Introduction to Hazard Mitigation

Objectives

- -hazard and risks of the circumpacific region (from Ernst, 2001)
- -awareness of regional and global distribution of hazards and impacts (Tobin and Whiteford, 2005)
- -example of mitigation difficulties: Puerto Rico hurricane (Tobin and Whiteford, 2005)

Ernst, W.G. (2001) The increasing severity of circumpacific natural disasters. *International Geology Review*, 43, 380-390.

Definition of hazards:

-relatively abrupt, natural (geologic or climatic) events that endanger lives and property

Why "abrupt?

-Droughts? …Perhaps better to say unpredictable in most long-term considerations

Examples of natural hazards?

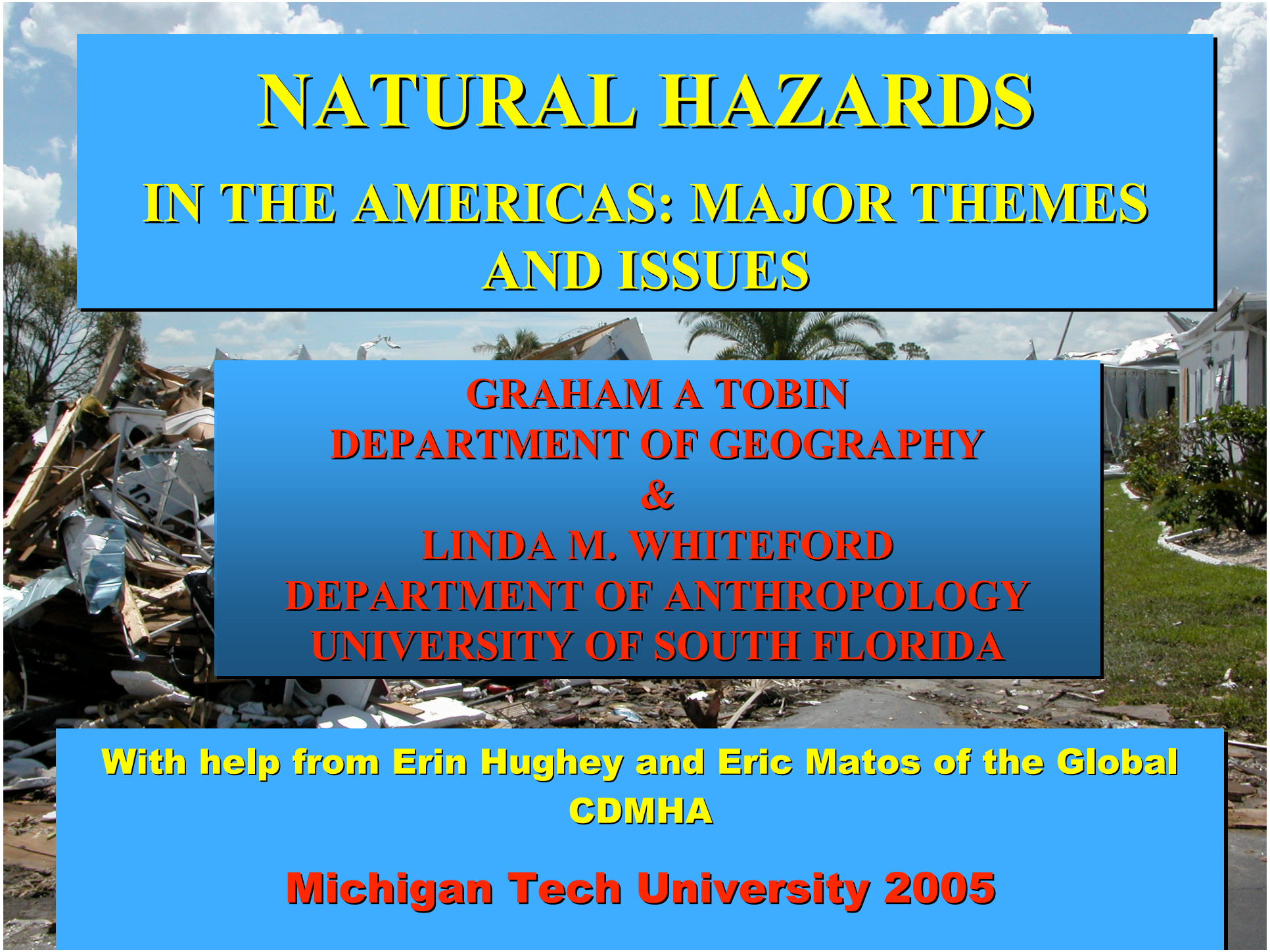
-Earthquakes, hurricanes, floods/storm surges, volcanoes, bio-invasions, landslides, subsidence, drought, tornadoes

Why is the circum-pacific region at risk?

-Population distribution, geology, global warming/sea level rise, poor mitigation approaches

What is needed for effective hazard mitigation?

-Planning for ongoing hazards, rather than response to last disaster; implementation of available technology



NATURAL HAZARDS

IN THE AMERICAS: MAJOR THEMES AND ISSUES

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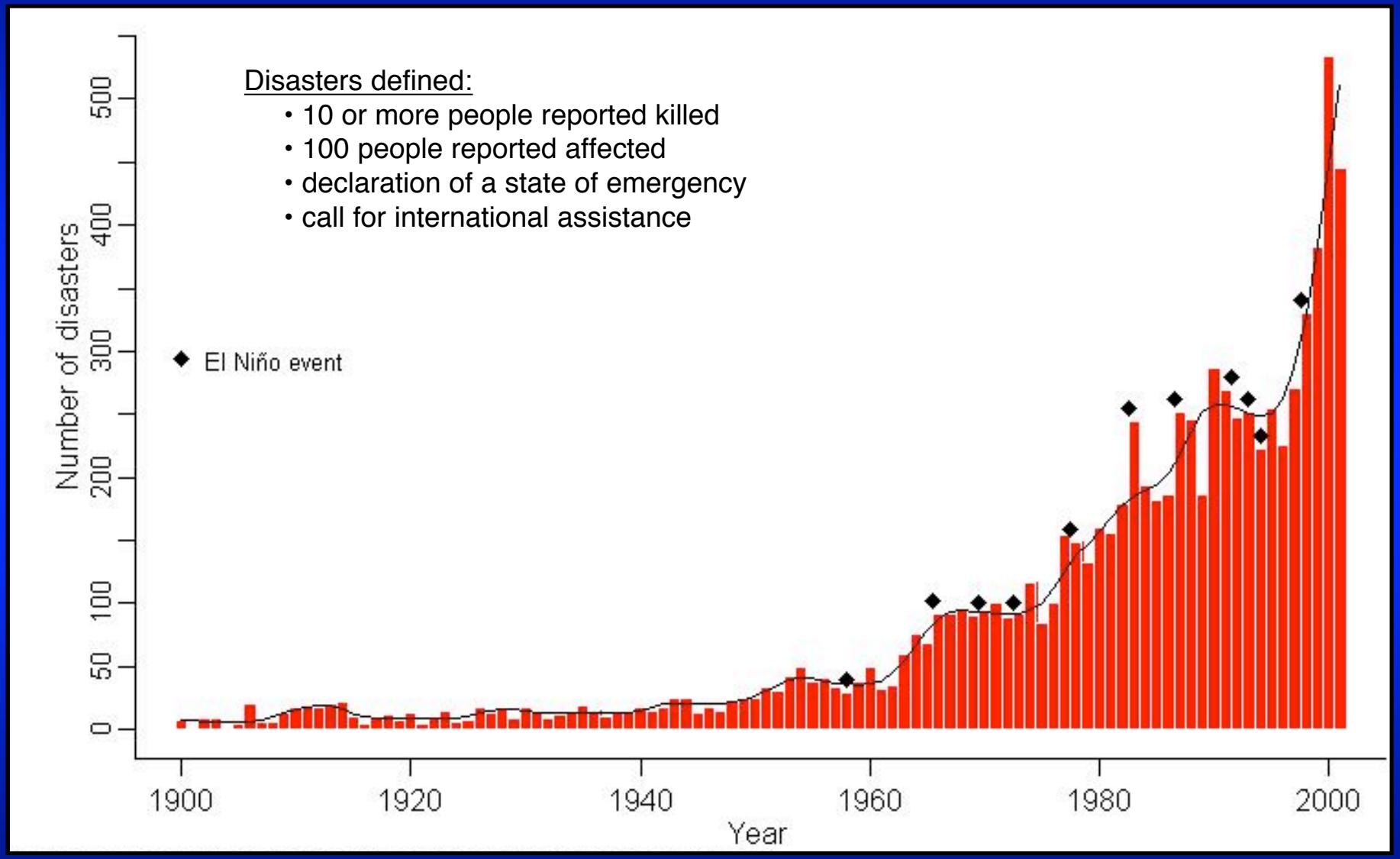
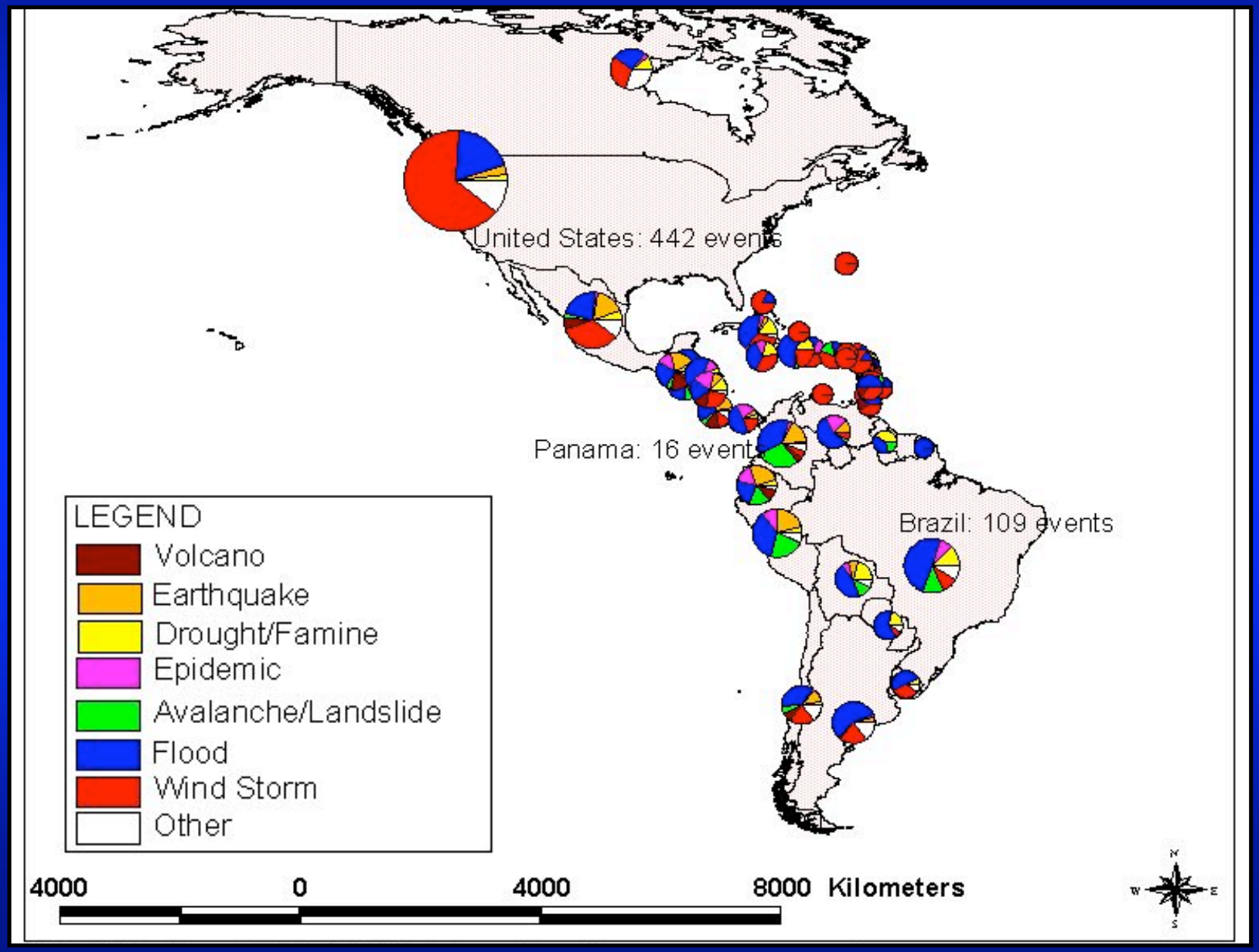
Michigan Tech University 2005

NATURAL DISASTERS REPORTED: GLOBAL STATISTICS 1900-2001

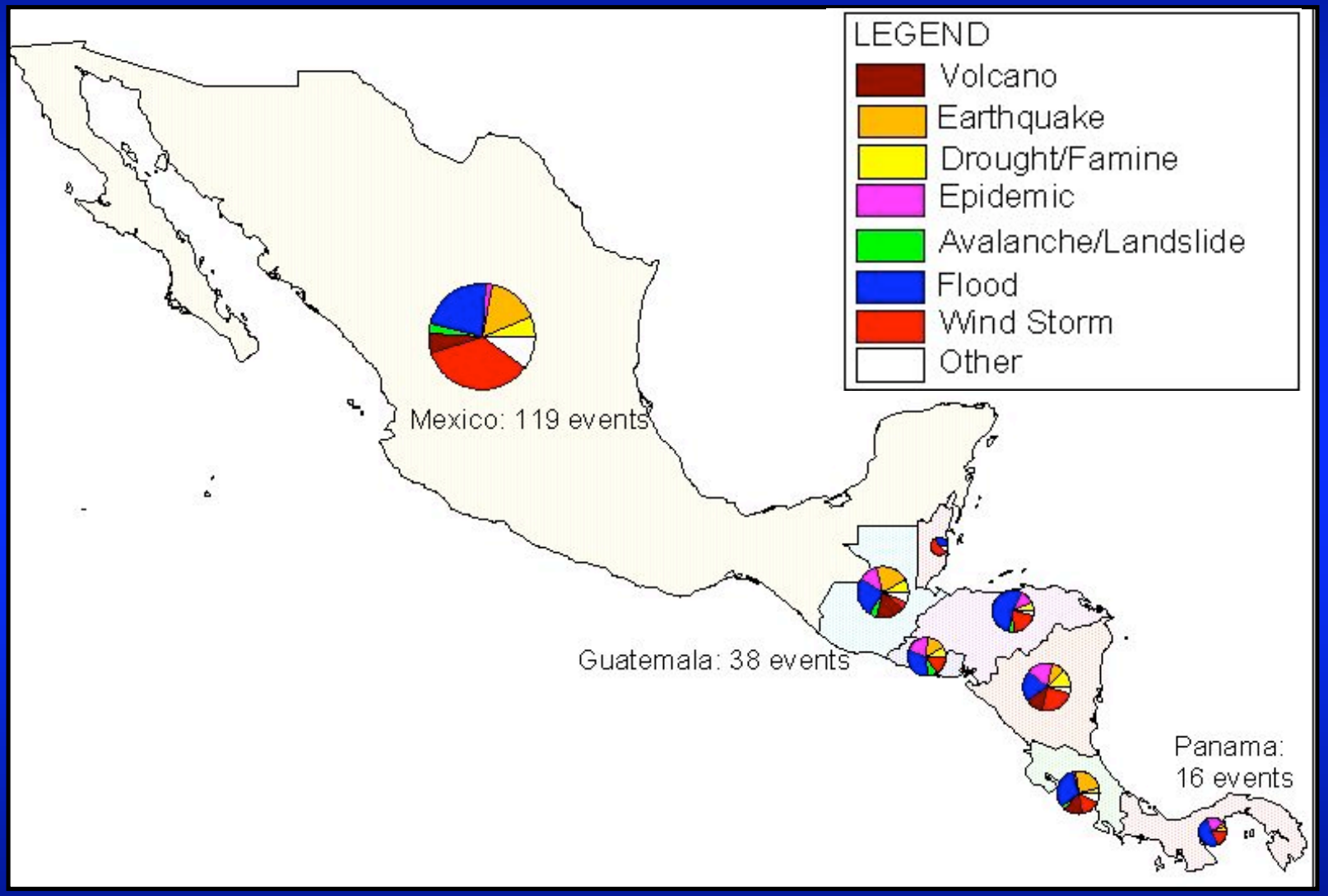


Source: OFDA/CRED International Disaster Database

DISTRIBUTION OF DISASTERS AMERICAS 1975-2001

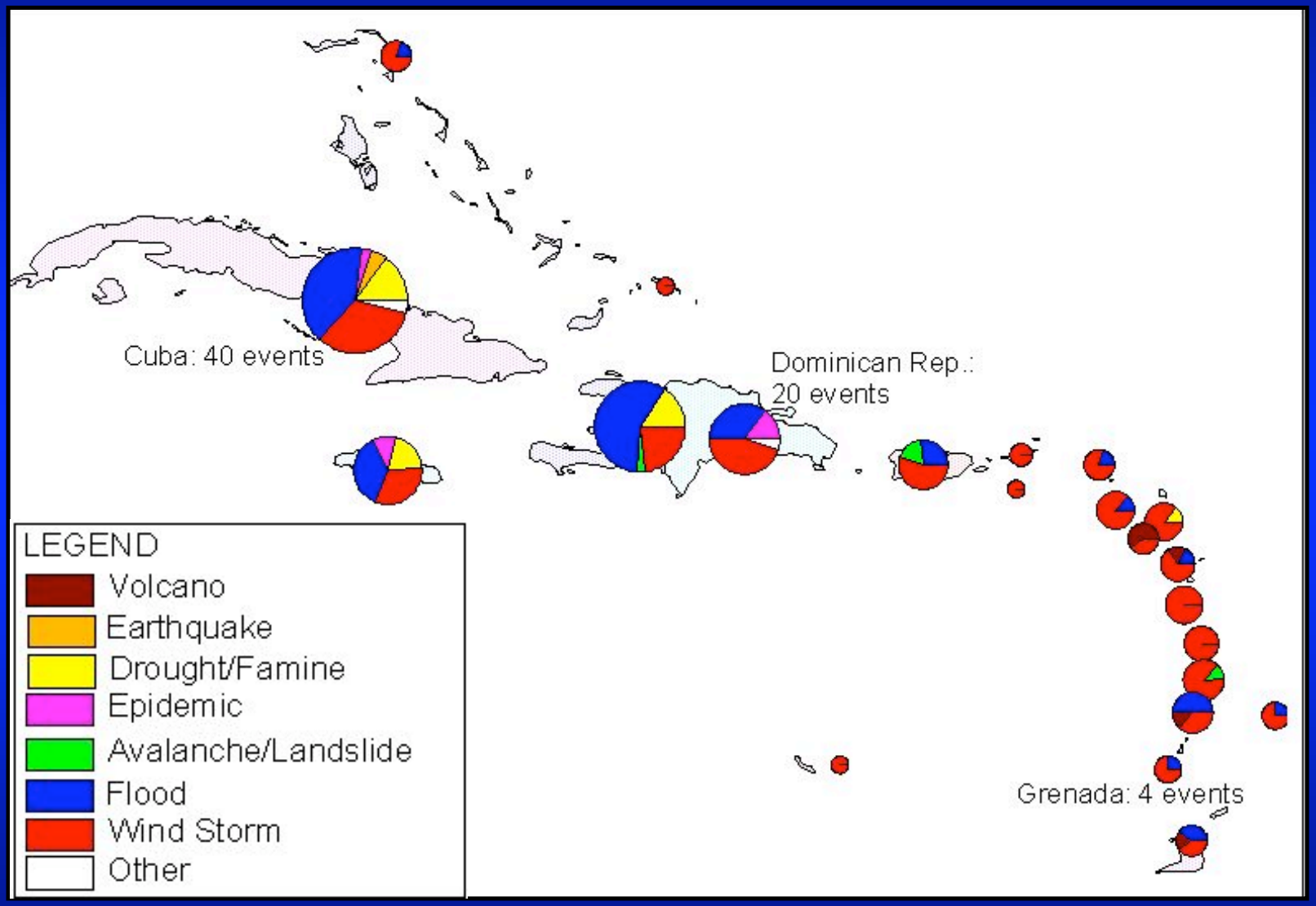


DISTRIBUTION OF DISASTERS: CENTRAL AMERICA 1975-2001



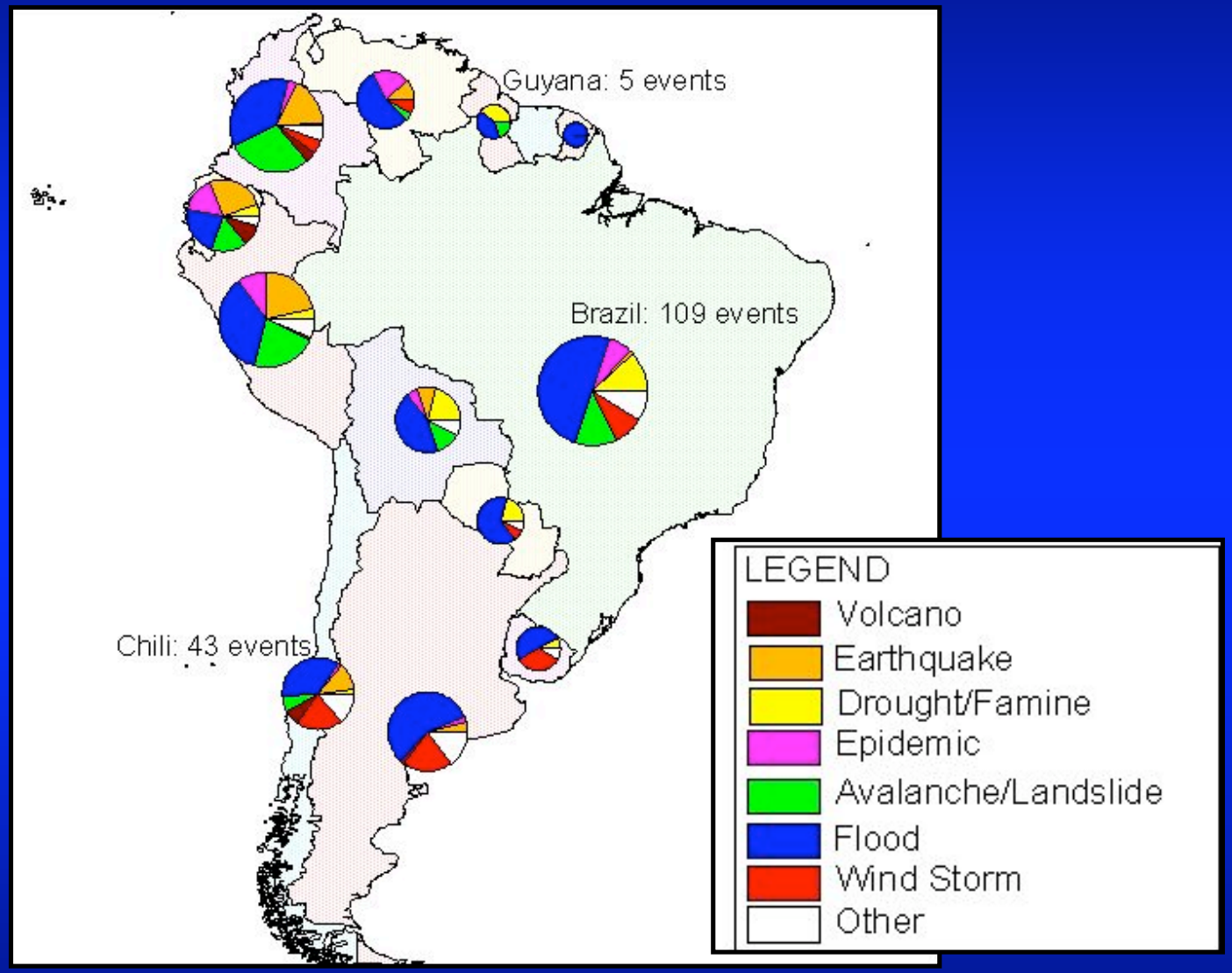
Source: OFDA/CRED International Disaster Database

DISTRIBUTION OF DISASTERS: CARIBBEAN 1975-2001



Source: OFDA/CRED International Disaster Database

DISTRIBUTION OF DISASTERS: SOUTH AMERICA 1975-2001



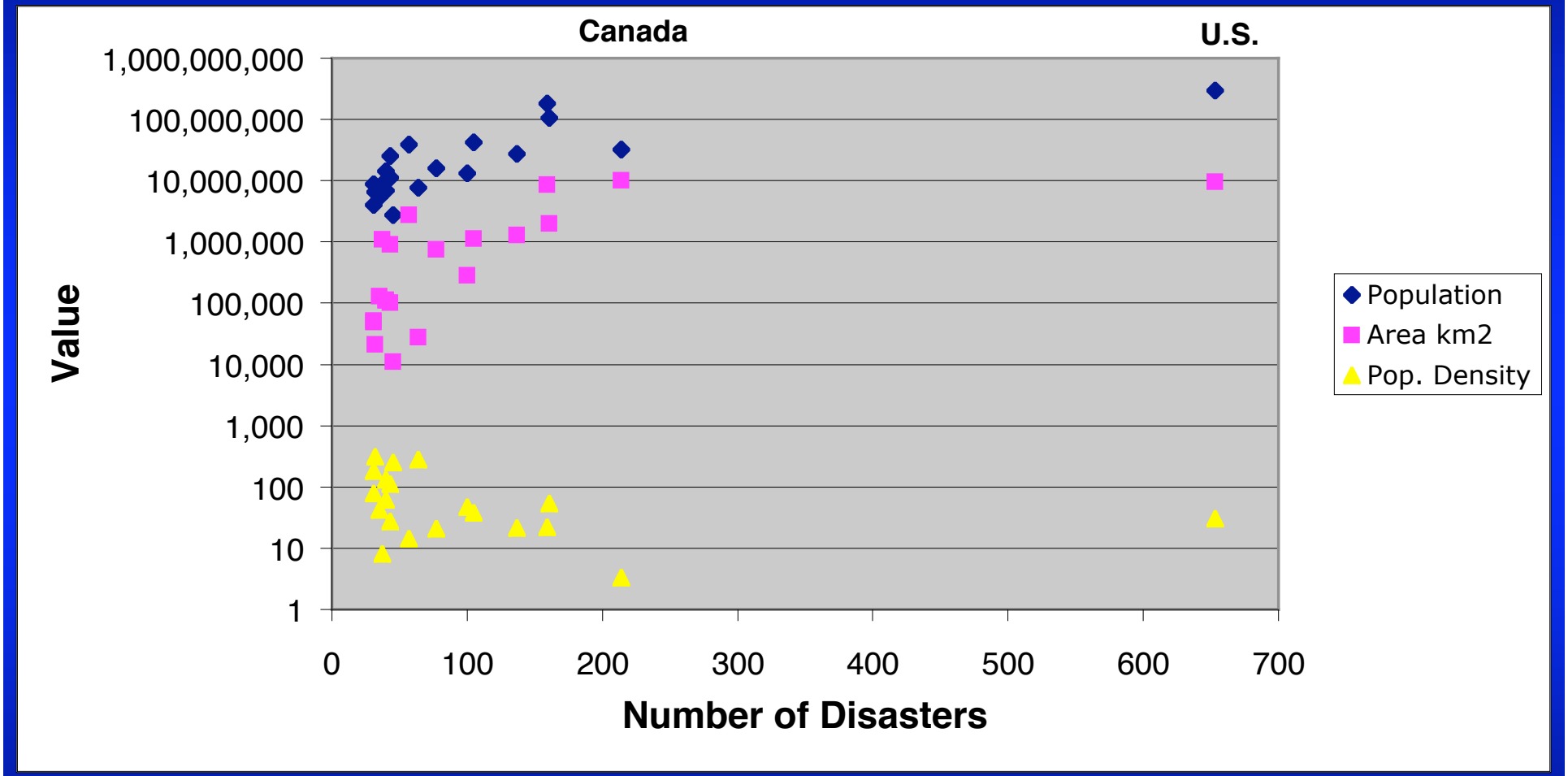
Source: OFDA/CRED International Disaster Database

NUMBER OF DISASTERS REPORTED:1900-1993

- USA (653)
- Canada (214)
- Mexico (161) Brazil (159) Peru (137) Colombia (105) Ecuador (100)
- Chile (77) Haiti (64) Argentina (57) Jamaica (45) Cuba (43) Venezuela (43) Guatemala (40) Honduras (40) Bolivia (37) Nicaragua (35) El Salvador (32) Costa Rica (31) Dominican Rep. (31) Anguilla (29) Panama (26)
- Puerto Rico (20) Bahamas (15) Guadeloupe (12) St Lucia (11) Martinique (11) St Vincent (11) Paraguay (11) Trinidad/Tobago (10) Dominica (9) Guyana (9) Uruguay (8) Bermuda (8) Belize (7) Barbados (7) Antigua (6) Grenada (6) St. Kitts (6) Neth. Antilles (3) Montserrat (3) St. Martin (2) Br. Virgin Is. (2) Suriname (2)

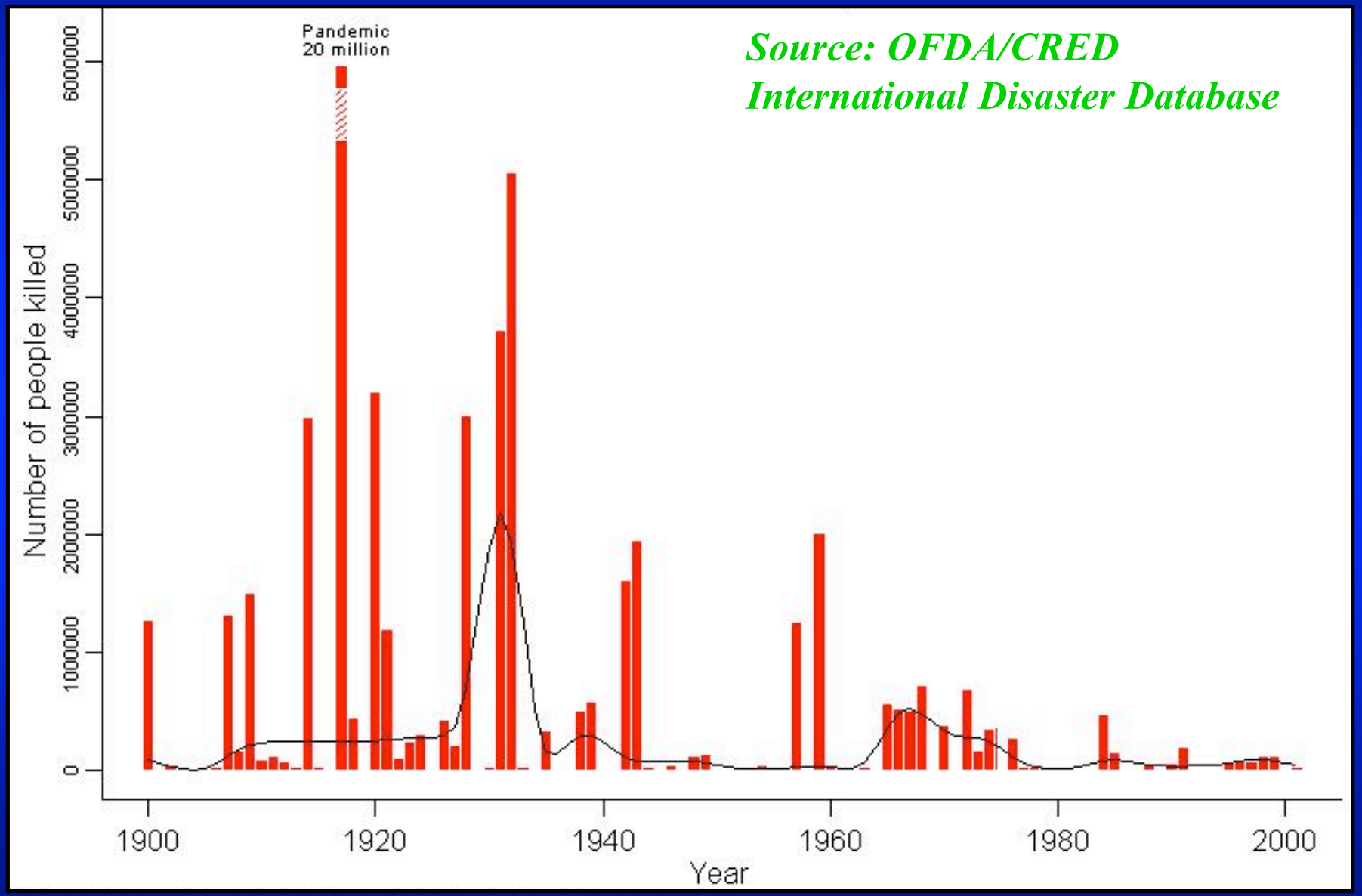
Centre for Research on the Epidemiology of Disasters

NUMBER OF DISASTERS REPORTED:1900-1993

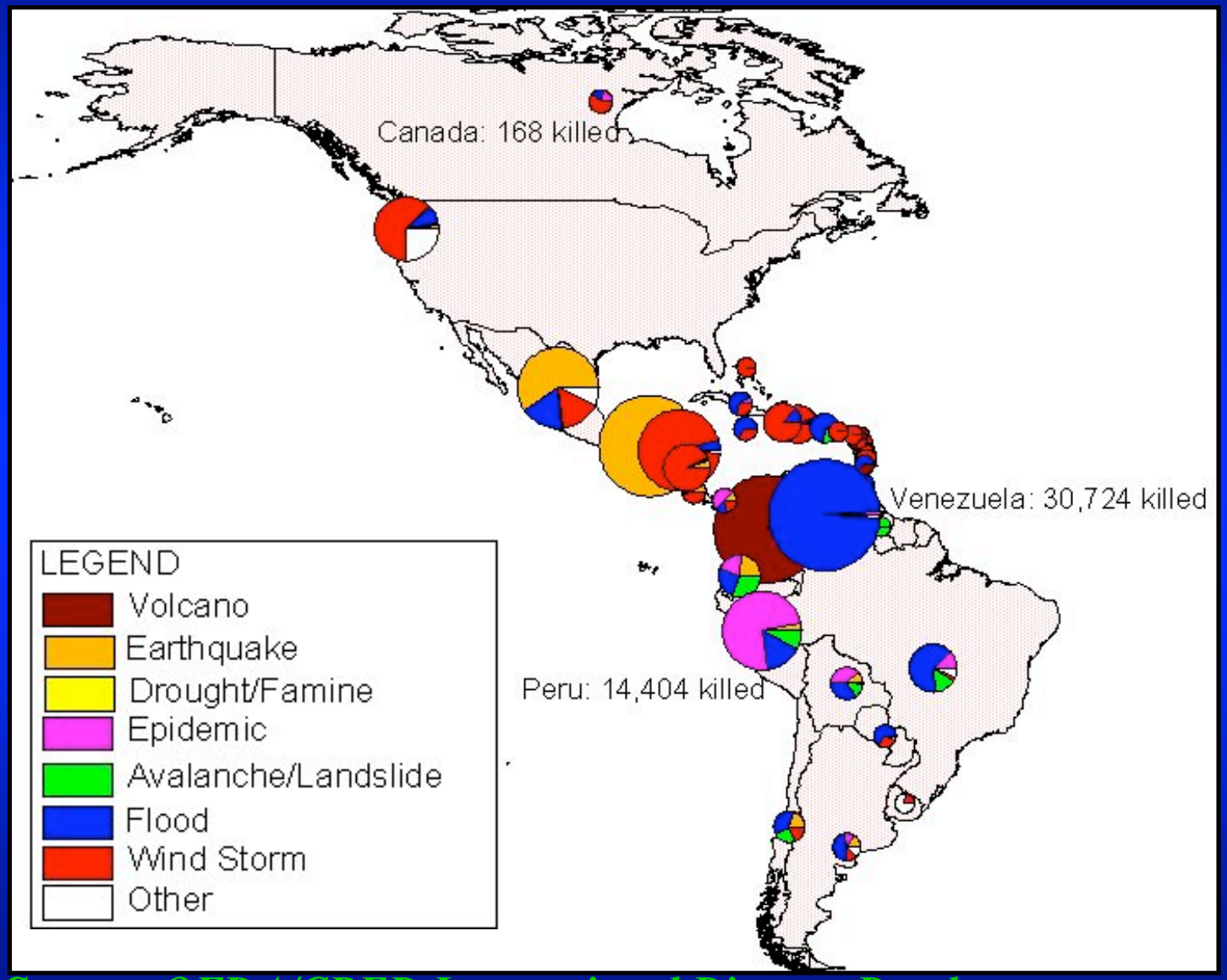


Centre for Research on the Epidemiology of Disasters

NUMBER OF PEOPLE KILLED IN DISASTERS: GLOBAL STATISTICS 1900-2001

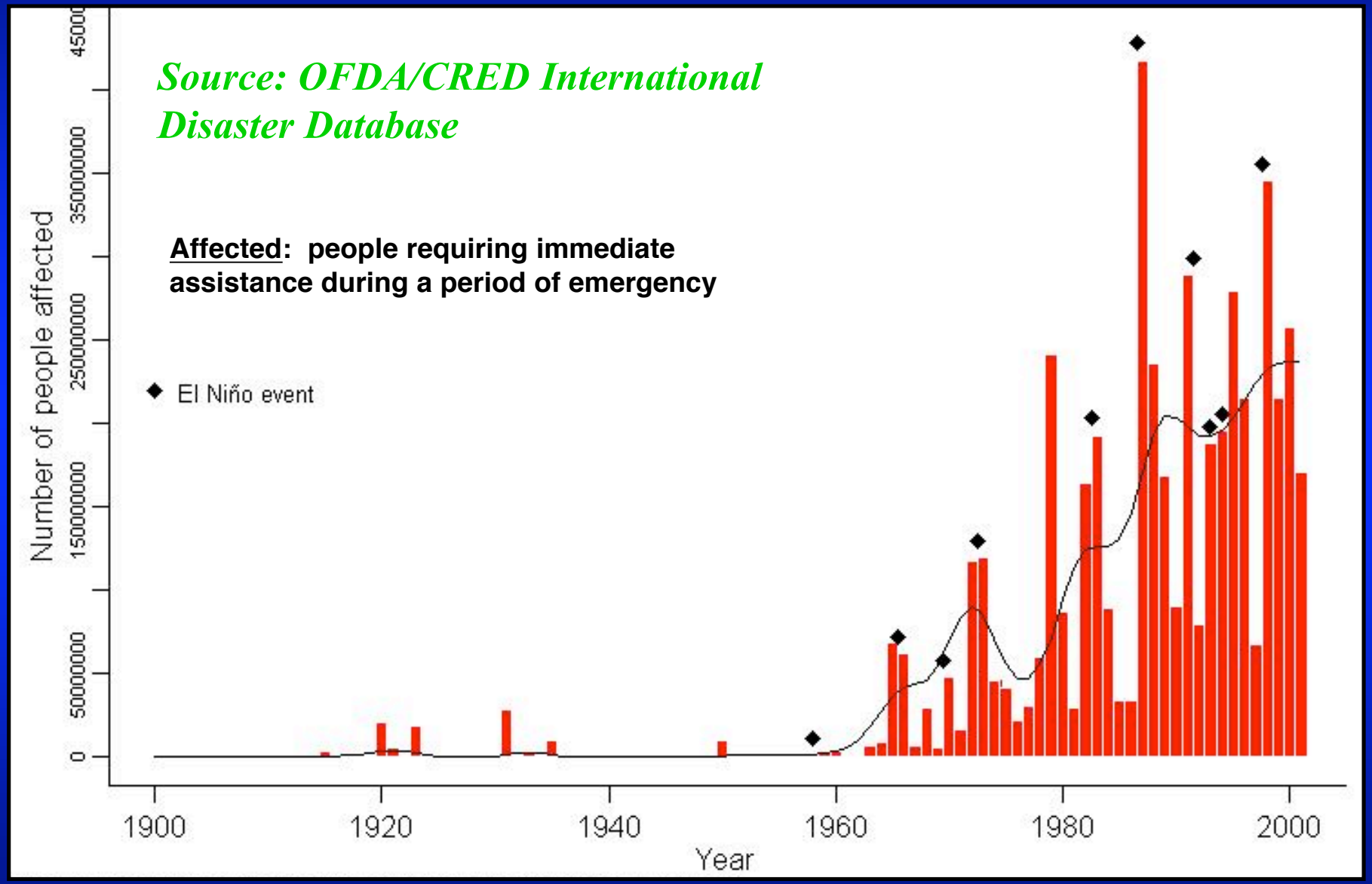


DISTRIBUTION OF FATALITIES: AMERICAS 1975-2001

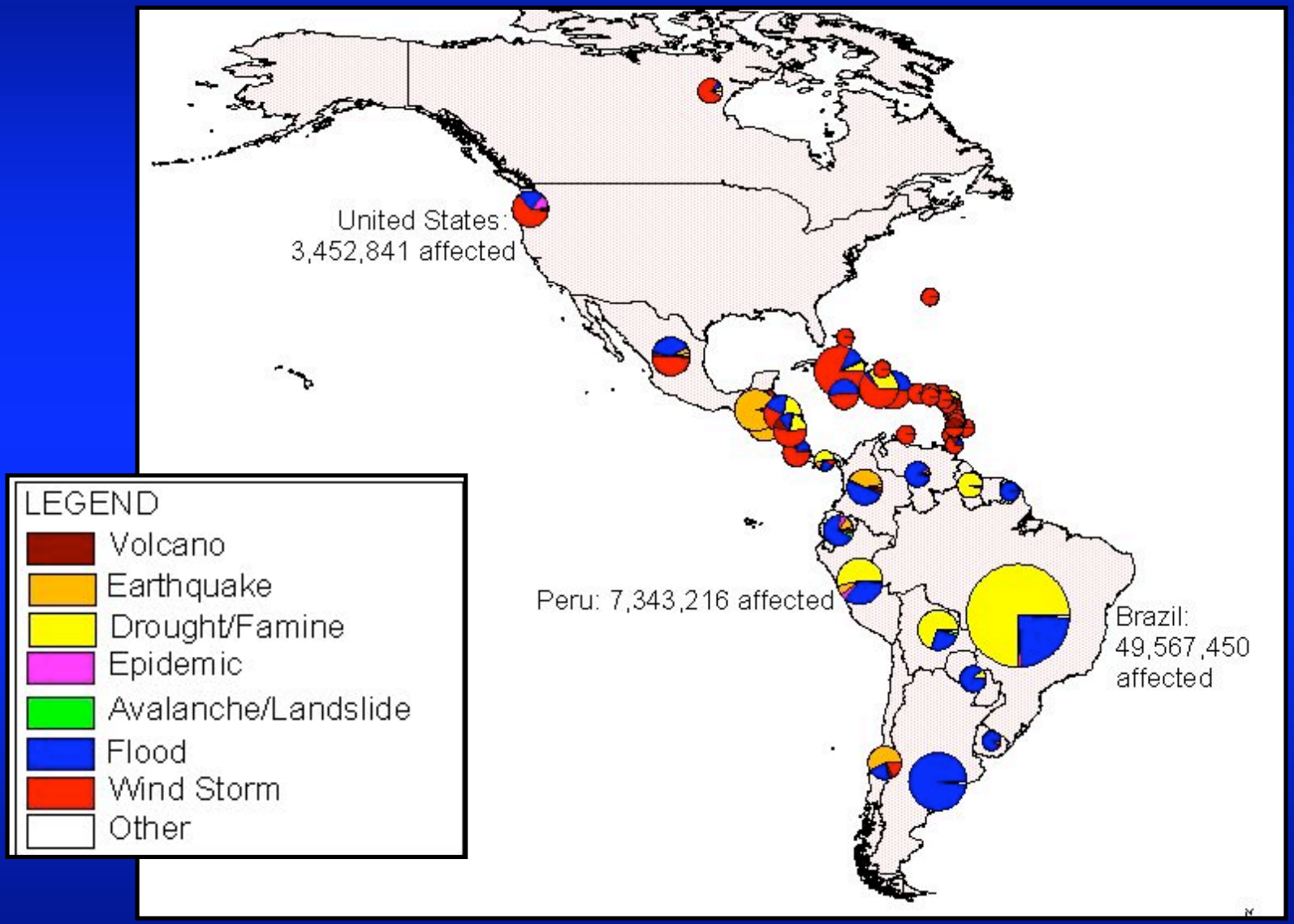


Source: OFDA/CRED International Disaster Database

NUMBER OF PEOPLE AFFECTED BY REPORTED DISASTERS 1900-2001

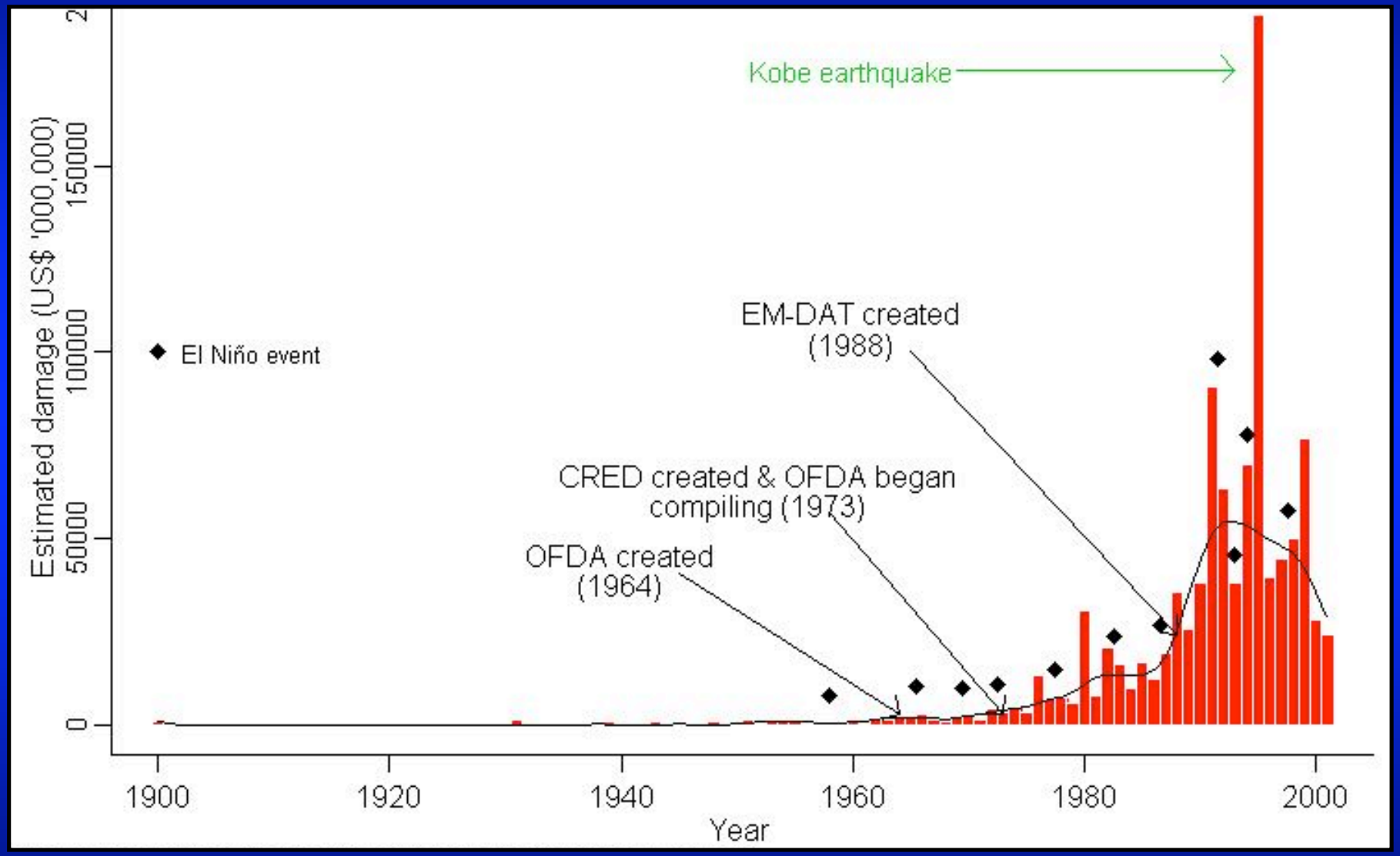


DISTRIBUTION OF PEOPLE AFFECTED: AMERICAS 1975-2001

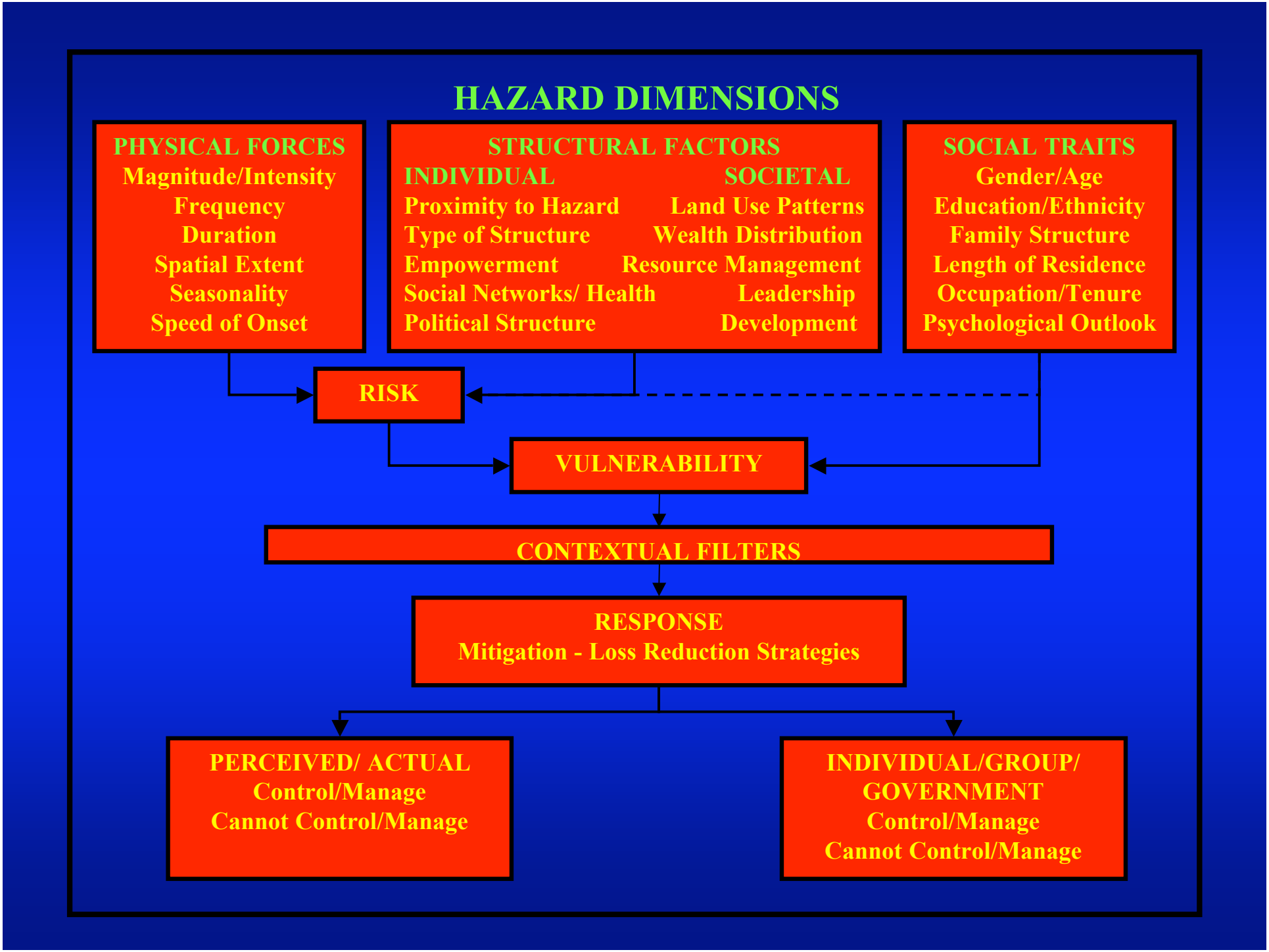


Source: OFDA/CRED International Disaster Database

ESTIMATED DAMAGES ($US): GLOBAL STATISTICS 1900-2001



Source: OFDA/CRED International Disaster Database


HAZARD DIMENSIONS
PHYSICAL FORCES
Magnitude/Intensity
Frequency
Duration
Spatial Extent
Seasonality
Speed of Onset
STRUCTURAL FACTORS
INDIVIDUAL
Proximity to Hazard
Type of Structure
Empowerment
Social Networks/ Health
Political Structure
SOCIETAL
Land Use Patterns
Wealth Distribution
Resource Management
Leadership
Development
SOCIAL TRAITS
Gender/Age
Education/Ethnicity
Family Structure
Length of Residence
Occupation/Tenure
Psychological Outlook
RISK
VULNERABILITY
CONTEXTUAL FILTERS
RESPONSE
Mitigation - Loss Reduction Strategies
PERCEIVED/ ACTUAL
Control/Manage
Cannot Control/Manage
INDIVIDUAL/GROUP/
GOVERNMENT
Control/Manage
Cannot Control/Manage

VULNERABILITY ELEMENTS

RECOVERY MODEL

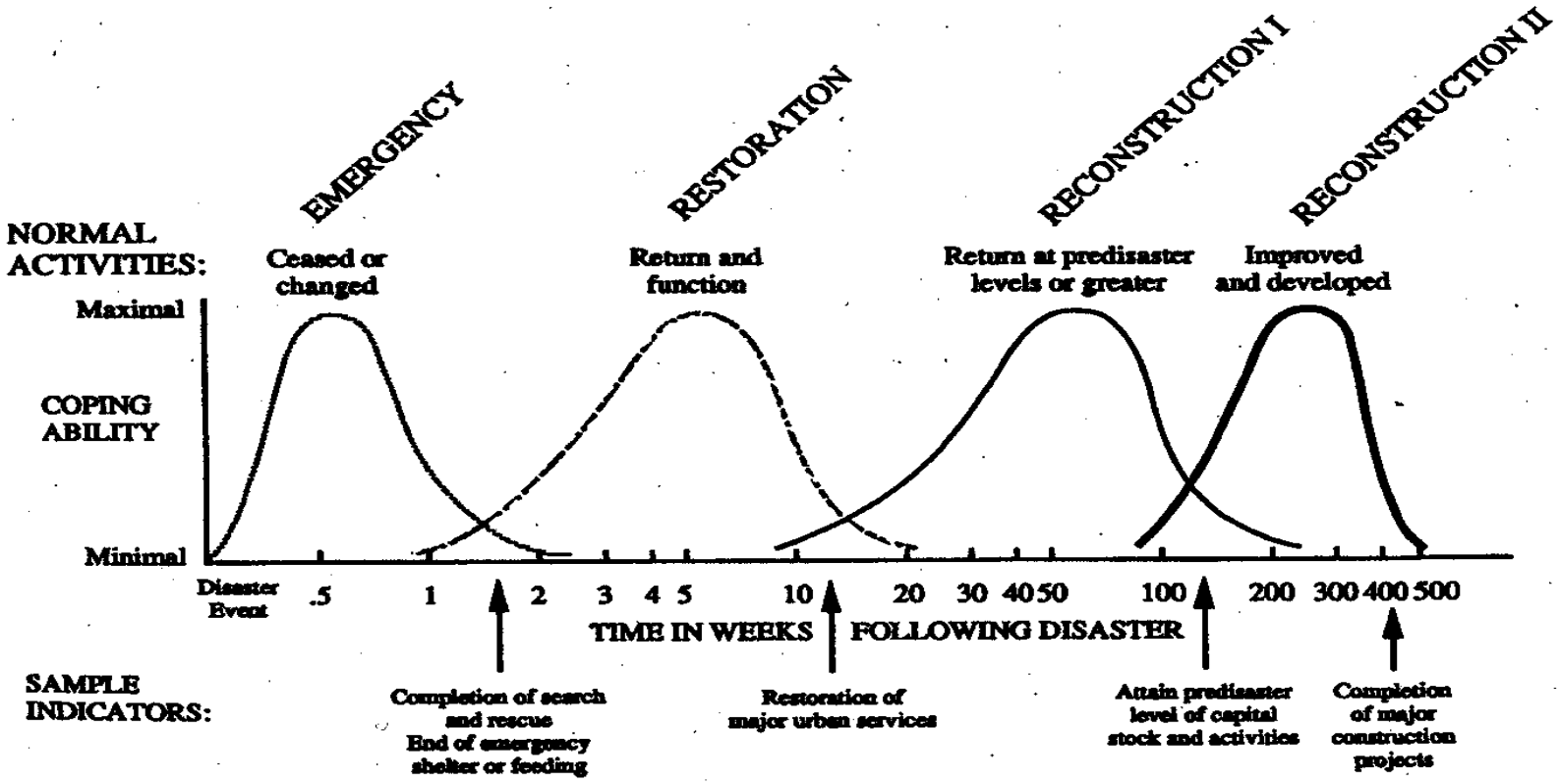
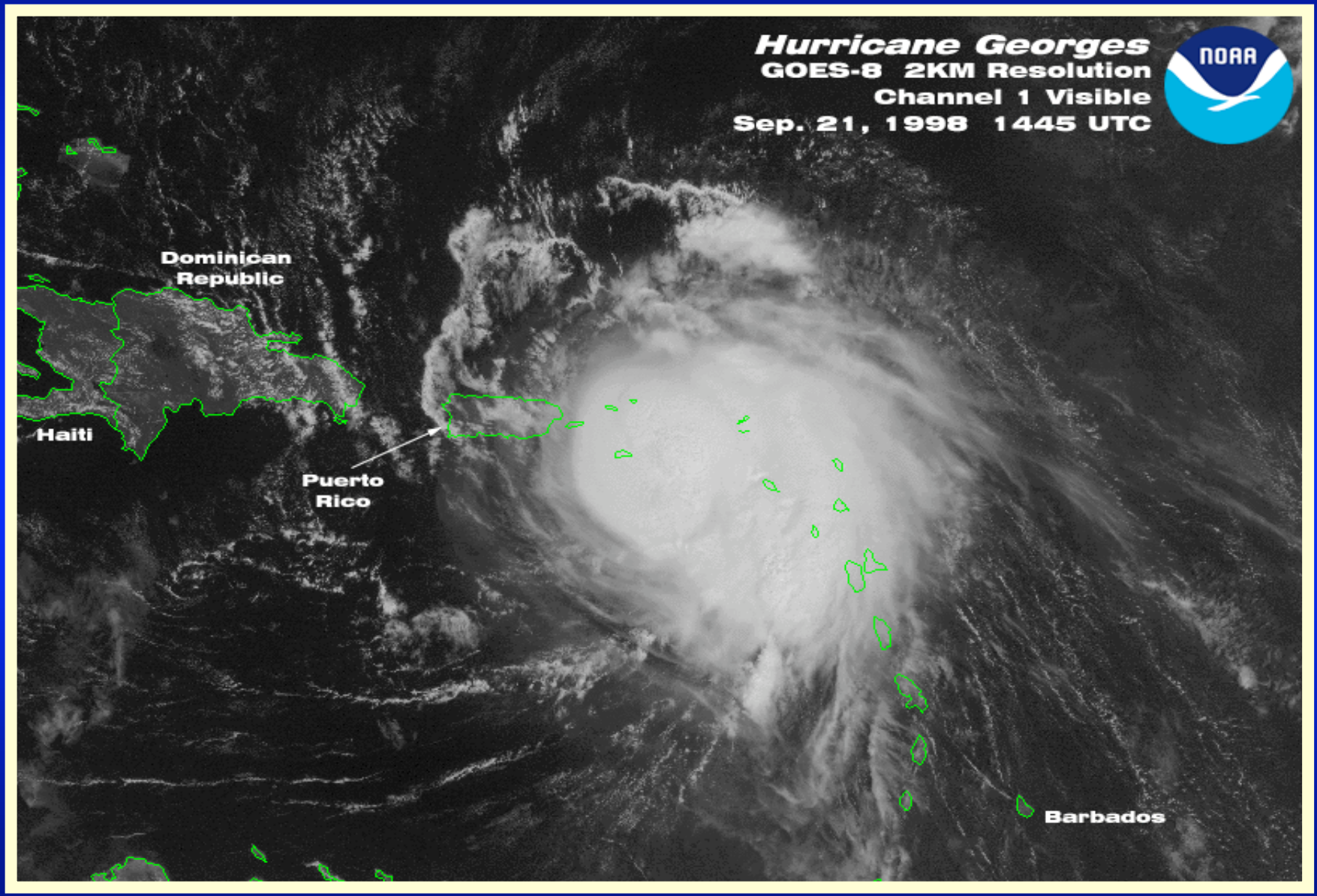


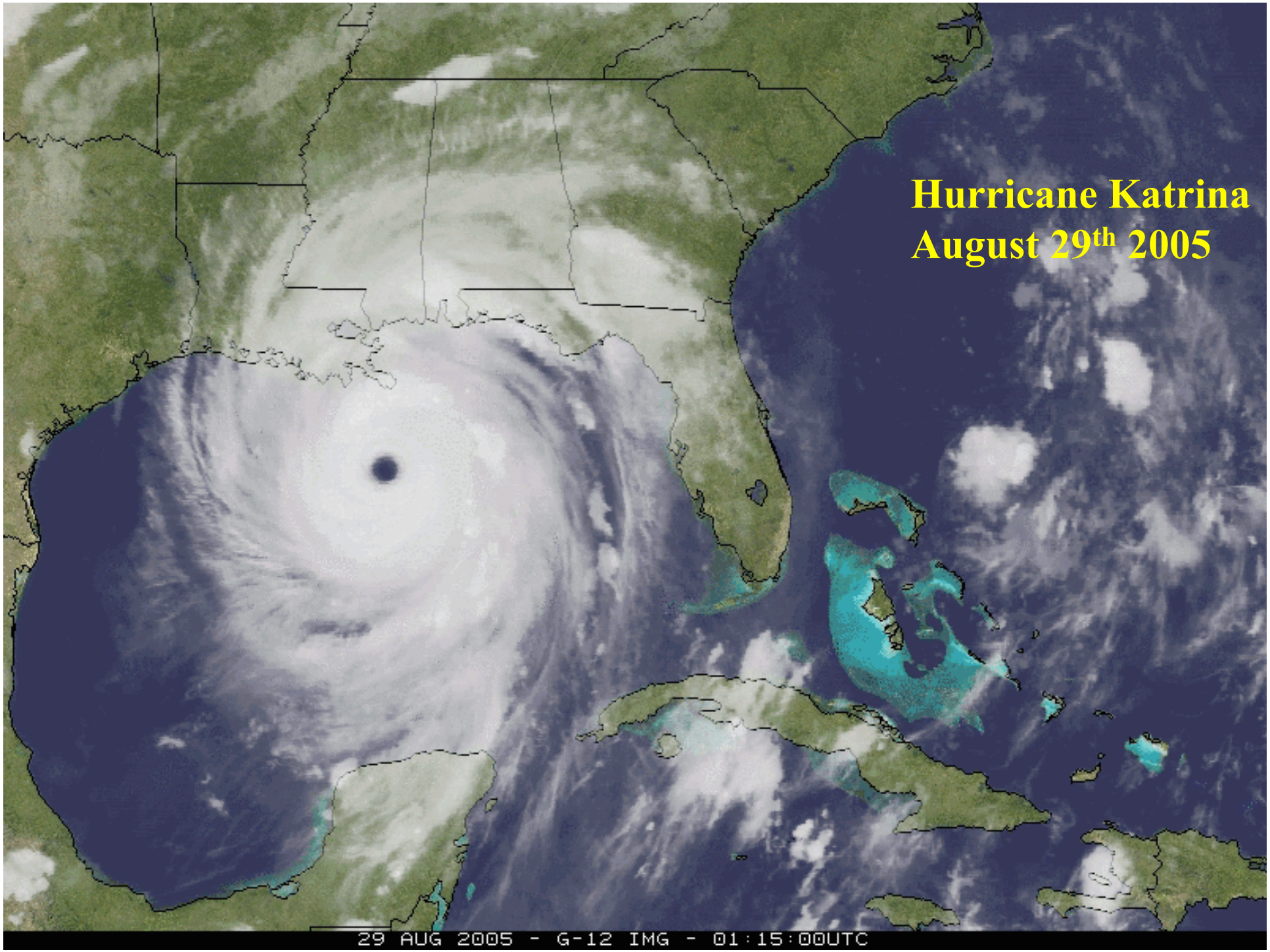
FIGURE 1.3. The postdisaster recovery period. Of the four distinct intervals, each lasts approximately 10 times longer than the previous one. Evidence to support this time frame, however, is sketchy. *Source:* Haas, Kates, & Bowden (1977). Copyright 1977 by MIT Press. Reprinted by permission.

PUERTO RICO AND HURRICANE GEORGES, 1998

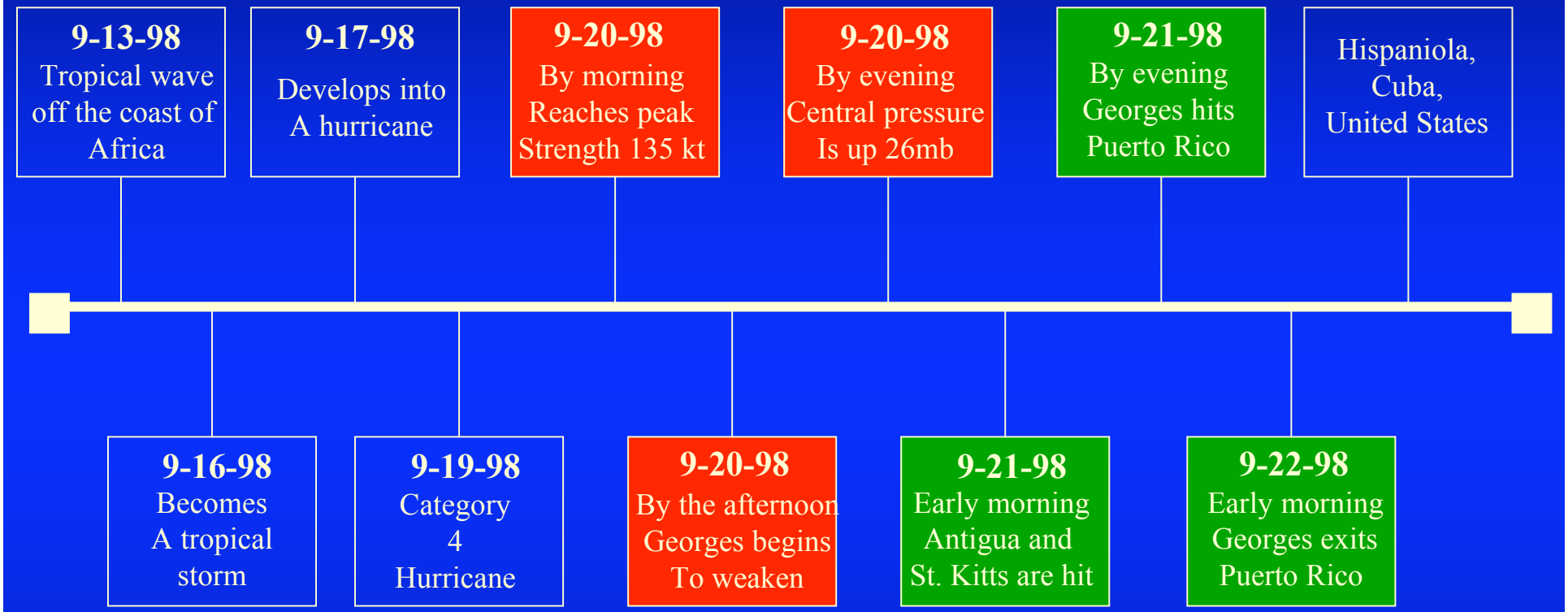
- Hit the east coast of Puerto Rico as category 2 hurricane Sustained winds of 110 – 115 mph with gusts 175 mph.
- Up to 26 inches of rainfall were deposited in some areas
- Storm surge of 10 – 15 feet
- Caused 3 tornadoes, extensive flooding, severe beach erosion, and massive mud and landslides.

HURRICANE GEORGES




Hurricane Katrina
August 29th 2005
29 AUG 2005 - G-12 IMG - 01:15:00UTC

HURRICANE GEORGES



HURRICANE TIME LINE

HURRICANE GEORGES STORM TRACK

HURRICANE GEORGES - DAMAGE

HURRICANE GEORGES - DAMAGE

Picture taken, from a incoming flight heading east towards San Juan International Airport, of Río de La Plata river mouth and sediment plume, September 25, 1998.

HURRICANE GEORGES - DAMAGE

- 900,000 Customers without potable water
- 100% of electrical service was disrupted
- 258,780 customers were without telephone service
- over 217,000 homes were destroyed
- 75% of the coffee crop was destroyed
- 95% of the plantain and banana crop were destroyed
- 65% of the poultry industry destroyed
- 25% of the ornamental plant industry was destroyed

American Red Cross

Federal Response Plan Activated

HURRICANE GEORGE MAKES LANDFALL

- **Preliminary Damage Assessment is conducted**
  - 40 bridges and miles of roadway were damaged, blocked, or washed out to sea.
  - thousands of homes had major damage
- **Feeding sites are established**

American Red Cross

Service Centers

- Deployed outreach (DO) teams (family service, damage assessment, communications, mass care, mental health, health services)

D.O. for goods

Direct distribution of items, which could be used while families were living in damaged homes covered by tarps with some exposure to rain.

- "high quality" inflatable mattresses
- lanterns
- cooking stoves
- ice chests

American Red Cross

We'll be there.

CHALLENGES

- Keeping the distribution center supplied
- Differences in language and customs
- Lack of volunteers who spoke Spanish
- Mental Health of Relief Workers
- Complex problems with communication and logistics
- Movement of volunteers and equipment

DISASTER STRIKES

- Identified Hazards
- Who's Vulnerable
- Planning and Mitigation Action

"The link between theory and application is a critical one"

A COUNTRY OR A STATE???
POLITICS IN PUERTO RICO

- **Puerto Rico is a self-governing commonwealth in association with the United States.**

WHAT DOES THIS MEAN?

- **Puerto Rico has authority over its internal affairs, While the US controls such things as:**
  - **Interstate Trade**
  - **Foreign Relations and Commerce**
  - **Customs Administration**
  - **Immigration**

SUMMARY: DISASTERS IN AMERICAS in a GLOBAL CONTEXT: 1991-2000

AMERICAS

- 1,057 events (22.5%)
- 78,041 people dead (10.4%)
- 47,900,000 people affected (2.3%)
- $185,187,000 losses (26.0%)

Note, at Global Scale:

- 60% disasters occurred in medium development countries
- 62% deaths occurred in low development countries
- 2% people affected lived in high development countries
- 57% losses accrued in high development countries – 4% in low development countries

Source: *International Federation of Red Cross and Red Crescent Societies*

CONCLUSIONS

- Disasters are a ubiquitous problem for the Americas – spatial patterns of geo-physical events fairly clear
- Risk (exposure to hazard) generally understood – though not always acted upon (mitigation strategies are limited)
- Scale is important both in terms of the event & impacts:
  - Spatial (local, national, global)
  - Temporal (short and long term)
- Disasters involve complex web of forces:
  - social (individual, family, kinship, community)
  - economic (wealth, exchange, trade, domestic & foreign aid)
  - political (leadership, national & international relationships)
- Vulnerability: understanding of these forces important if to mitigate hazards effectively
- Resilience (coping ability): recovery & planning for resilient communities

DISASTER MITIGATION - COMMUNITY ACTION

- **Locally based focus** – Local communities are the key actors and main beneficiaries of mitigation strategies
- **Local involvement** - Local communities should be involved in the process of mitigation from start to finish
- **Root causes of vulnerability** - Management strategies should seek to reduce vulnerability; that is increase the capacities of local communities to respond
- **Planning process** - The process is dynamic and should be ongoing

Adapted from:

Blaikie et al. (1994)
Tobin and Montz (1997)
Whiteford and Tobin (2002)
Pelling (2003)
Tobin and Whiteford (2005)
Yodmani (n.d.)

THE FUTURE

Fostering Resilience: Incorporating Economic, Social and Political Factors at appropriate spatial and temporal scales

Displaced child from Banos living in albergue