New Directions?
Hazardousness of Place

RISK AND UNCERTAINTY
HAZARDOUSNESS OF PLACE

PHYSICAL ENVIRONMENT: PROCESSES

- Frequency of Events
- Magnitude of Events
- Duration of Events
- Speed of Onset

RISK
- Temporal Patterns
- Spatial Patterns
- Behavior
- Perception
- Decision-Making

HUMAN ENVIRONMENT: PROCESSES

- Vulnerability Variables
- Social Norms
- Coping Mechanisms

Dynamic conditions and interdependence of both the physical and human environments present ongoing challenges to understanding and managing risk

Tobin and Montz 2009
Structural Impacts

Simplistic reliance on geophysical models and engineering solutions!

- Disaster Response - technological fix
- False sense of security
- Perception = "Problem solved"
- Development increases
- Failure - catastrophic losses

Disaster-damage-repair-disaster...cycle.

Need a understanding of social forces in an integrated model

Near Yuba City, California 1997
Root causes of vulnerability* Such as:

Failure to recognize the hazard

Failure to take out disaster insurance

Failure of the insurance industry

Limited choices in buildings

* (See Wisner et al., 2004)
Residual Risk: Responsibility: Levels of Comfort

III. Residual Risk – Personal/Community Responsibility

Risk Choices: Positive and Negative Impacts

Technological Fix or Behavioral?
Community: Levels of Risk

Changing Mitigation Strategies/Comprehensive Planning

Residual Risk - Personal Responsibility

Levee System
Building Codes
Zoning Limits
Warnings/Alerts
Insurance Program
Responsibility?

III. Residual Risk – Personal/Community Responsibility

Changing Mitigation Strategies/Comprehensive Planning

Hypothetical depiction of residual risk. Note: (i) Vertical intervals will not necessarily be identical; (ii) Model will be place specific; and (iii) The system is dynamic and will change over time.

Adapted from Riley 2007, and others
GIS-Based Research Framework

Socioeconomic Components

- Layer 1
- +
- Layer 2
- +
- Layer 3

Geo-physical Components

- Layer 1
- +
- Layer 2
- +
- Layer 3

Social vulnerability

Geo-physical risk

Overall Hazard Vulnerability
Risks from Multiple Hazards

- Joint – Risk Magnitude
- Inadequate Data
- Lack of Analytical Models
- Hazard Differences
- Independent and Dependent Probabilities
- Such studies – just snapshots in time – we need to account for dynamism in each system.

Hillsborough County, Florida

Block Groups Affected by Multiple Natural Hazards

Hazard Levels:
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

Data Obtained from TAOS (The Arbitrator of Storms). Parcel Data obtained from 1990 Census 9-8-00

Emrich 2000
Residual Risk - Temporal Factors

Need to understand how these change over time and space and in turn affect risk.
Sustainable Mitigation and Risk: Critical Factors

- Geo-physical Criteria
- Vulnerability Metrics
- Behavior Patterns
- Risk Levels
- Hazardousness of Place
- Personal Responsibility
- Dynamic Systems

Planning Needs?
Sustainable Mitigation and Risk

1. **Geo-Physical Criteria:** Continued research into geo-physical events - goal of improving forecasting and warning systems.

2. **Vulnerability Measurements:** To date indices of vulnerability have failed to provide meaningful answers and certainly have no predictive value. We know that certain groups are more vulnerable than others - the more important question is how to address the problem.

3. **Behavioral concerns:** We still do not know exactly how individuals will react to disaster. For instance, experience can have positive and negative impacts as can communication and education. Risk taking is not fully understood in this context. (e.g. it is usually argued that death is the ultimate fate - to some this may not be the case).

4. **Risk Levels:** What is an acceptable level of risk? This is addressed in the literature, but like vulnerability has not led to any clear consensus. Can we model comfort levels of individuals? Perhaps individuals “have to reach a level of comfort with that risk.”
Sustainable Mitigation and Risk

5. Hazardousness of Place: Perhaps focus more on the context of place. Take hazard principles identified in the literature and apply to place - but what is the appropriate scale of analysis? Incorporate planning at the local level - get buy-in with the community.

6. Dynamic Systems: Recognition of the dynamism of both the human and natural systems. Need to update regularly, but how to keep attention on such issues given other pressing needs?

7. Personal and Community Responsibility: Given all the factors that limit choices and generally exacerbate vulnerabilities, there remains a residual risk that must be addressed at the individual and community levels. Social networks, social capital and community are all inter-related and need to be understood in different contexts.
The Right Direction?