

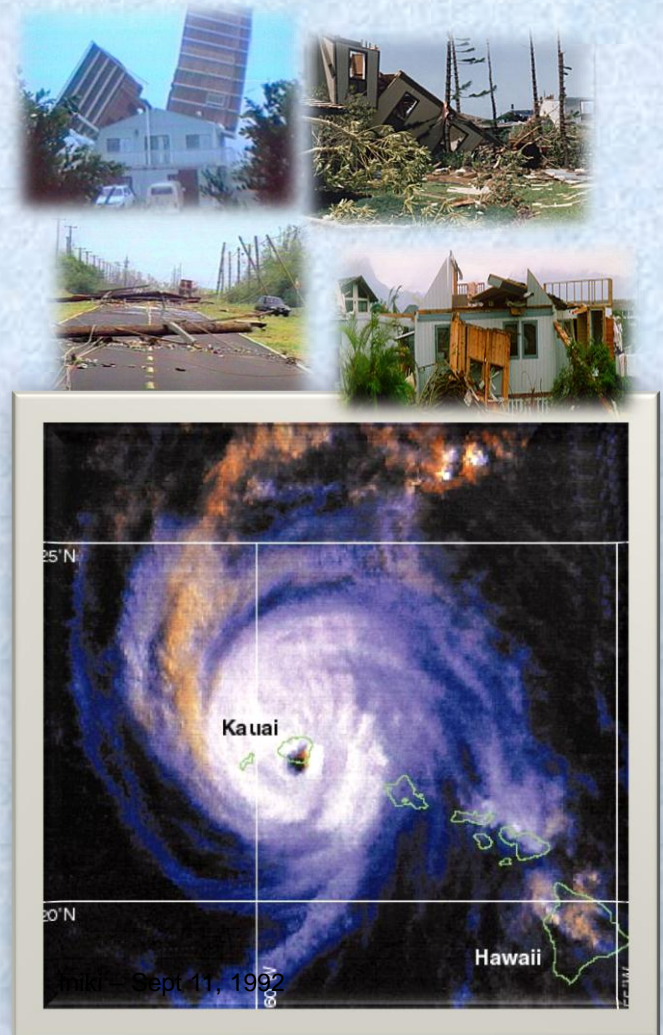
RVA at PDC: Overview and Examples



**Fostering Disaster-Resilient Communities through
Information, Science, Technology and Exchange**

PDC Origins and Concept

- Conceived in the aftermath of Hurricane Iniki (Impacted Kauai on Sept 11, 1992)
- A center to establish access to new, innovative, and more effective information resources supporting all levels of emergency management to **better prepare for** and **respond to** disasters.
- Established in 1996.
- Today, PDC is an acknowledged leader in using the application of science and technology to advance international best practices in **Disaster Risk Reduction (DRR)**.
- University of Hawaii: Managing Partner ('06)



PDC Location and Composition

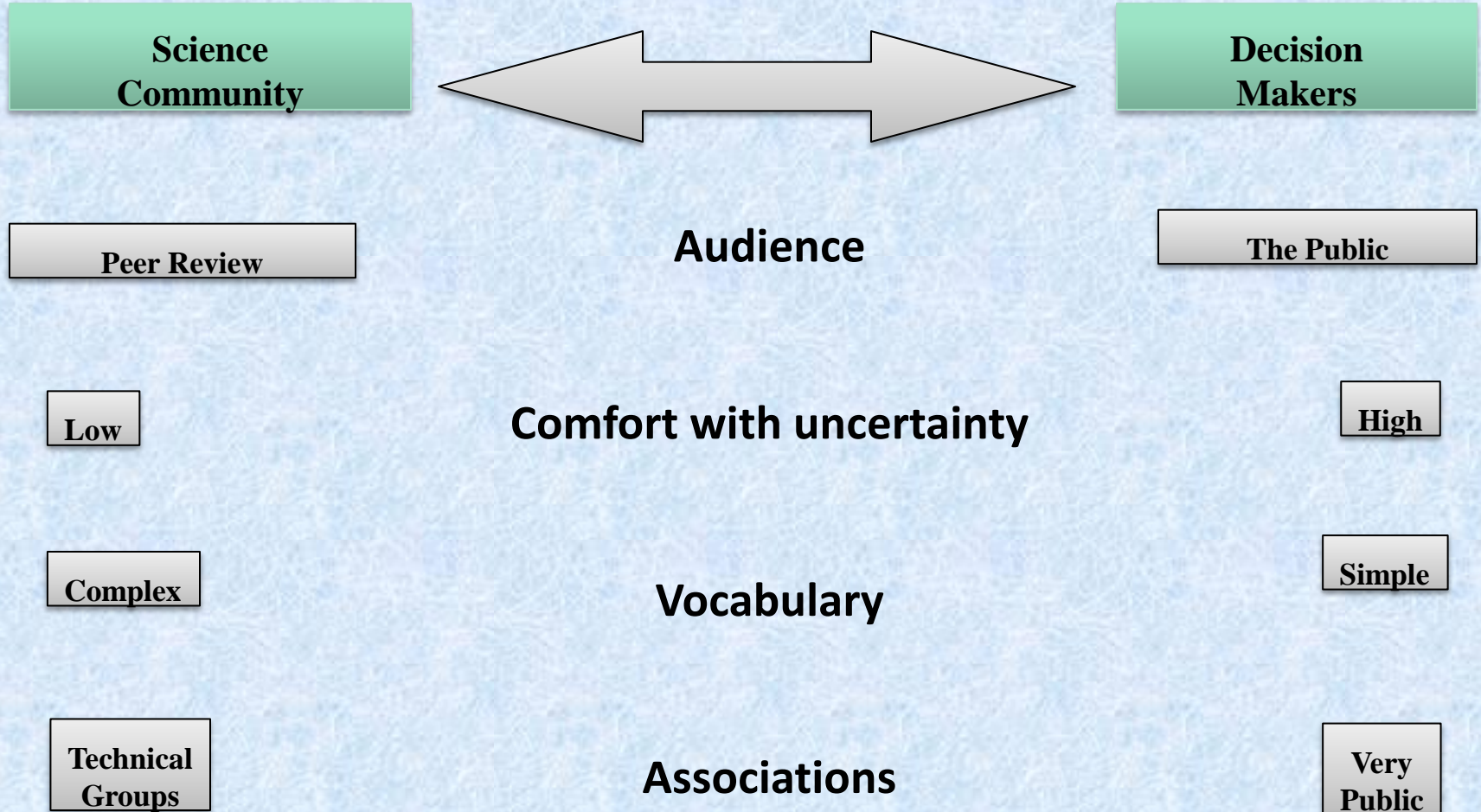
- Program under UH
- 75% Public funds, 25% Proposals/Grants
- About 40 full time staff and contractors
 - Hawaii: Maui and Oahu (36)
 - Vietnam, Thailand, Wash DC, CO. (4)

Staff Expertise:

- Disaster Management
- Geospatial Data and Visualization
- Information System Engineering & Technology
- Modeling, Simulation, & Risk Assessment



Building Bridges



-
- Observation Systems , Data Collection**
- Integrating Information, Science, Technology**
- GIS, Visualization and Display Systems**
- Improve Decision-Support Capabilities**
- Communication Systems and Networks**
- Advanced Applications, Algorithms, Models**

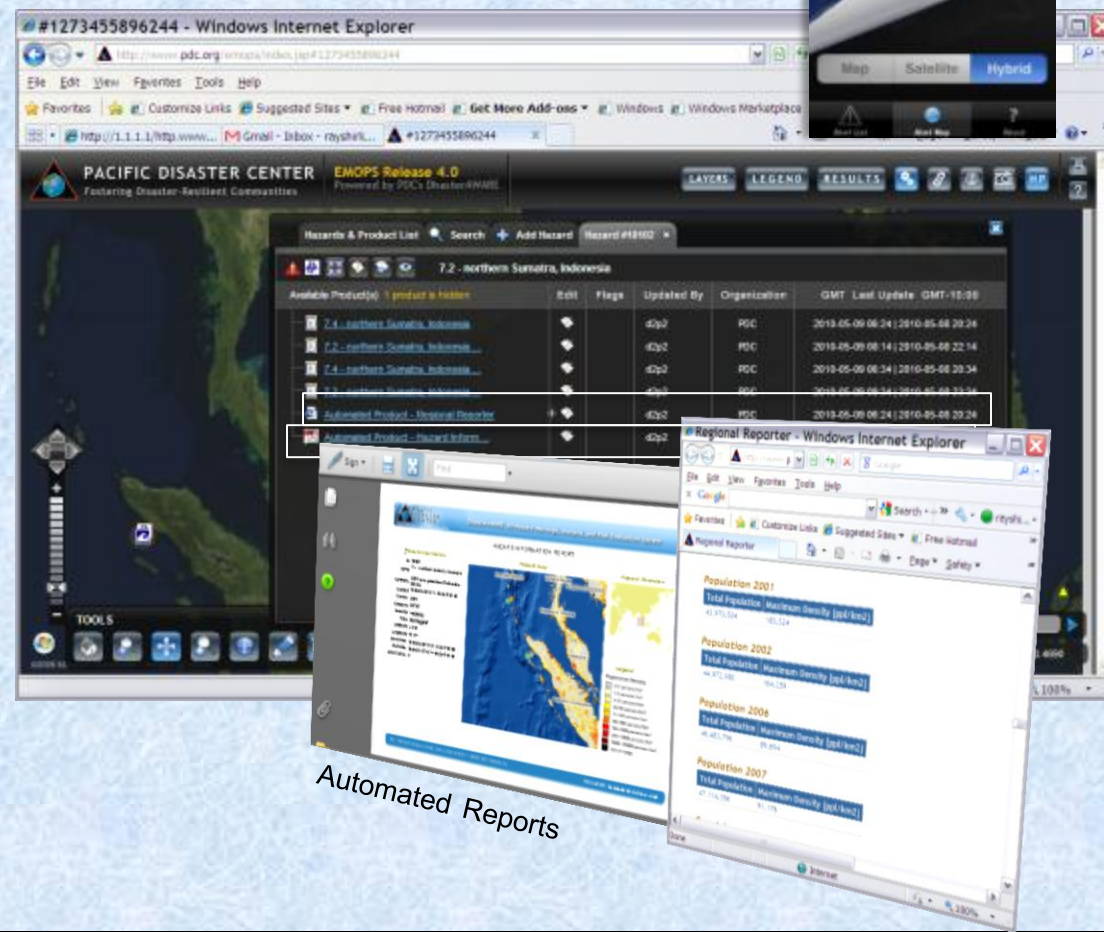
What Is DisasterAWARE?

- Integrated Multi-hazard Hazard Monitoring
- Disaster Early Warning
- Automated / Integrated Modeling
- Exposure Maps & Historical Hazard data
- Customized Impact Modeling AND
- Intra- and Inter-Agency Info Sharing
 - User Added Situation Reports
 - Damage Products, ...
- Remote Access

Mobile App



May 10, 2010



Available Product(s)	Edit	Flags	Updated By	Organization	GMT	Last Update
7.2 - northern Sumatra, Indonesia			42p2	PDC	2010-05-09 08:34	2010-05-08 20:24
7.2 - northern Sumatra, Indonesia			42p2	PDC	2010-05-09 08:14	2010-05-08 22:14
7.4 - northern Sumatra, Indonesia			42p2	PDC	2010-05-09 08:34	2010-05-08 20:24
7.4 - northern Sumatra, Indonesia			42p2	PDC	2010-05-09 08:34	2010-05-08 20:24
Automated Product - Regional Reporter			42p2	WPC	2010-05-09 08:34	2010-05-08 20:24

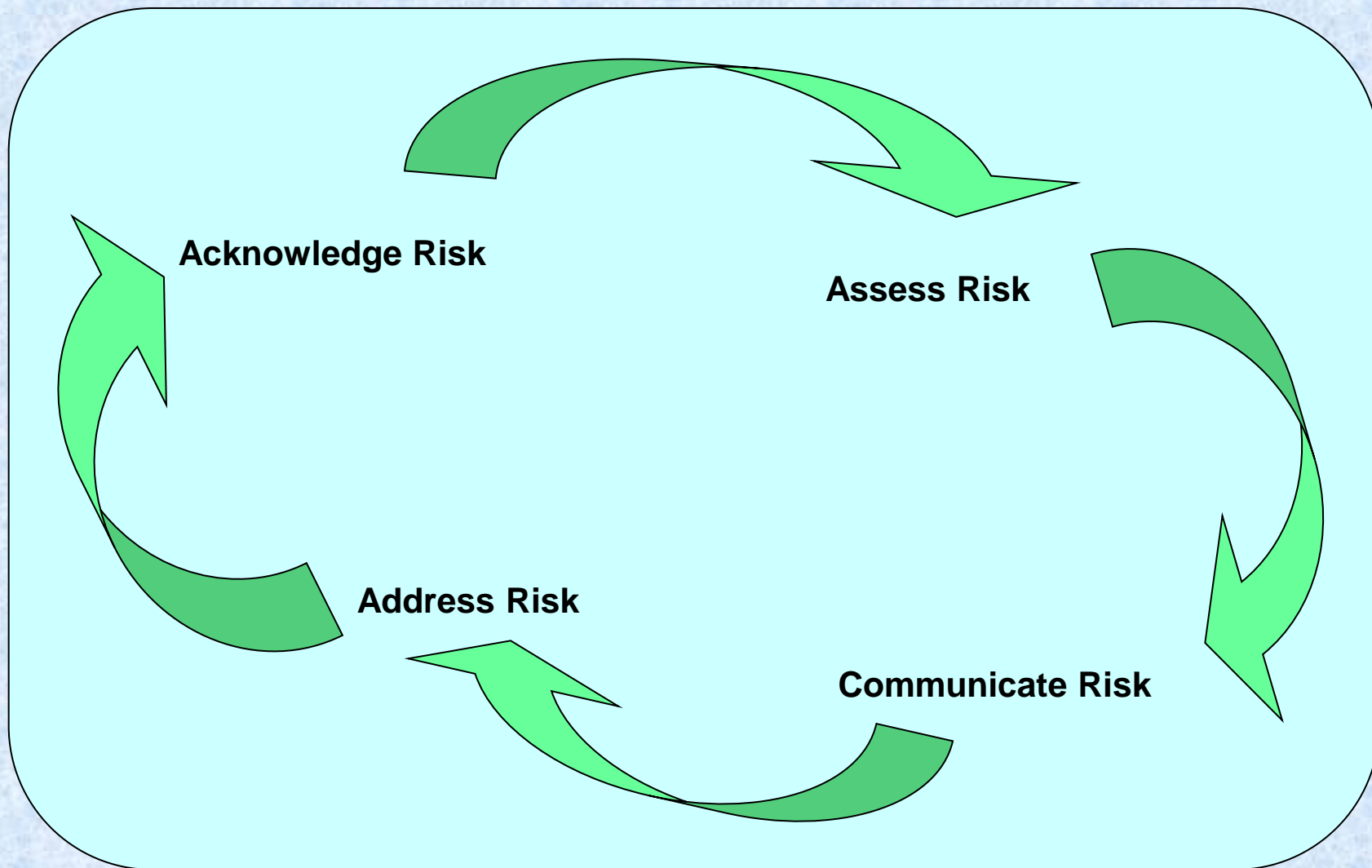
Population	Total Population	Maximum Density (pop/km2)
Population 2001	10,471,504	145.124
Population 2002	10,471,504	145.124
Population 2006	10,471,504	145.124
Population 2007	10,471,504	145.124

Automated Reports

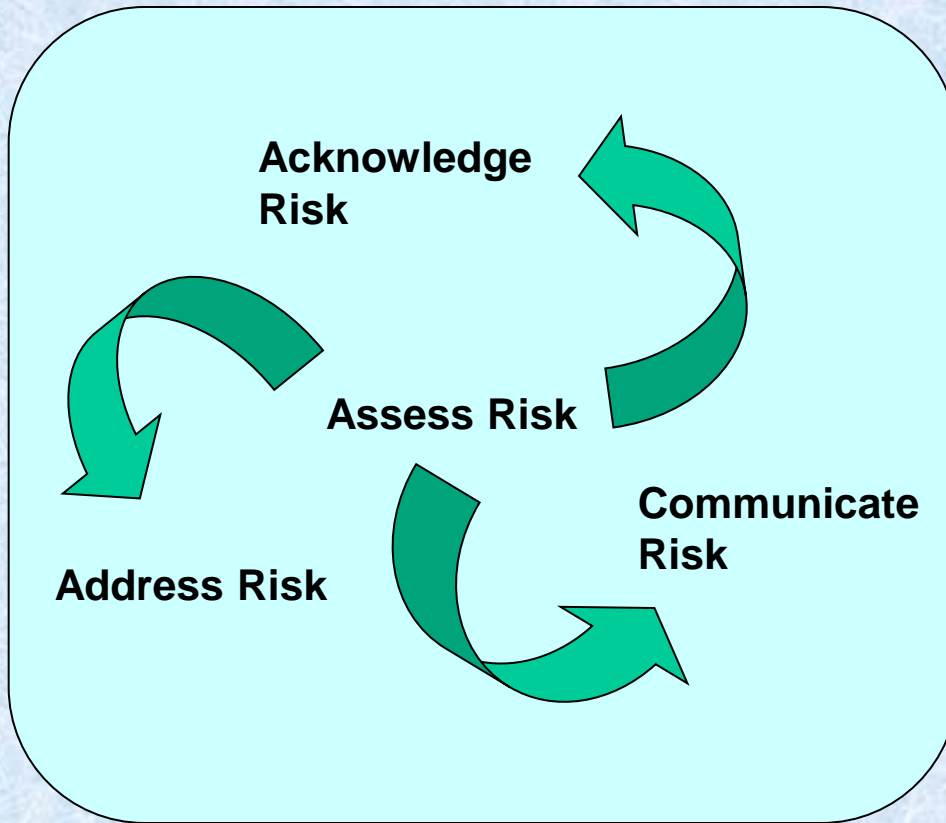
- Technical Advisory Services
 - ASEAN
- Workshops and Training
 - Vietnam, APEC
- Data Collection and Assessment Activities
 - ADB
- Outreach to Both Worlds
 - *Risk, Hazards & Crisis in Public Policy*
 - PRiMO



An Approach to Disaster Risk Reduction

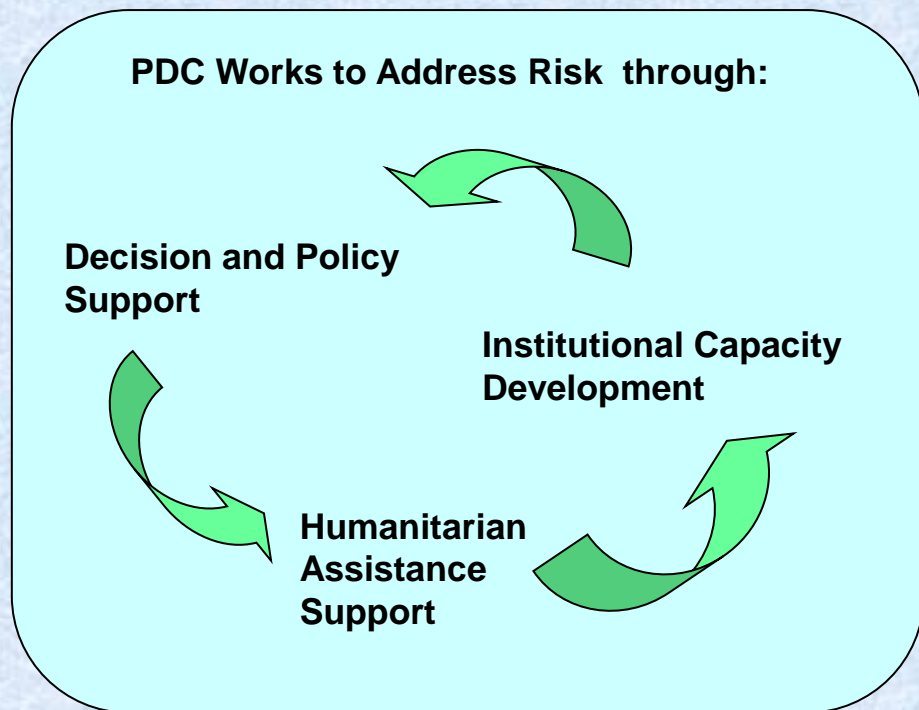


Why Do Assessments?



- Helps stakeholders understand patterns of risk and consequences
- Identifies gaps and “hotspots”
- Increases effectiveness of DM and HADR activities
- Aids Prioritization
- Helps set meaningful goals
- Makes idea of risk more tangible

How Does RVA Support PDC Efforts to Address Disaster Risk?



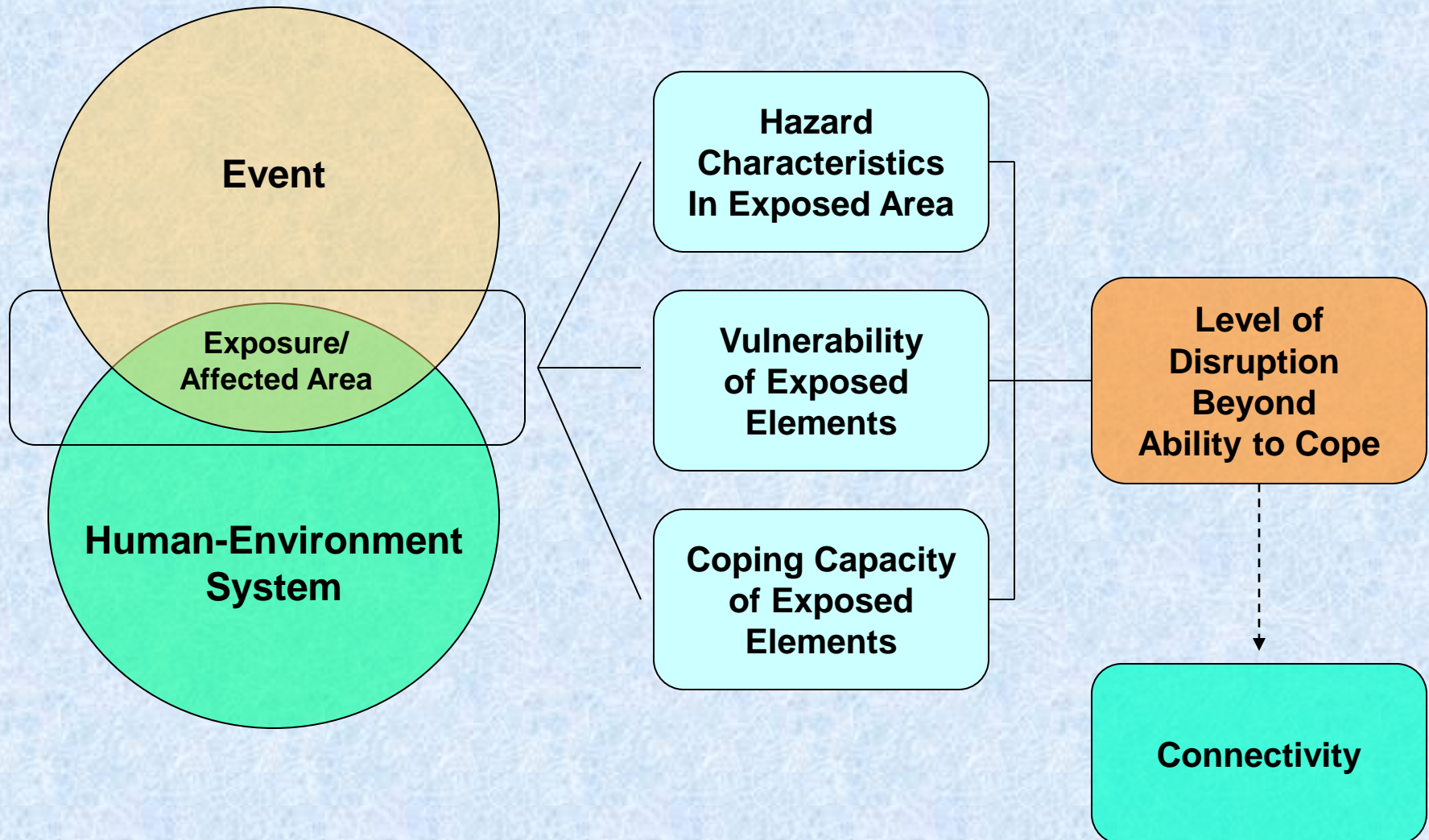
- Frameworks Guide Data Collection
- Modeling and Analysis Outputs Provide Content for DSS
- Modeling and Analysis Results Provide Evidence for Decision Making
- Theory and Methods Support Capacity Development
- Socio-Economic and Environmental Analysis Provides More Complete Picture

What Is a Risk Assessment? (ISDR 2009)

A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.

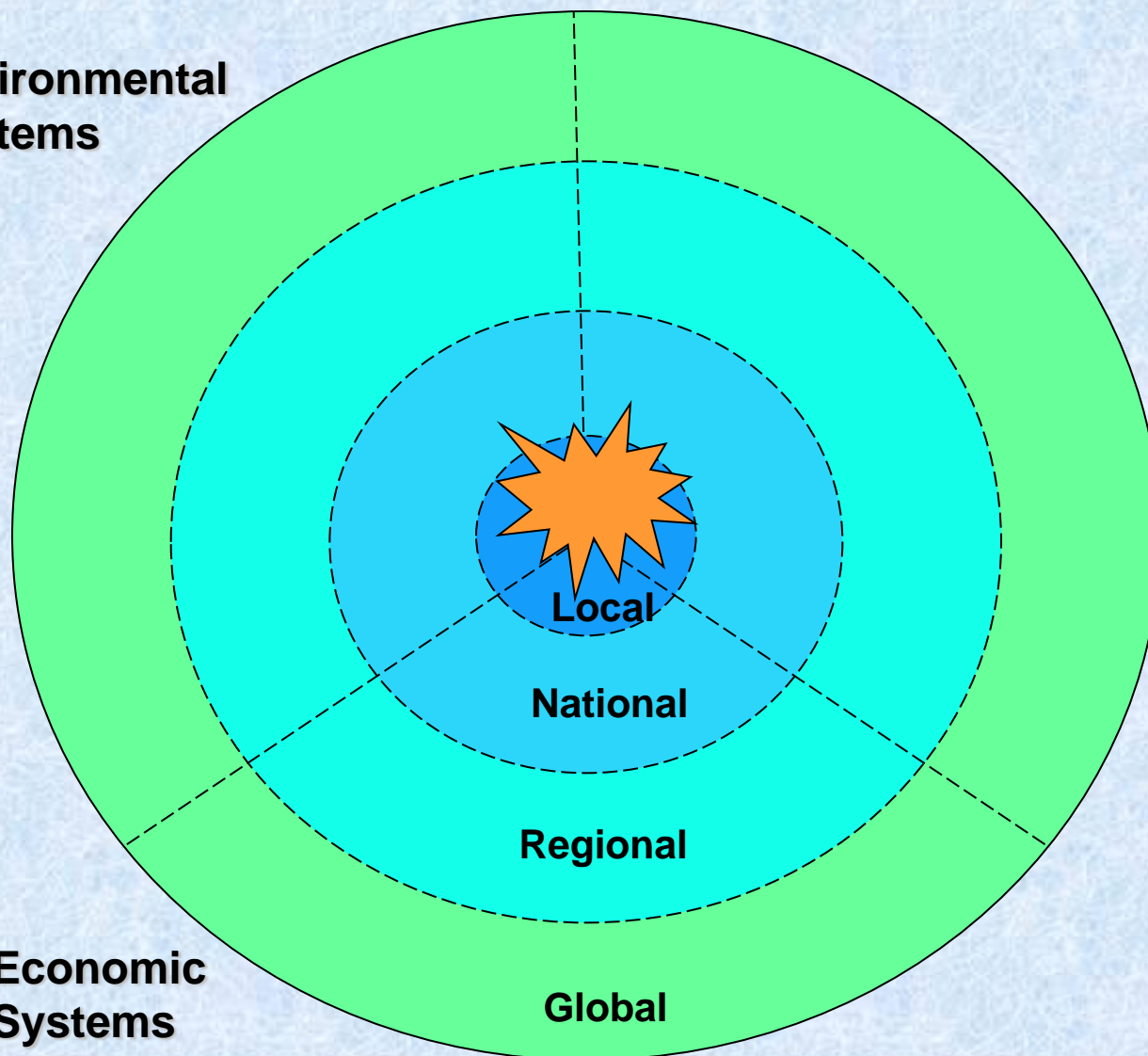
Risk assessments (and associated risk mapping) include: a review of the technical characteristics of hazards such as their location, intensity, frequency and probability; the analysis of exposure and vulnerability including the physical, social, health, economic and environmental dimensions; and the evaluation of the effectiveness of prevailing and alternative coping capacities in respect to likely risk scenarios. This series of activities is sometimes known as a risk analysis process.

Components of Disaster Risk



Components of Disaster Risk

**Environmental
Systems**



**Social
Systems**

**Economic
Systems**

How Do We Assess All That?!!!

- We Don't
- Estimations and Interpretations of Reality
- Practical Tools to Help Us Do Our Jobs More Effectively
- Address a Limited Number of Factors
- What We Include Depends on Purpose and Goals
- ...but We Try to Keep in Mind What's Missing

Many Types of Risk Assessment

- Qualitative or Quantitative
- Simple or Complex
- Multi-Hazard or Single-Hazard
- Performed for Communities, Sectors, Systems or Objects
- Should support larger DRR or DM goals
- Generally, Should Know Something About:
 - The Frequency and Intensity of Relevant Hazards
 - The Assets and Resources of Interest that May be Exposed
 - Characteristics that Make those Elements More Susceptible to Impact and Less Able to Cope

Risk Assessment Road Map

Purpose, Goals, and Objectives of Risk Assessment

Scale

Participation and Roles

**Characterize
Risk**

**Definitions
Conceptualization
Key Components
and Categories**

Analyze Risk

**Methods
Data Requirements
and Collection
Execution**

**Communicate
Risk**

**Representation
Reporting
Dissemination**

**Acknowledge
and
Address
Risk**

**Policy
Planning
Mitigation
Mainstreaming
Etc.**

Standardization/Interoperability

Assessment Examples*



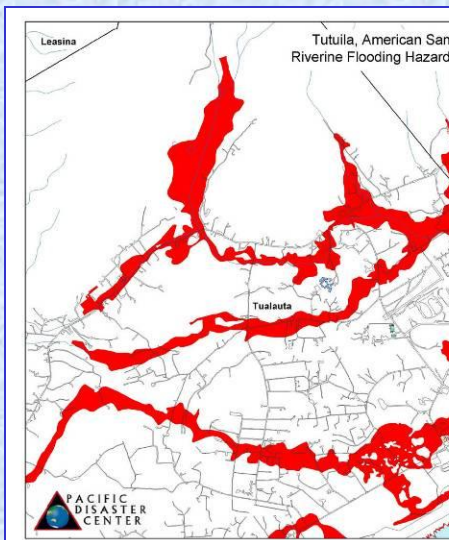
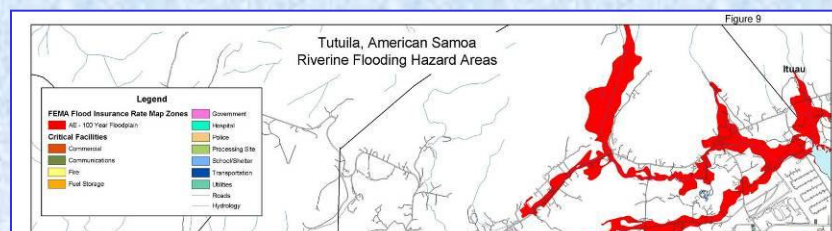
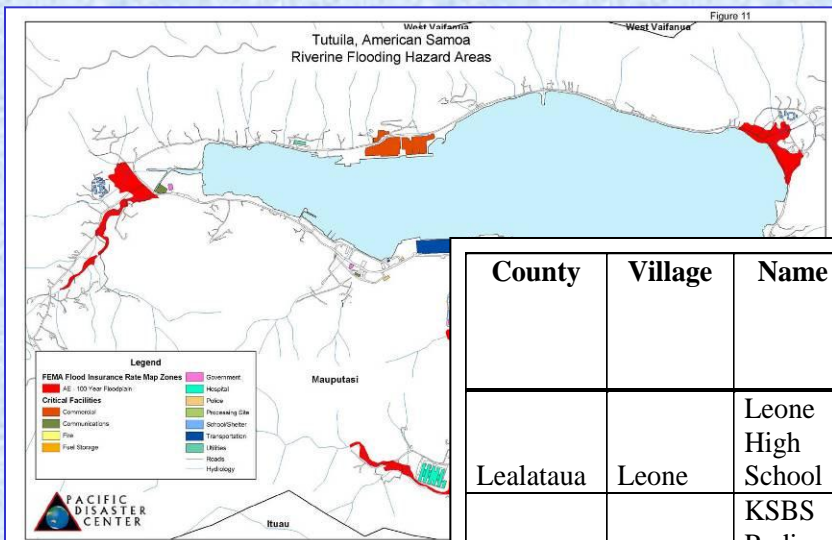
*Please Do Not Distribute Examples Provided

Example 1: American Samoa: Focus on Critical Facilities



County	Village	Facility Name	Number of Buildings	Function	Earthquake	Flood	Landslide	Storm Surge / Tsunami
Maoputasi	Fagatogo	American Samoa Telecom.	1	Communications	Medium	Low	Low	High
Maoputasi	Utulei	Dept of Ed.	1	Government	Medium	Low	Medium	High
Maoputasi	Fagatogo	High Court	1	Government	Medium	Low	Low	High
Maoputasi	Fagatogo	Inter-island Ferry Terminal	1	Transportation	Medium	Low	Medium	High
Maoputasi	Fagatogo	DPS Fire Division	2	Fire	Medium	Low	Medium	High
Maoputasi	Fagatogo	Container Dock	1	Transportation	Medium	Low	High	High
Maoputasi	Pago Pago	District Court	1	Government	Medium	Low	Low	High
Maoputasi	Satala	Star Kist Samoa Co.	2	Commercial	Medium	Medium	Medium	High

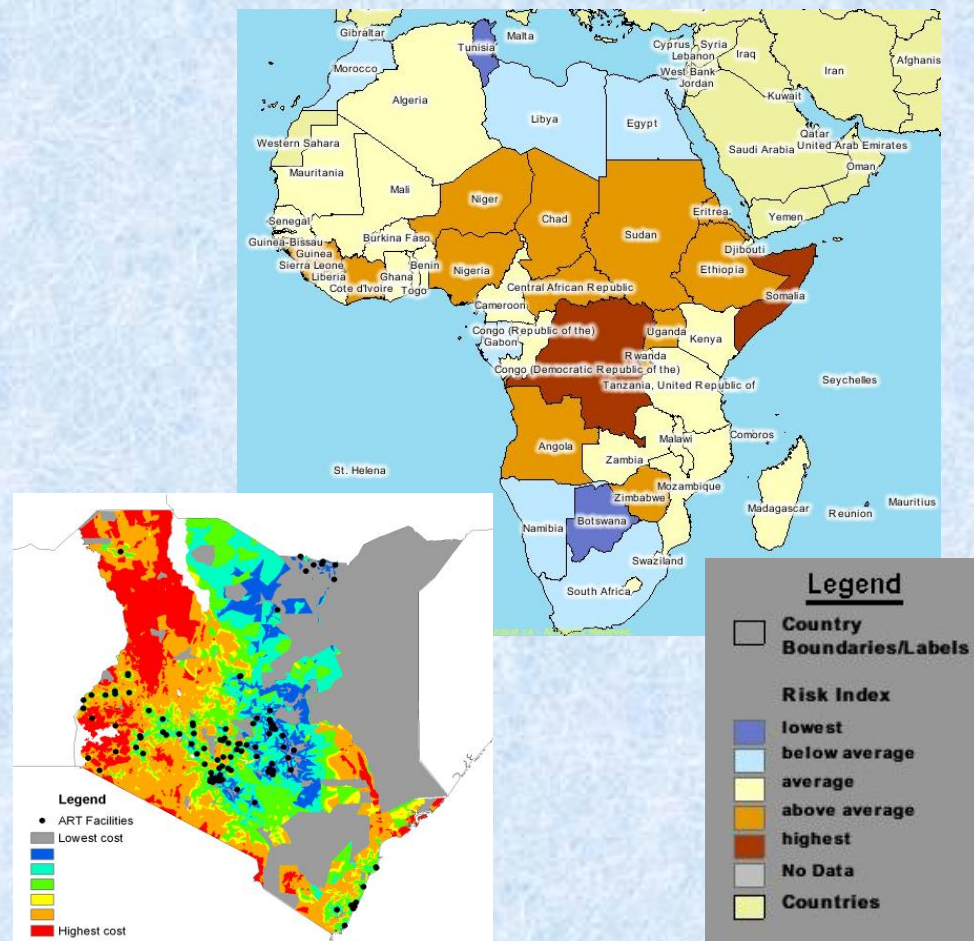
Loss Estimation for Critical Facilities Tutuila, American Samoa



County	Village	Name	Function	Number of Employees	Estimated Replacement Cost (\$)	Critical Facilities Ownership	Approx. Value Contents (\$)	1 st -Floor Flood Elevation (feet)
Lealataua	Leone	Leone High School	School/Shelter		\$1,960,000	Gov't.	\$1,960,000	53
Maoputasi	Fagaalu	KSBS Radio Station	Communications	10	\$384,000	Private	\$384,000	15
Maoputasi	Fagaalu	LBJ Tropical Medical	Hospital	500	\$18,836,193	Gov't.	\$28,254,289	17
Maoputasi	Fagatogo	ASG Gov't Bldgs.	Government		\$14,000,000	Gov't.	\$14,000,000	12.5
Maoputasi	Fagatogo	DPS Central Station	Police	230	\$770,414	Gov't.	\$1,155,621	8
Maoputasi	Fagatogo	DPS Fire Division	Fire	25	\$150,000	Gov't.	\$225,000	6
Tualauta	Tafuna	PPG Intl. Airport	Transportation	77	\$69,080,080	Gov't.	\$69,080,080	15.5

Example 2: Support for HADR Information Needs in Africa*

- National Level Risk Assessment for Continent of Africa
- Interactive Map Viewer
 - Visualize and Interact with Physical and Social Spatial Data, Risk Assessment Indicators and Indices
- Sub-National Analysis
 - Example: Travel Costs in Kenya



* Colvin, Peter, Heather M. Bell, Margaret Roth. 2009. *PDC Support of Humanitarian Assistance and Disaster Relief Information Needs in Africa*. Maui, HI: PDC

Assessment Approach

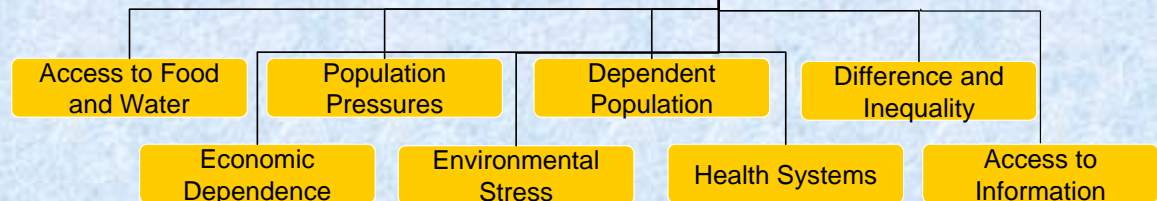
$$\text{RISK} = \text{Hazard} + \text{Vulnerability} - \text{Capacity}$$



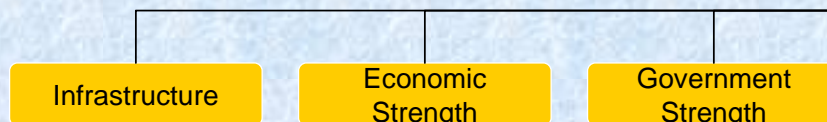
**Hazard Is Modular,
Includes Exposure and
Specific Vulnerability
And Capacity**

**Vulnerability and Capacity
Components Are
Hazard Independent**

$$\text{RISK} = \text{Hazard} + \text{Vulnerability} - \text{Capacity}$$



$$\text{RISK} = \text{Hazard} + \text{Vulnerability} - \text{Capacity}$$



**Composite Index Allows
Drill Down into
Drivers of Hazard,
Exposure, Vulnerability,
And Capacity**

Capacity Example

- Mauritius
 - Higher Capacity in All Aspects
- Equatorial Guinea
 - Weak Governance, High Economic Strength
- Ghana
 - Strong Governance, Relatively Weak Infrastructure



Top 10	Capacity		Governance		Infrastructure		Economic Strength	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank
Country	(Range 0-1)	(Rank x of 53)	(Range 0-1)	(Rank x of 53)	(Range 0-1)	(Rank x of 53)	(Range 0-1)	(Rank x of 53)
Mauritius	0.90	1	0.93	3	0.89	1	0.89	2
Cape Verde	0.76	2	0.94	1	0.78	2	0.56	7
Botswana	0.73	3	0.93	3	0.26	10	0.99	1
Seychelles	0.71	4	0.78	6	0.71	3	0.65	6
South Africa	0.61	5	0.83	5	0.51	6	0.49	8
Tunisia	0.55	6	0.64	8	0.36	7	0.66	5
Namibia	0.48	7	0.84	4	0.19	20	0.43	10
Sao Tome and Principe	0.46	8	0.57	13	0.70	4	0.11	32
Equatorial Guinea	0.39	9	0.15	45	0.24	13	0.80	3
Morocco	0.38	11	0.56	14	0.27	9	0.31	16
Ghana	0.38	11	0.72	7	0.14	32	0.28	17

Viewer Example: Atrocities Information

Disaster Resilience Visualization and Assessment Tool II (DRVAT2)

PDC Home Feedback Disclaimer Help Case Study

Tools

DisasterAWARE
Legend/Layers
Overview
Zoom In
Zoom Out
Full Extent
Zoom Last
Pan
Identify
Identify All
Hyperlink
Bookmark
Print
Regional Reporter

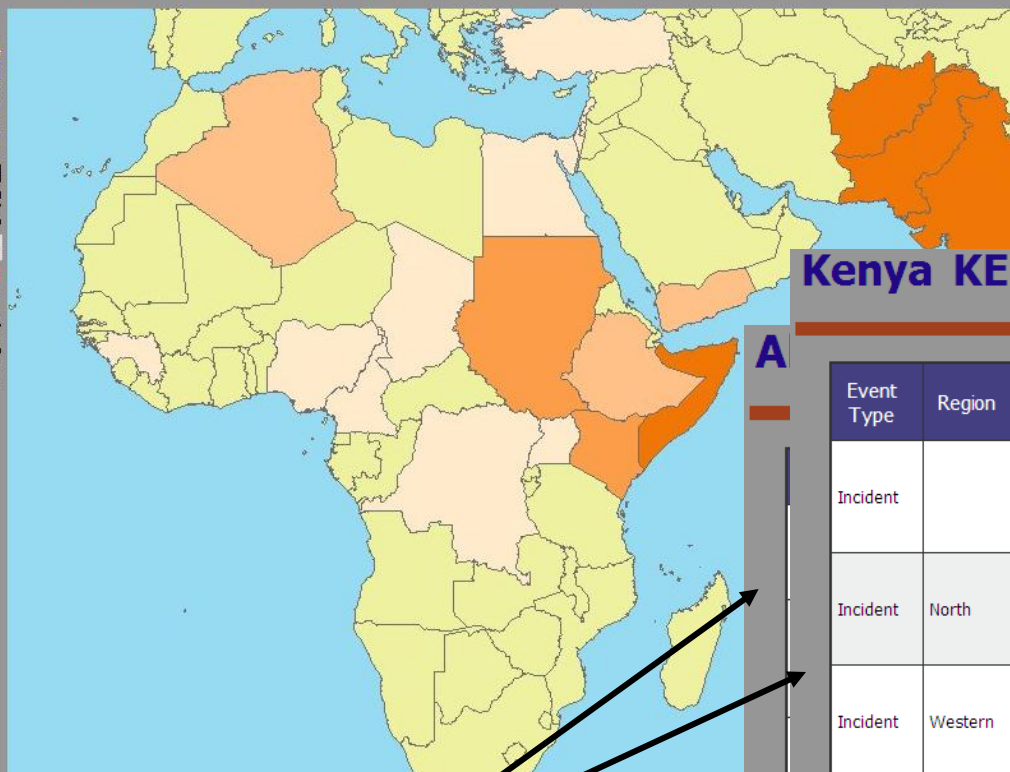
Refresh Map

Hide Legend

Legend

Atrocities 2007

1 - 2
3 - 4
5
5 - 13
No Reported Data
Countries



Kenya KEN

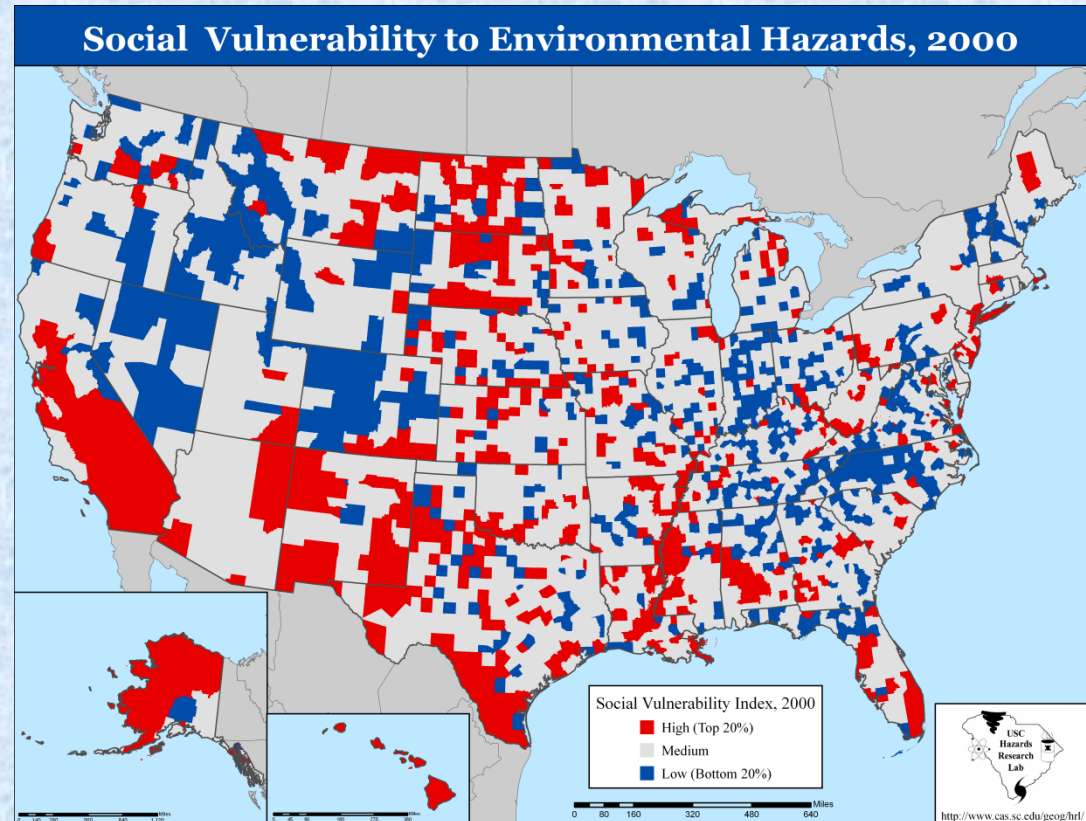
Atrocities 2007

Rec	DATA LINK	ISO 3 DIGIT	COUNTRY NAME	NUM
1	Click for Atrocities Report	KEN	Kenya	5

Event Type	Region	District	Locality	Number of Deaths	Weapon Types	Description	More
Incident		Turkana district	Nakambeit	5-24	Primitive Weapons	Twenty "Sudanese livestock-raiders" crossed the border into Kenya and killed six people, including f...	see more
Incident	North		Moite	5-24	Unclear/Other	Livestock rustlers have killed at least 11 people in Kenya's remote north where clashes over scant r...	see more
Incident	Western		Matisi	5-24	Firearms	Armed robbers killed 10 people in an attack on a village in Kenya's western region on May 3, police ...	see more
Incident	Turkana Region		Lokwamosing	5-24	Firearms	Livestock raiders in a remote part of northwestern Kenya have killed 14 people, including eight chil...	see more
Incident			Athi River township	5-24	Firearms	Five blood-soaked bodies riddled with bullet holes were also found in a thicket near Athi River town...	see more

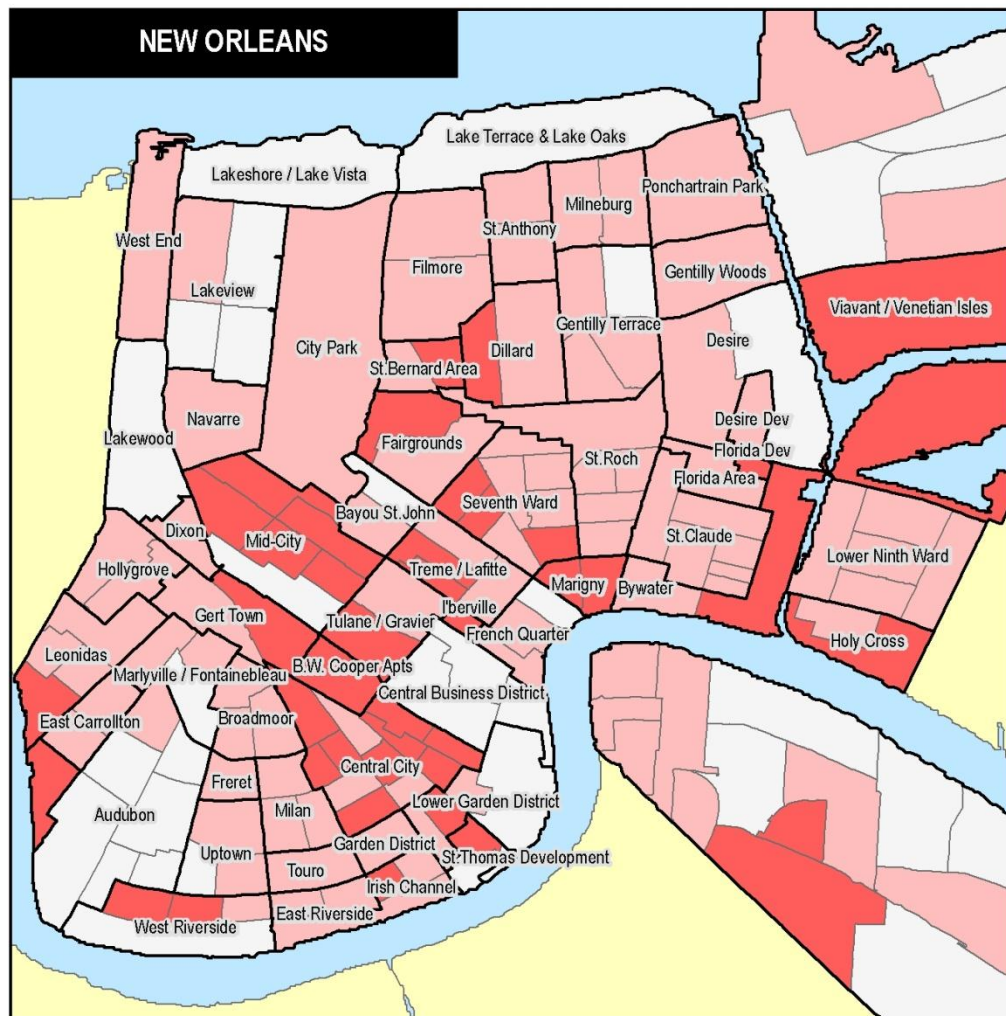
Example 3: Social Vulnerability and Hazard in New Orleans

- Social Vulnerability Estimation Based on SoVI Method*
- Combined with Hazard
- Applied to Examine Recovery and Inform Planning

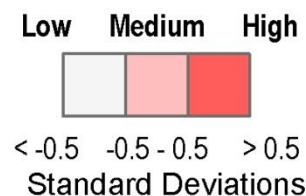


*S. L. Cutter, B. J. Boruff, and W. L. Shirley. 2003. Social Vulnerability to Environmental Hazards, *Social Science Quarterly* 84 (2): 242-261.

New Orleans Social Vulnerability*



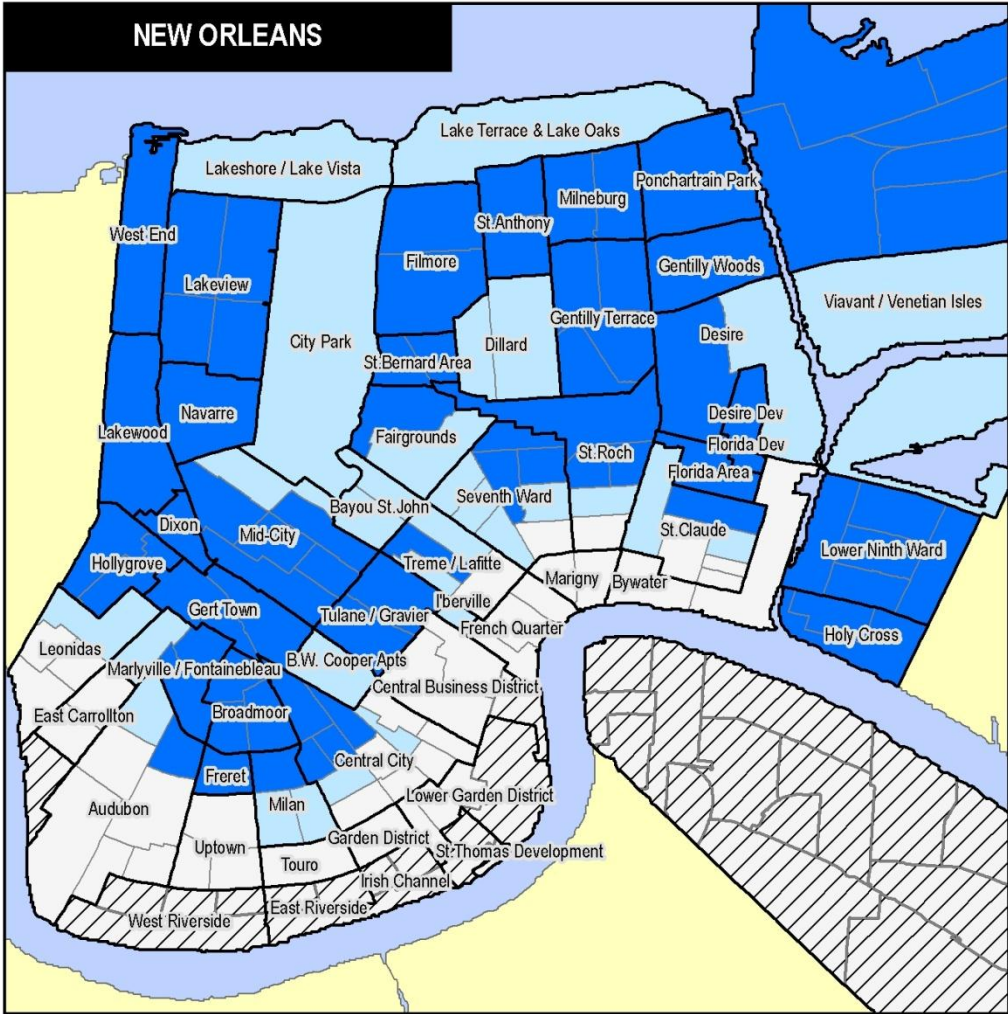
SOCIAL VULNERABILITY INDEX ORLEANS PARISH, LA



*Following slides from Finch, C., C. Emrich, and S. L. Cutter. 2010. Disaster Disparities and Differential Recovery in New Orleans. *Population and Environment*. DOI 10.1007/s11111-009-0099-8.

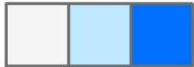


New Orleans Flooding during Katrina



**FLOOD INUNDATION
ORLEANS PARISH, LA**

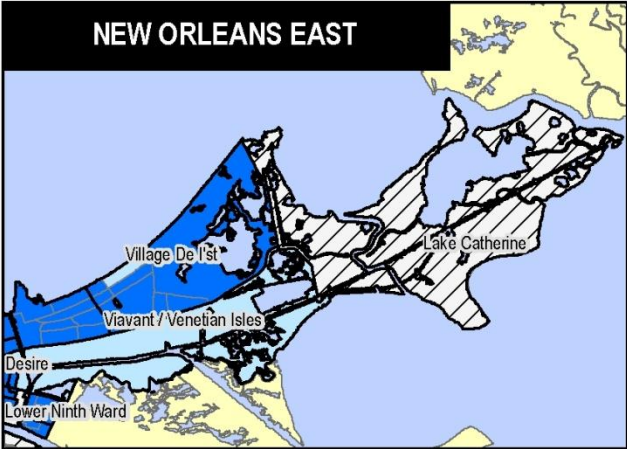
Low Medium High

 ≤ 2 $2-4$ > 4

Average Flood Depth (In Feet)



No Flooding



NEW ORLEANS EAST



Combining Hazard and Vulnerability



SOCIAL VULNERABILITY
Low Medium High

FLOOD INUNDATION

None

Low

Medium

High

NEW ORLEANS EAST

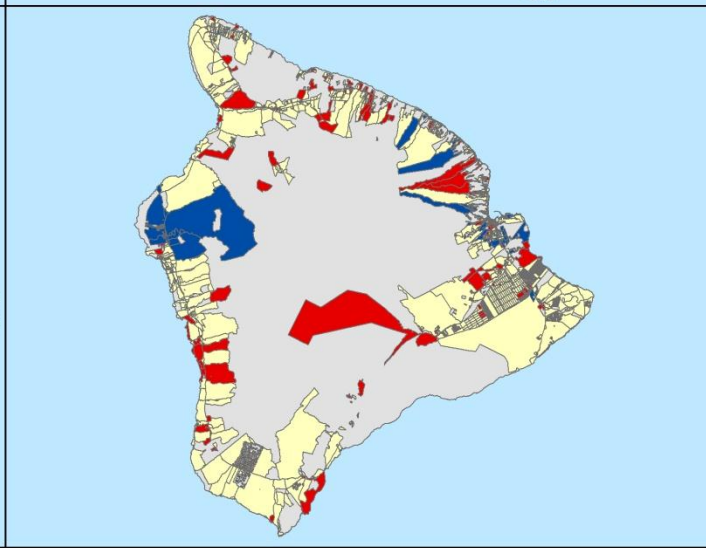
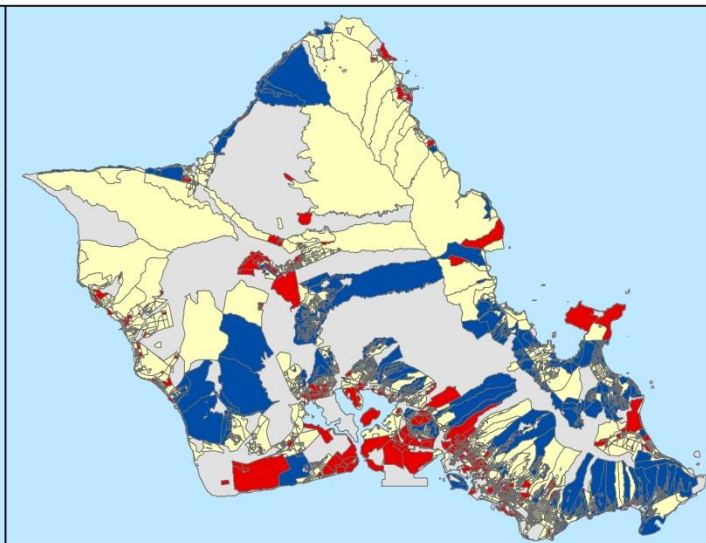
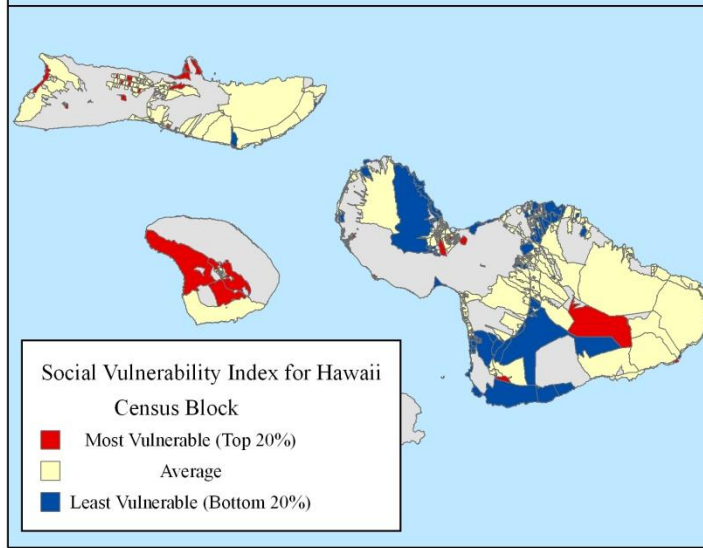
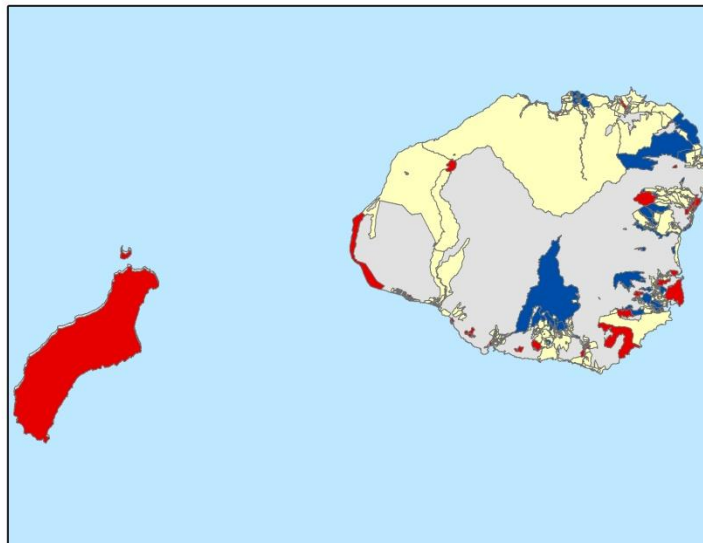
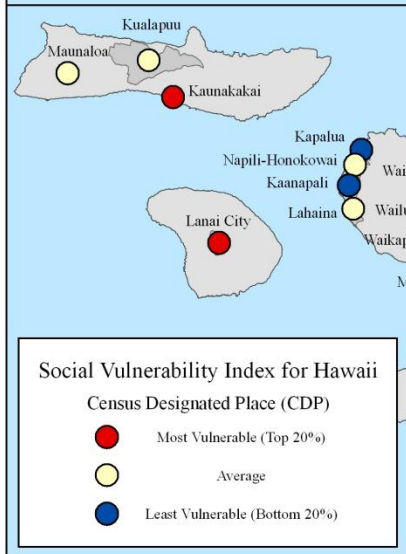
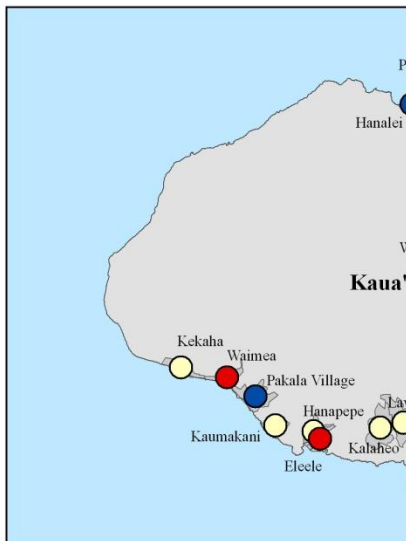
Village De l'st

Lake Catherine

Viavant / Venetian Isles

Lower Ninth Ward

SoVI Applications in Hawaii (works in progress)



001

NU DAM NO. 4
HI000001

• Dam Locations

■ Dam Inundation Area **

Social Vulnerability Index

(Census Blocks)

< 1

1 - 2

2 - 3

3 - 4

> 4

□ No Population

** This product depicts downstream flood potential using the DHI MIKE 21 model.



- Fire Stations
- Public Schools
- Emergency Shelters
- Dams
- ▨ Evacuation Zone
- Perennial Streams

Imagery: (c) Digital Globe 2004

0 0.25 0.5 0.75 1 Miles

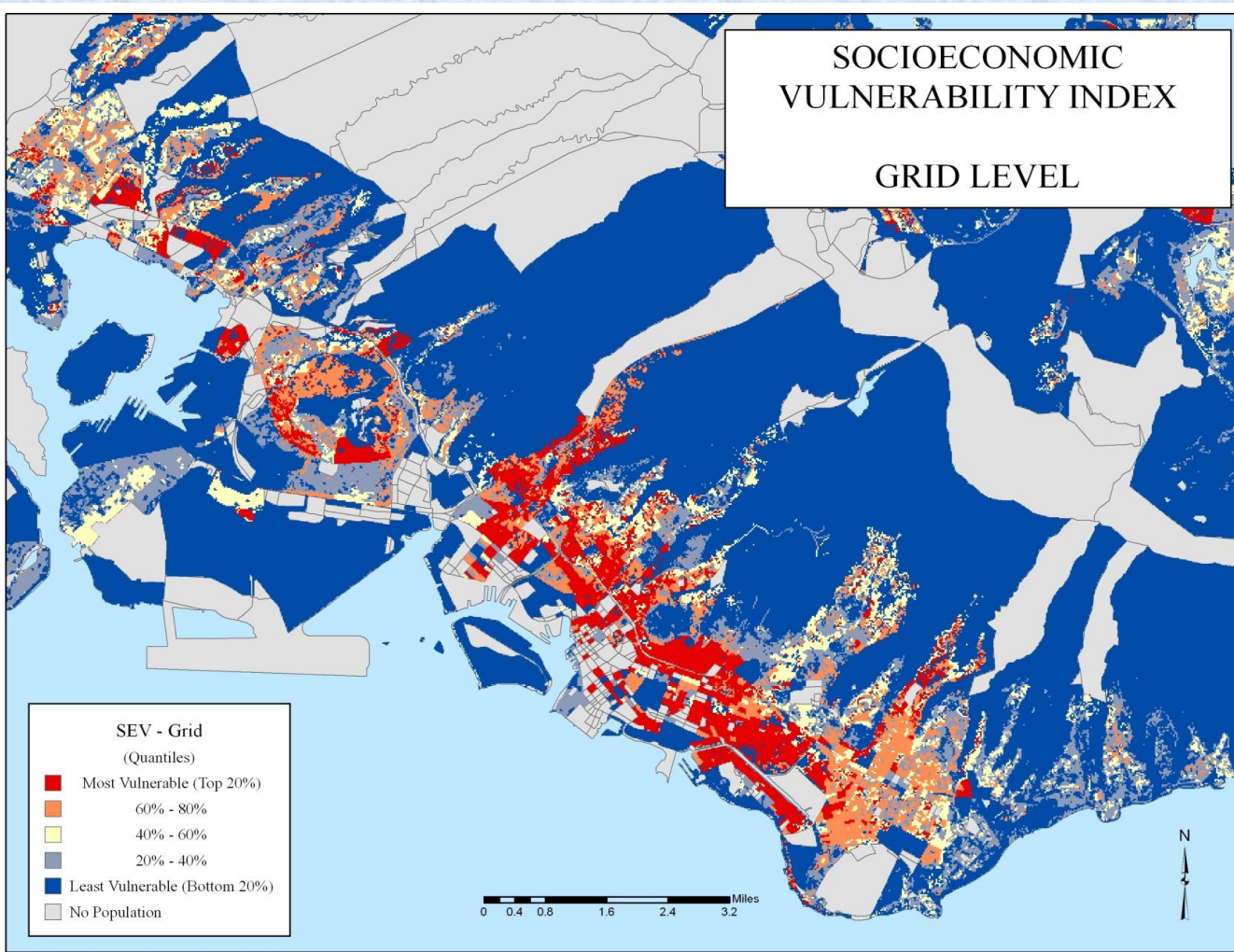
This product depicts downstream flood potential using the DHI MIKE 21 model.

November 29, 2010

0 0.3 0.6 1.2 1.8 2.4

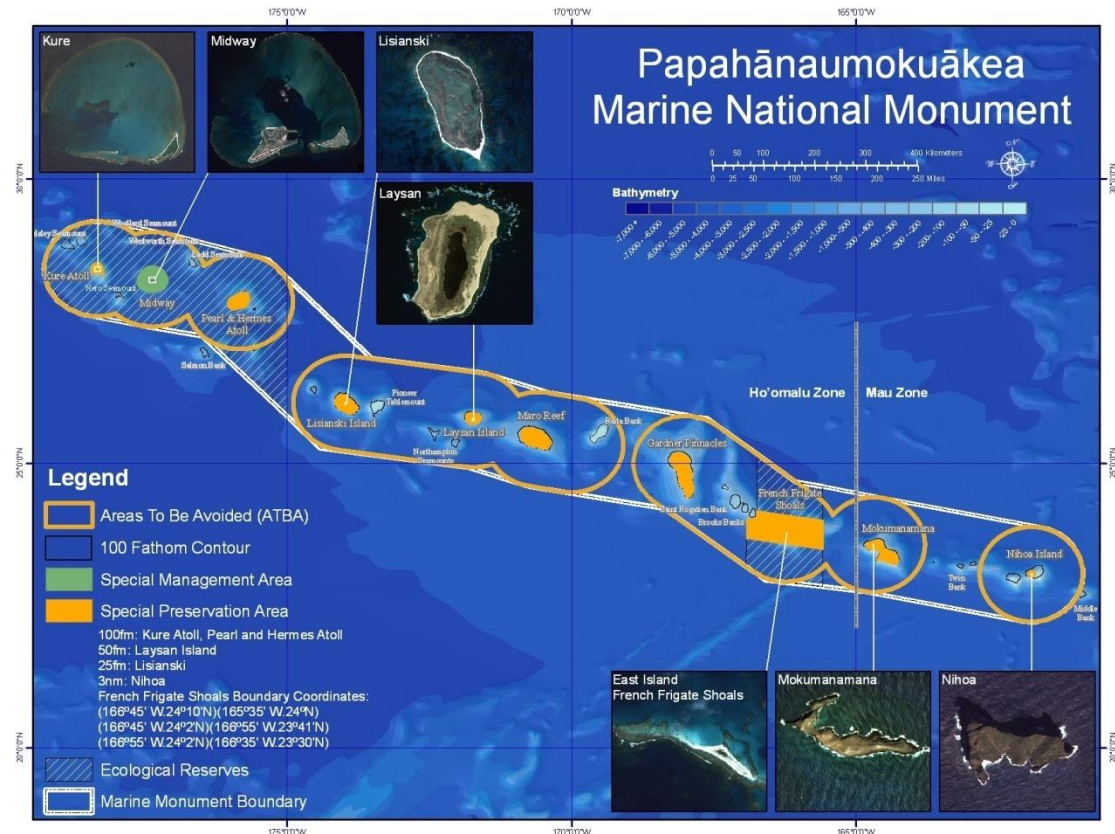
Example 5: Dasymetric Approaches to Representing Exposure and Vulnerability

- Dasymetric Mapping
- Applications for Vulnerability



Example 6: Multi-Hazard with Environmental Resource Focus*

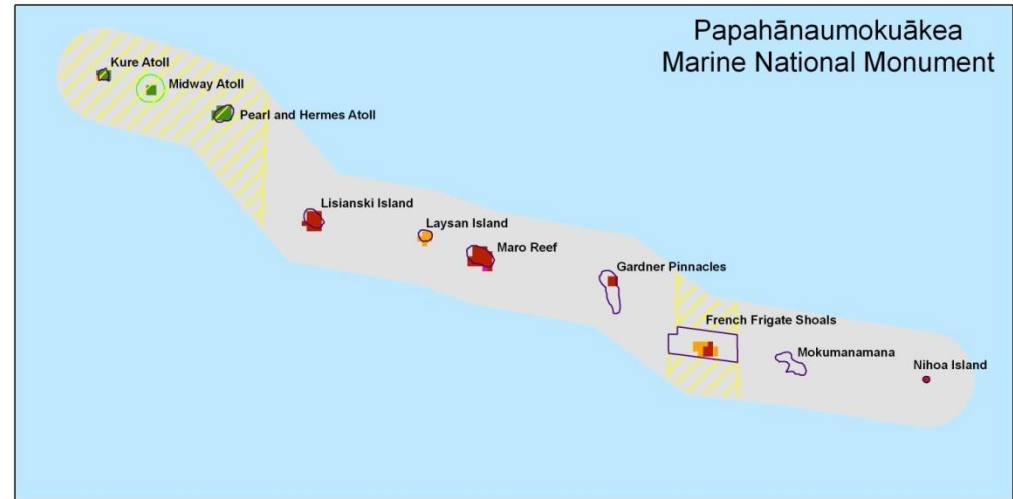
- Project Goals
 - Identify and Evaluate Threats to the Monument
 - Assess Vulnerabilities of Key Resources
 - Prioritize At Risk Areas for Monitoring Activities



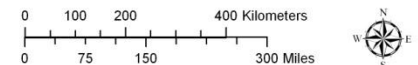
* Mielbrecht, S., P. Cowher, J. Livengood, H.M. Bell, C. Chiesa. 2009. Papahānaumokuākea Marine National Monument Threat Assessment Report: A Natural and Environmental Threat Assessment. Project Final Report. Maui, HI: PDC.

Characterizing Hazard, or “Threat”

Participatory Approach



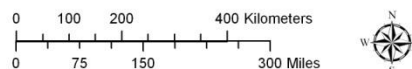
Relative Potential for Illegal Harvest Near Shore



Relative Potential for Occurrence



Relative Potential for Terrestrial Habitat Damage



Enforceable Threats

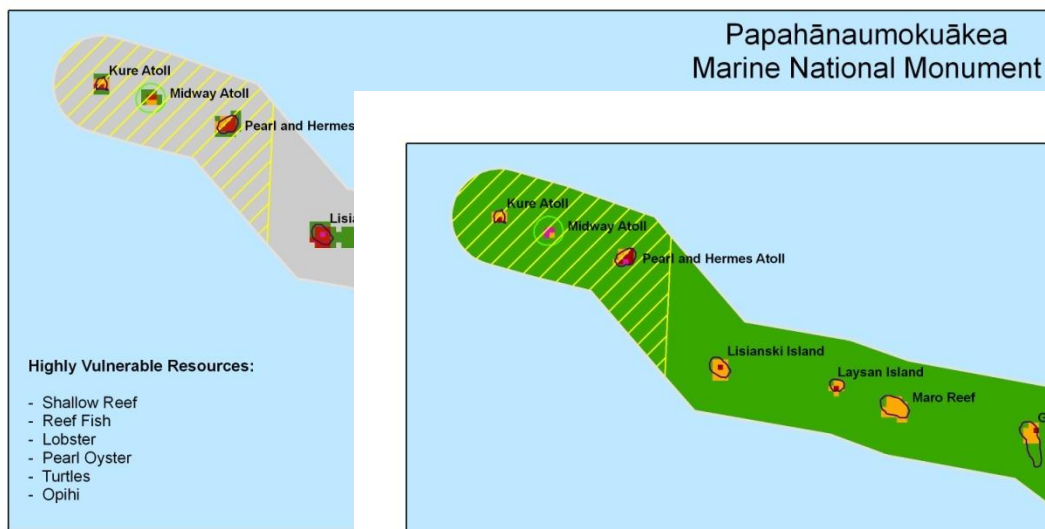
Representing Resources, Vulnerability and Risk



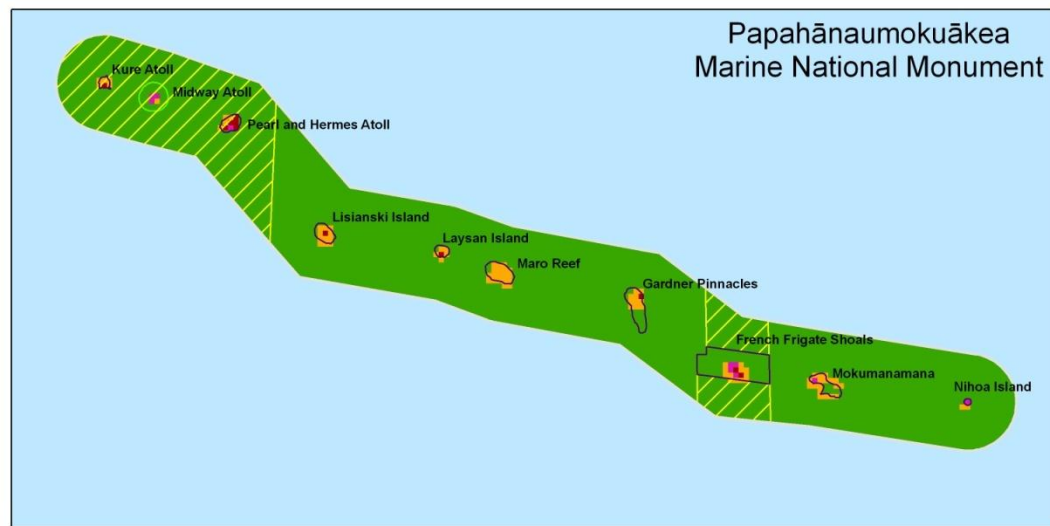
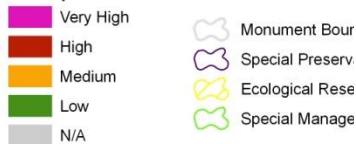
Total Resources



Papahānaumokuākea
Marine National Monument



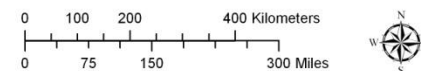
Relative Potential for Impact



Relative Potential for Impact



Average of All Threats Relative Potential for Impact on Identified Resources



Questions?



Heather Bell, PhD
Science Advisor
Editor-in-Chief, *Risk,
Hazards & Crisis in Public
Policy*
Pacific Disaster Center
808.891.7942
hbell@pdc.org

www.pdc.org
www.psocommons.org/rhcpp