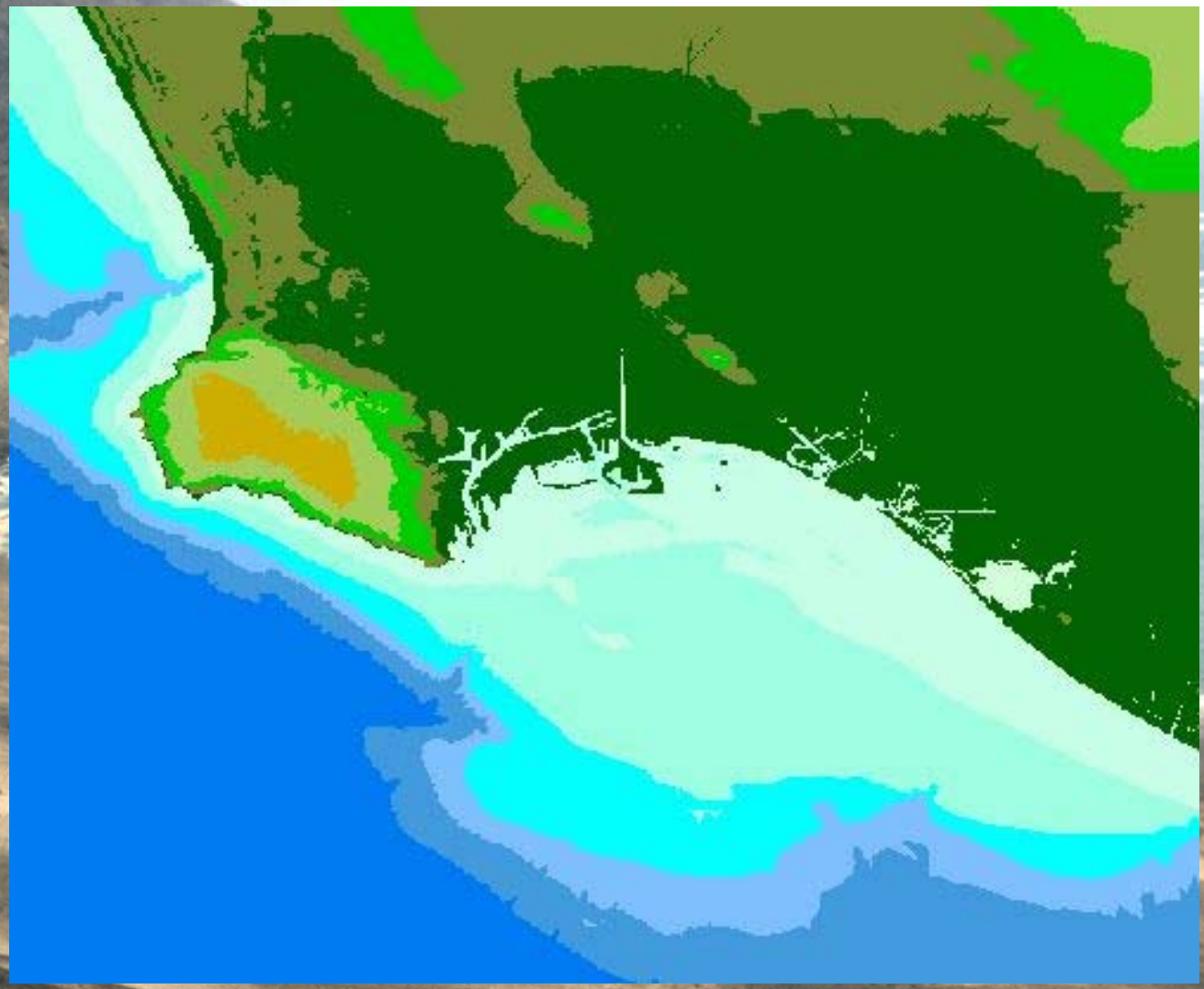
- Densely populated site in a low-lying area, bounded by land of higher elevation on three sides.
- Several major rivers.
- Coastline is rugged, with several small pocket beaches.
- Many small islands are included in the data.
- Features
  - power plant, oil storage tanks, seawall at the head of power plant
  - offshore terminal jetty
  - fishing port with quay and breakwater
  - bridges span the three major rivers.
  - wide variety of buildings, from small residences to large commercial buildings.
  - roads are narrow and form a complex network
- Available data
  - Topography grid: grid size is 50 m (can be refined to approximately 5 m); based on LIDAR
  - Bathymetry grid: grid size is 50 m from JWA, and 500 m grid size from JODC.



Example Community A: *Owase, Japan*

- Complex tsunami patterns within the embayment (there is a potential for a tsunami-induced resonance within the 4km long embayment);
- tsunami effects on the pocket beaches and local headlands;
- tsunami overtopping of breakwaters and jetty;
- tsunami propagation along the rivers;
- effects of tsunami actions on buildings, bridges, tanks and other objects;
- overland flows at the power plant site;
- behavior of floating bodies such as fishing boats;
- simulations for local warning transmission, human behaviors and evacuation strategies;
- rescue tactics and mitigation planning

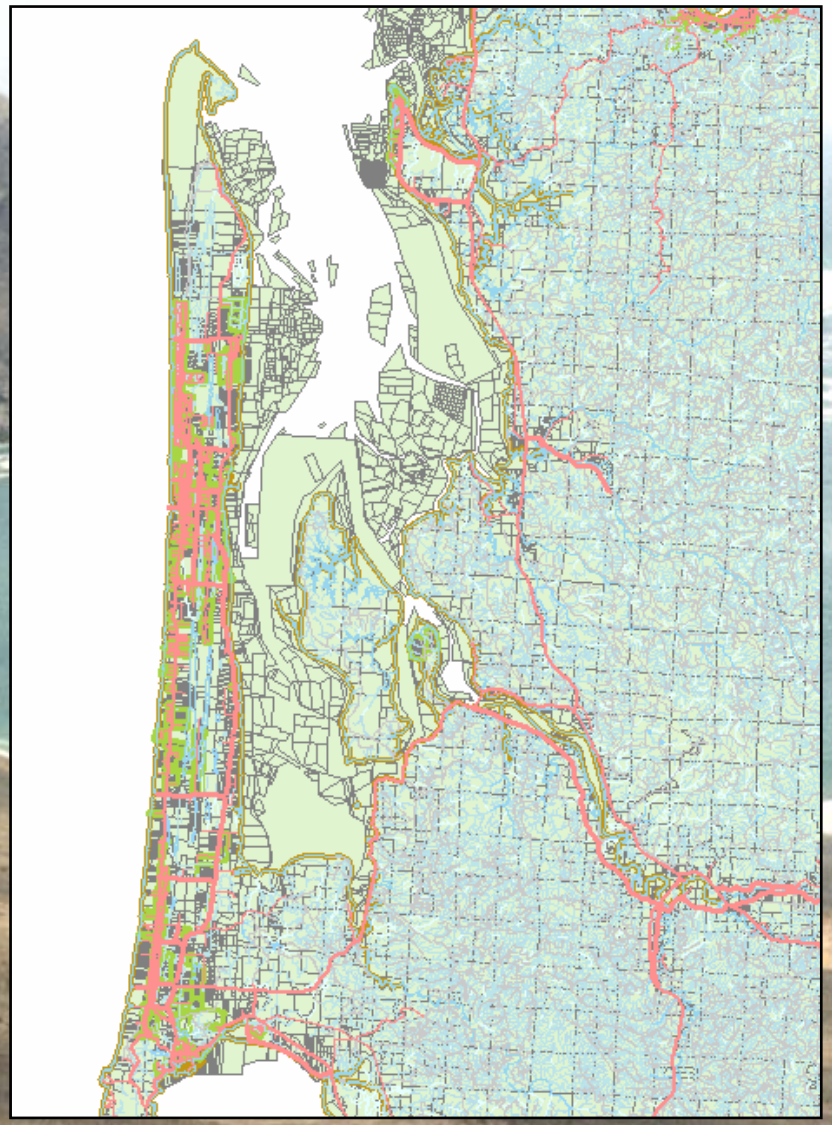
Example Community B: *Ports of Los Angeles and Long Beach, California*



Example Community B: *Long Beach, CA*

- Heavy industrial use, container port facilities, oil transfer, cruise ships, fishing fleet and private recreational boating.
- Features
  - Oil storage facilities,
  - Container storage
- Available data
  - 3 second resolution grid, approximately 75 m x 90 m is available as a GIS layer or ASCII grid
  - A wide variety of supporting GIS data is available from other sources.
- Tsunami interactions with armored and engineered shorelines.
- Effects of tsunami currents on shipping and oil transfer activities
- human issues such as emergency response and evacuation planning

Example Community C:
Long Beach, Washington



Discussion

- What are the minimum functions required to support integration of various simulation models?
  - How much effort; support; how?
- What are the ideal programs to develop and maintain the integrated scenario simulation activities?
  - How much effort; support; how?
- What are the rewards by participating in the scenario simulations? Why should I spend my time and effort ?
- Can multi-sponsors (e.g. NSF, NTHMP & FEMA) support this sort of activities coherently:
  - development & implementation? Initiative?
  - Can this activity be considered as a NEES Grand Challenge?