



*DIMTEC – Conference in Disaster Risk Reduction, University of the Free State, Bloemfontein, South Africa 26-27 May 2009*

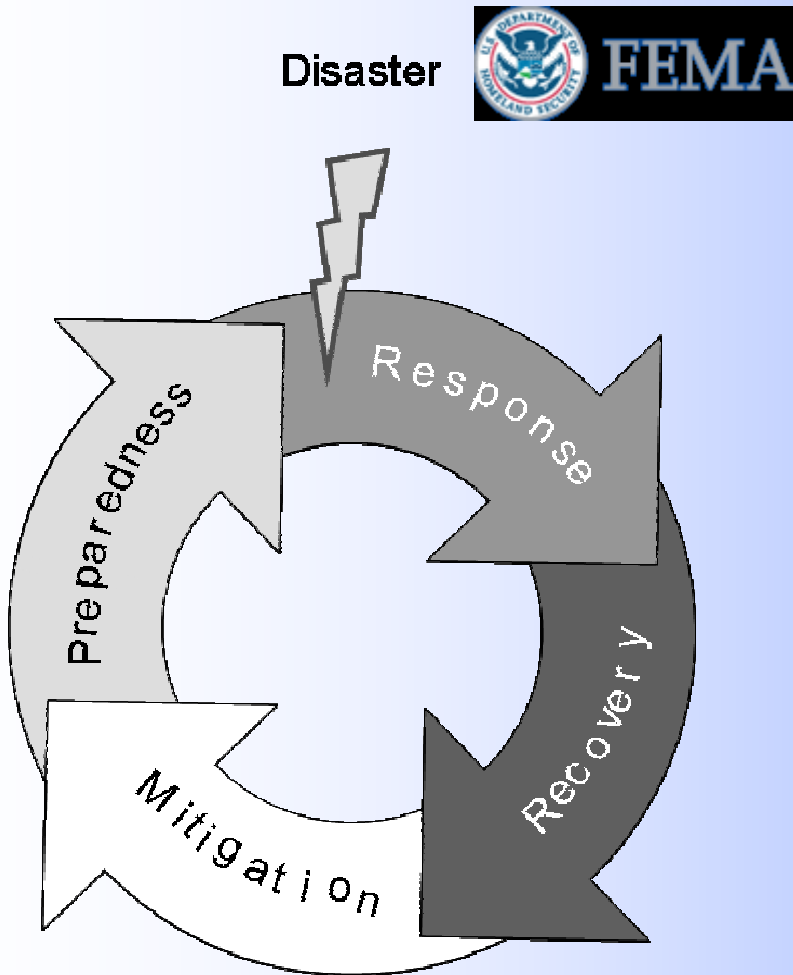
# Vulnerability Concepts in Disaster Risk Reduction and Climate Change Adaptation – Opportunities and Limitations –

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**UNITED NATIONS UNIVERSITY**

# Different Perspectives



Source: FEMA according to  
Cutter/Gall 2008, S. 356

## Social-Ecology

- Crises in form of the use and anthropogenic transformation of nature, values and perceptions, power relations
- Cases: traditional environmental problems, such as housing, water use, food and consumption patterns



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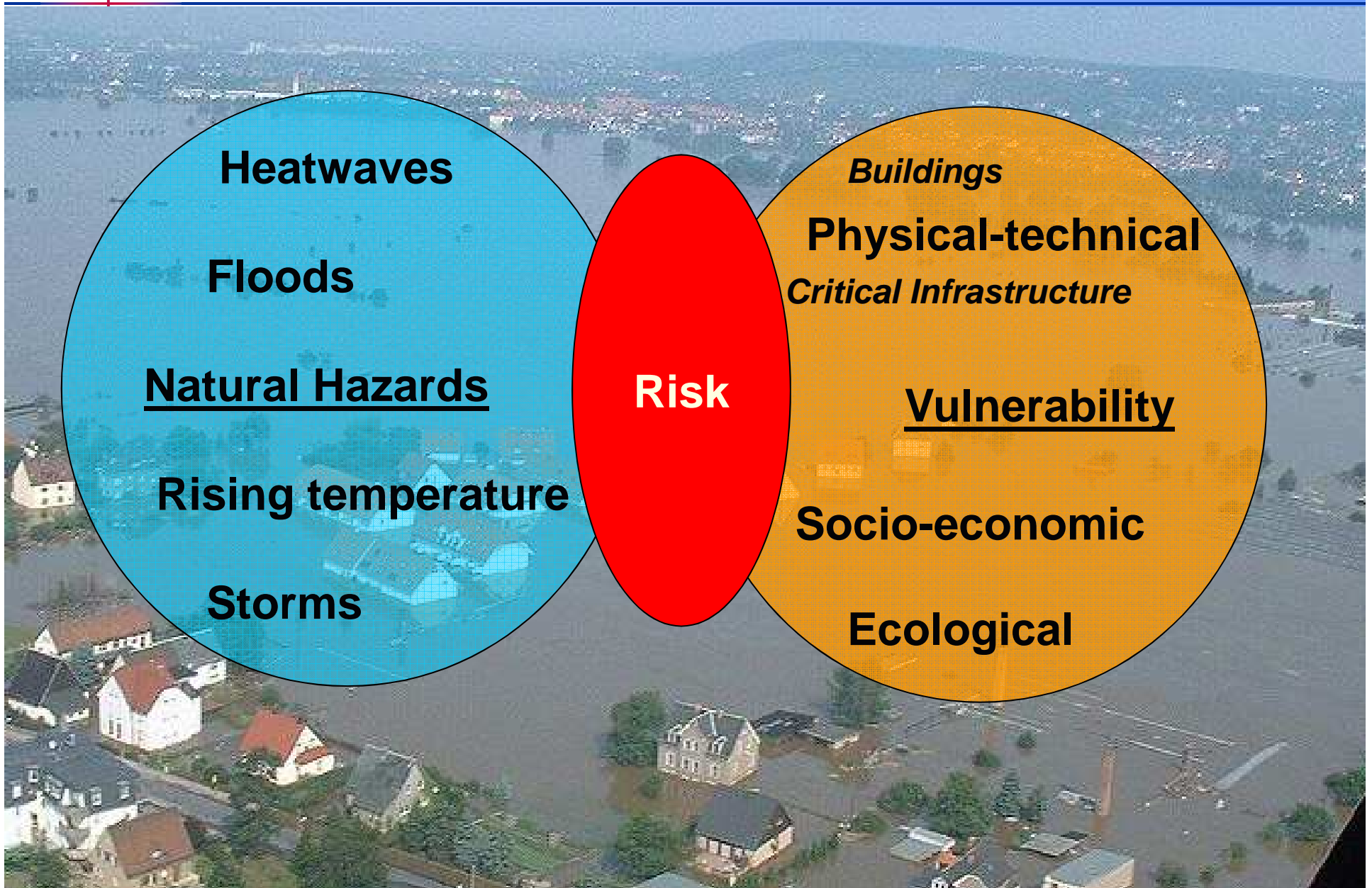
Source: Becker/Jahn 2006



# **The Focus of Disaster Risk and Vulnerability Research**



# Risk $f$ = Hazard and Vulnerability



# Key Dimensions of Vulnerability



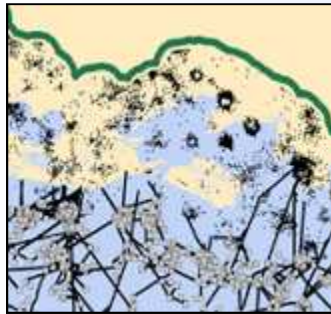
## Social Dimension

Vulnerability of different social groups,  
Role of social networks (coping)



## Economic Dimension

Vulnerability of different economic sectors and  
critical infrastructure



## Environmental Dimension

Environmental fragility (groundwater, land)  
Dependency on environmental services



## Institutional Dimension

Effectiveness and failure of structures and  
institutions

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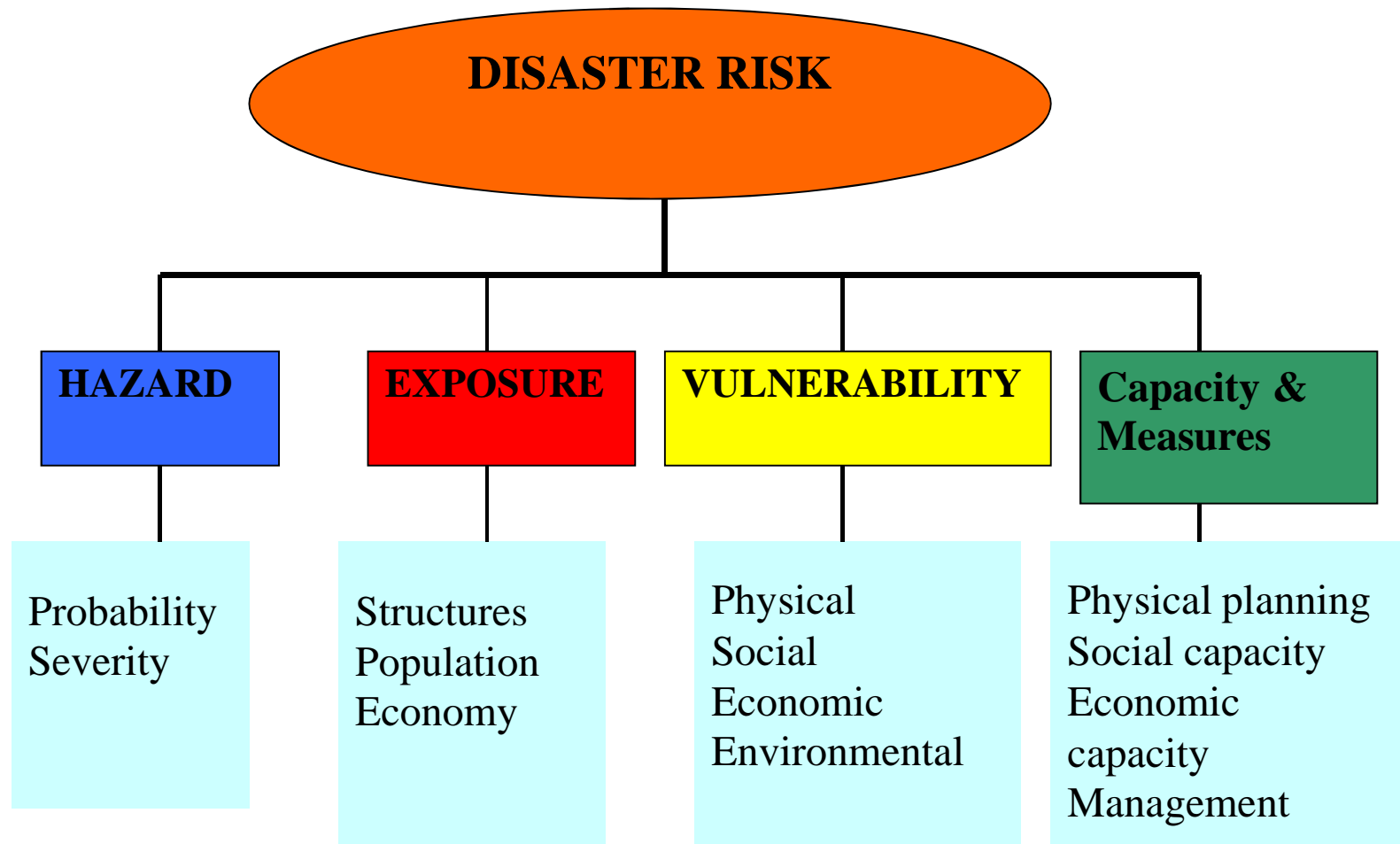


# Vulnerability Definitions

“... a human condition or process resulting from physical, social, economic, and environmental factors which determine the likelihood and scale of damage from the impact of a given hazard”  
(UNDP, 2004)

“... the likelihood of injury, death, loss, disruption of livelihood or other harm in an extreme event, and/or unusual difficulties in recovering from such effects”  
(Wisner, 2002)

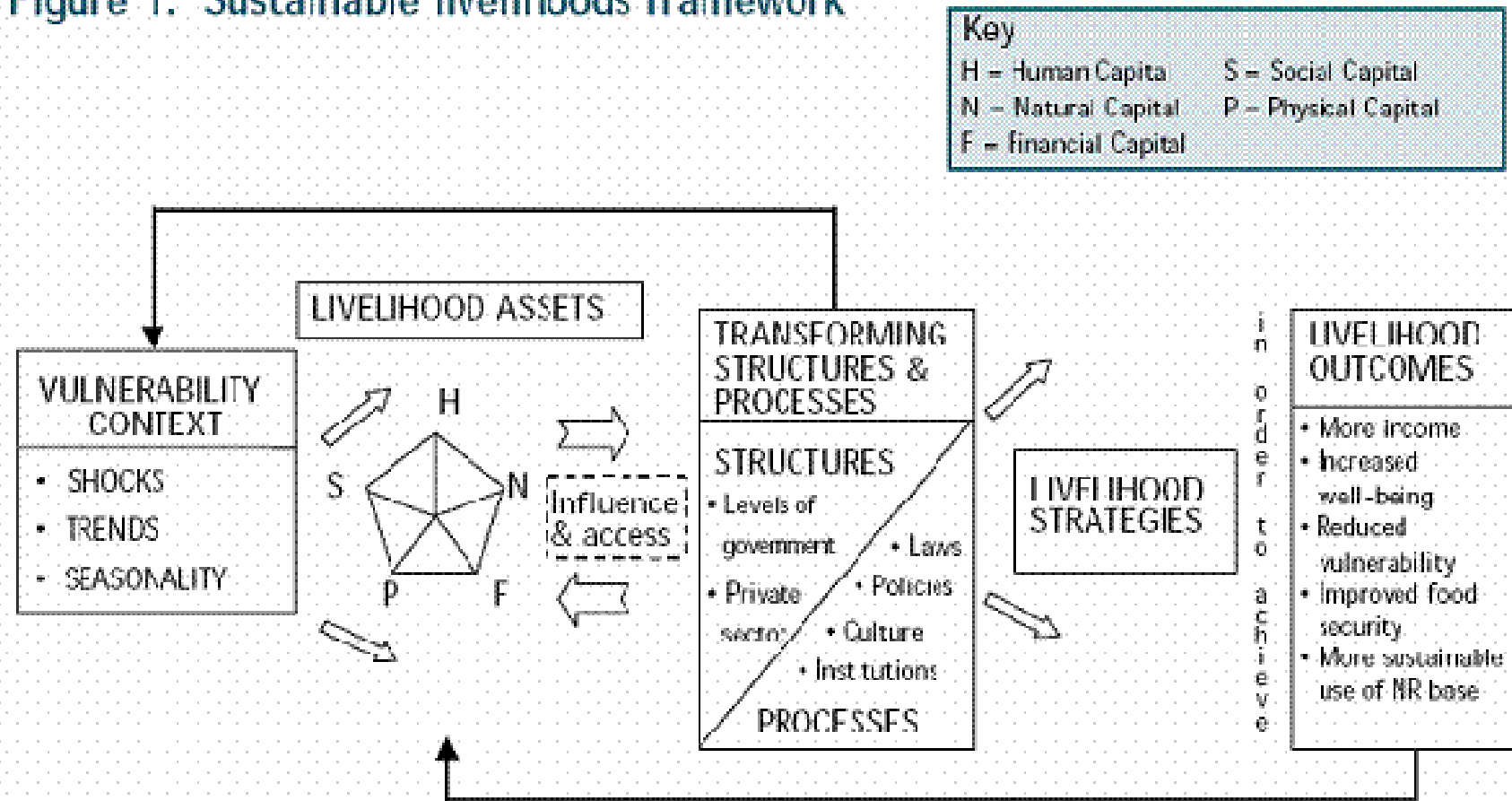
# The conceptual framework to identify disaster risk



Source: Davidson 1997 : 5; and Bollin et al. 2003 : 67

# Sustainable Livelihood Framework

Figure 1. Sustainable livelihoods framework

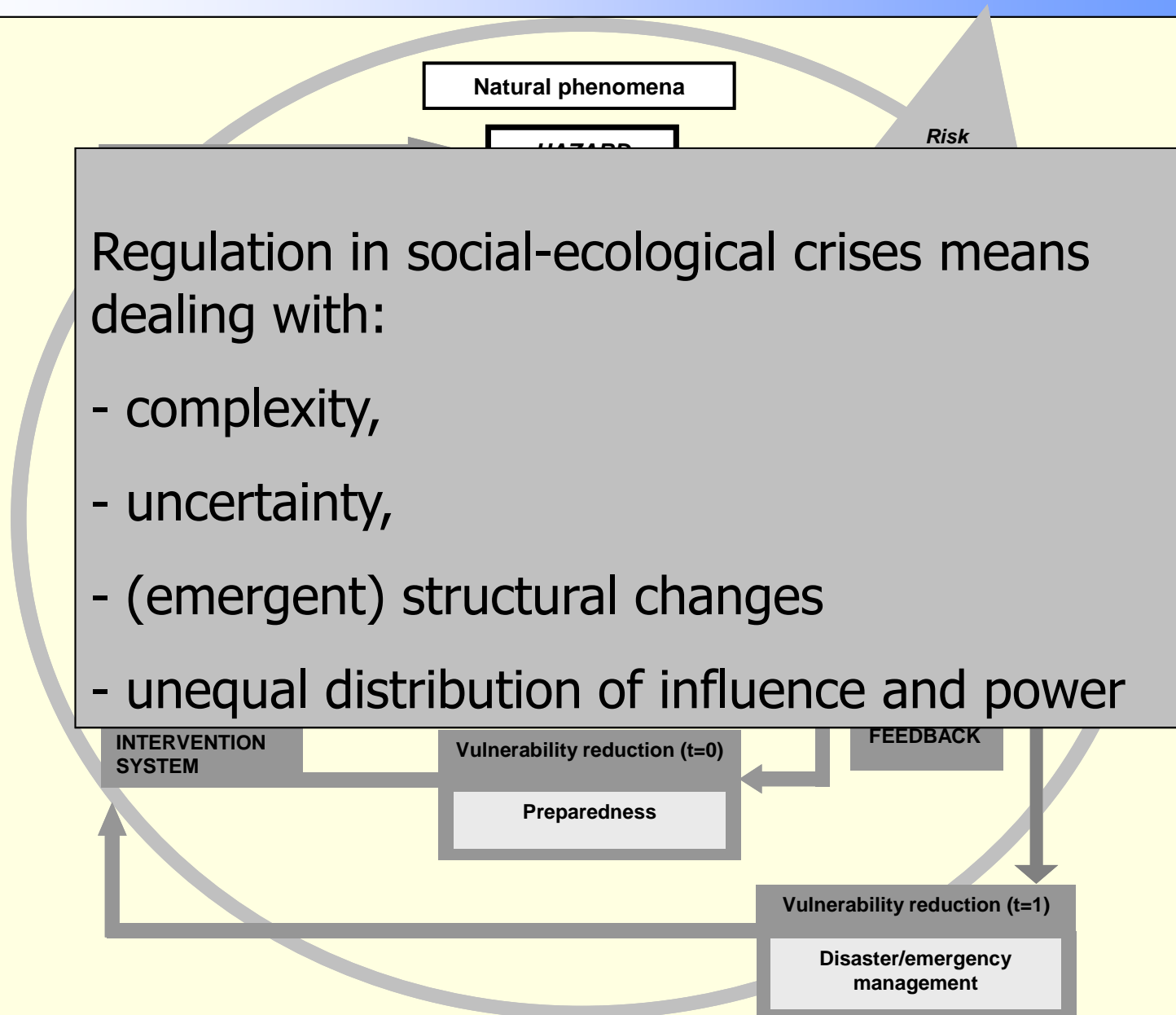


Source: DFID 1999





# The BBC-Framework

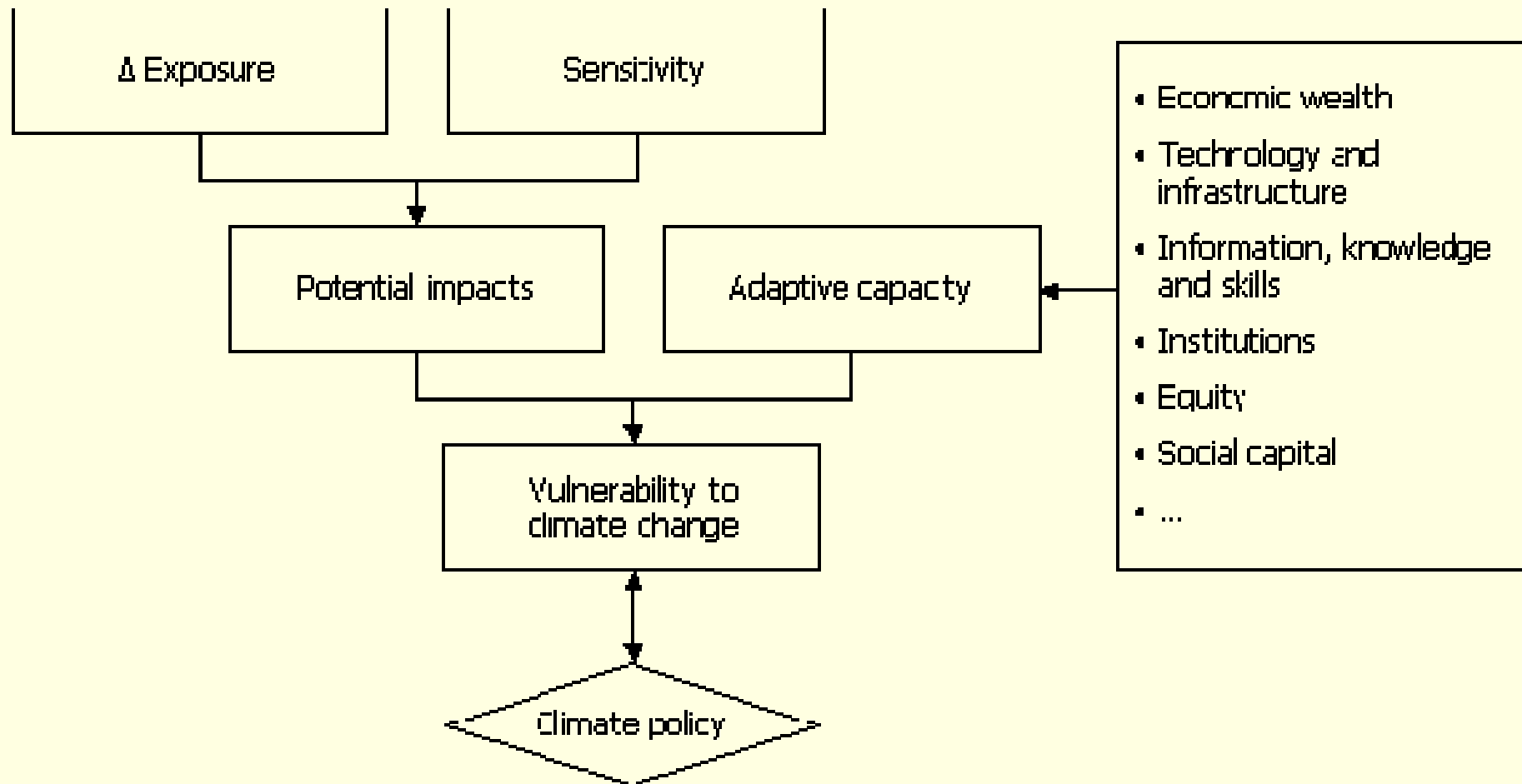




# The Focus of the Climate Change Research on Vulnerability



# Vulnerability in the CCA-Perspective



Source: R. Klein (2003) in website of the Potsdam-Institute for Climate Impact Research

# Comparing DRR and CCA Foci

## Different perspectives on how to act

**C.C.**

**DRR**

**Indicators**

### How to adapt to climate change (stress) ?

- Progressive process, ongoing but not well estimated
- Obligation of adaptation: what are the best measures ?
- Long term analysis (2100)
- Vulnerability=ending point :  
V=impacts - adaptation

### How to resist to/cope with natural hazards (shock) ?

- Abrupt change, pressure, hazardous
- How to reduce risks: reduce hazard exposure, enhance resilience and reduce vulnerability
- Limited time-scale: before/during/after disaster
- Vulnerability= starting point of risk assessment  
 $R=H \cdot E \cdot V$

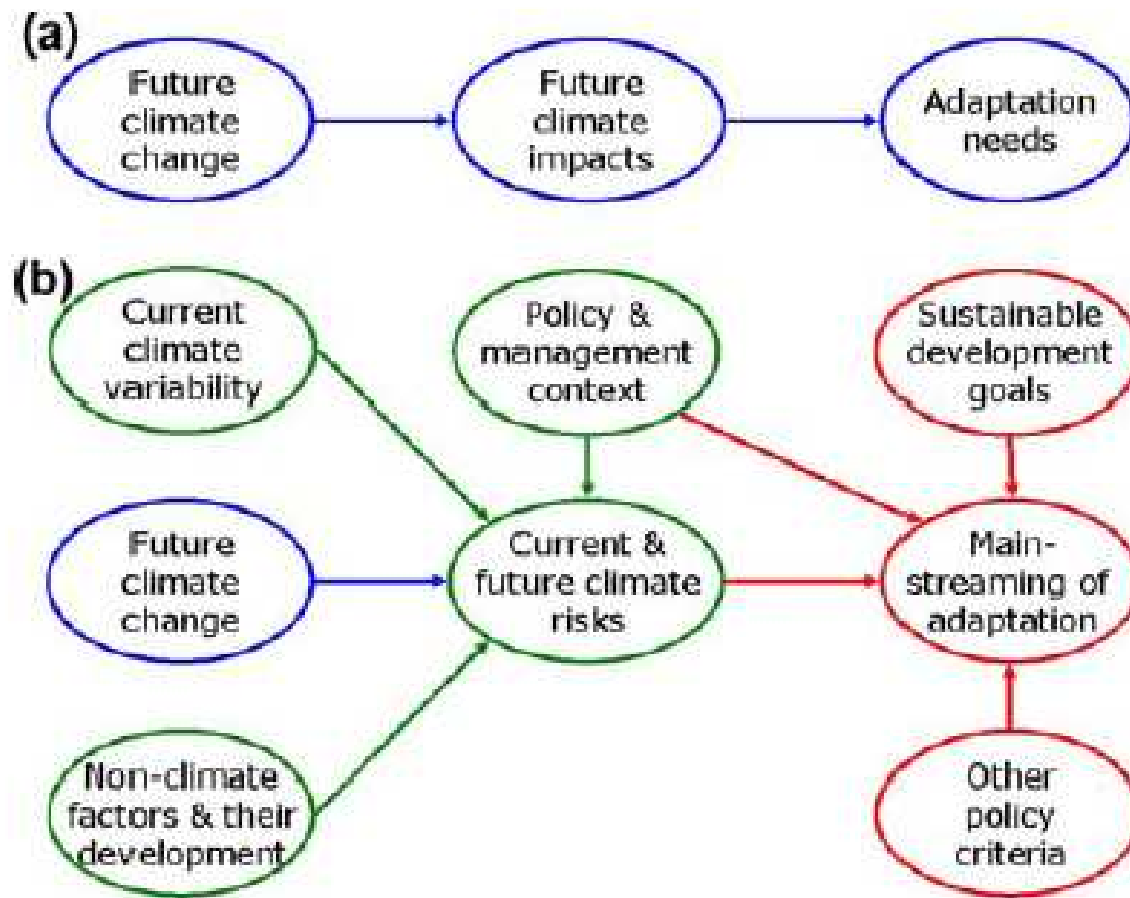
### Where are the « cooperation areas » ?

- Estimation of physical exposure to combined coastal processes (erosion, flooding, sea level rise)
- Socio-economic exposure: qualitative
- Give geographical priorities for action
- Vulnerability=ending point, sometimes only physical processes

**Different objectives, time-scales**

**Scale issue**

# Determining adaptation needs



**Fig. 3** Evolution of approaches for determining adaptation needs: **a** linear hazards-based approach; **b** complex integrative approach



# Linking DRR and CCA

Arguments for linking both schools of thought:

- Vulnerability: essential for highlighting other means for action than hazard/stress exposure
- Learn from each other
- Preparing for extreme events are a common interest
- Vulnerability and risk assessment should inform adaptation strategies

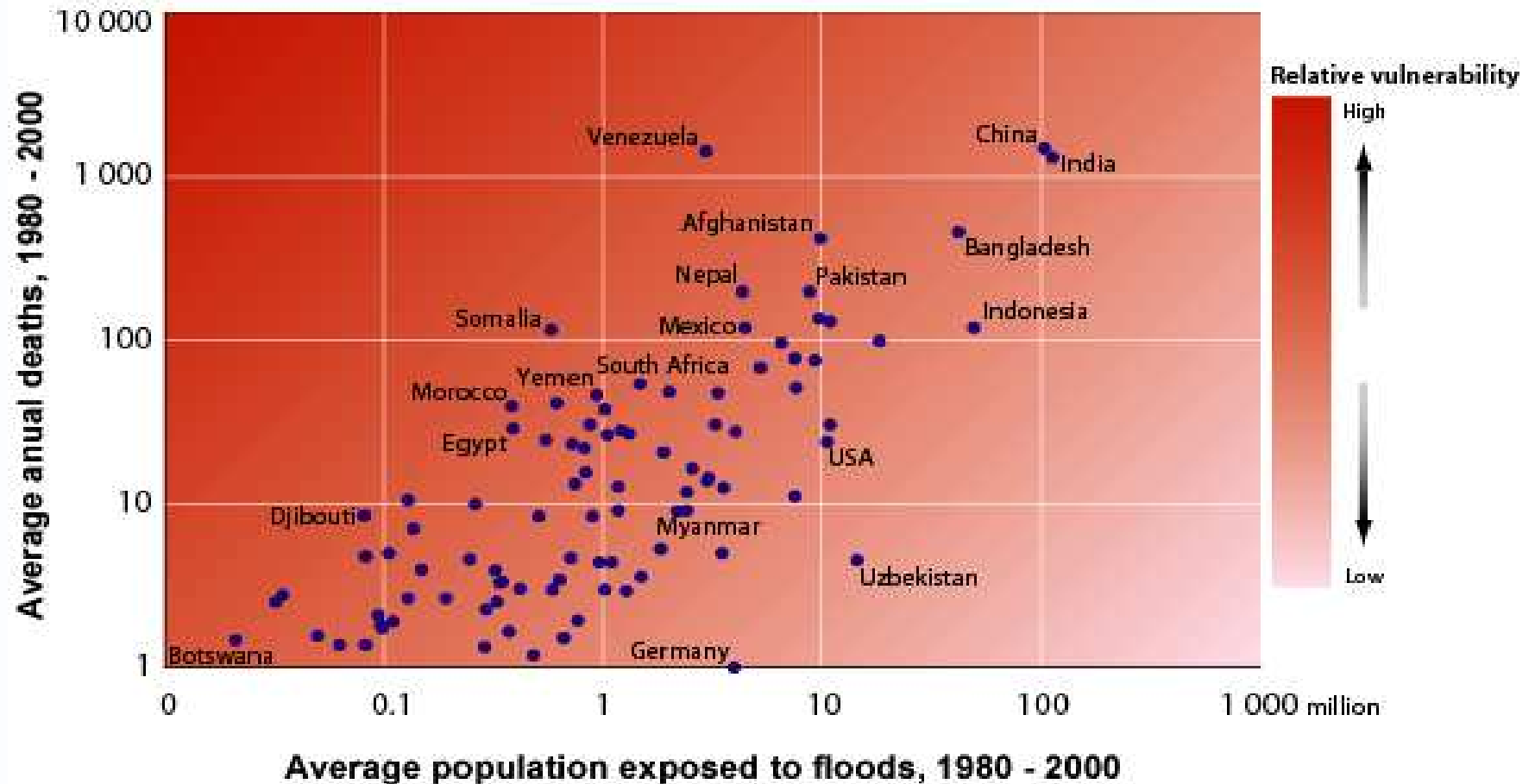


# **What can DRR contribute to CCA**



# Global Vulnerability Assessments by UNDP

## Relative Vulnerability for Floods



Source: The EM-DAT OFDA/CRED International Disaster Database and UNEP/GRID-Geneva

Source: UNDP 2004

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# Local Level Approaches



## EXAMPLE: STRUCTURE OF THE QUESTIONNAIRE FOCUSING ON VULNERABILITY

### Vulnerability

susceptibility and degree of exposure

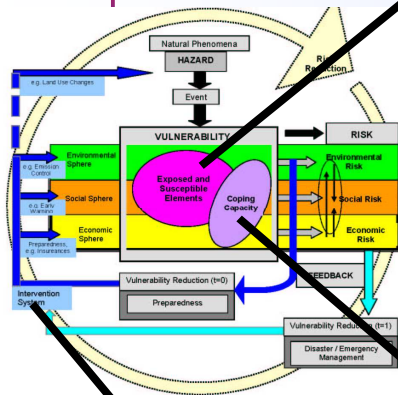
- 1) impact of tsunami on household members and their assets
- 2) structure of the household
- 3) housing conditions and the impact of the tsunami
- 4) direct loss of possessions
- 5) activity and occupation of the household members

### coping capacity

- 6) social networks
- 7) knowledge about coastal hazards and tsunami
- 8) financial support from formal and informal organizations
- 9) access to information, e.g. radio

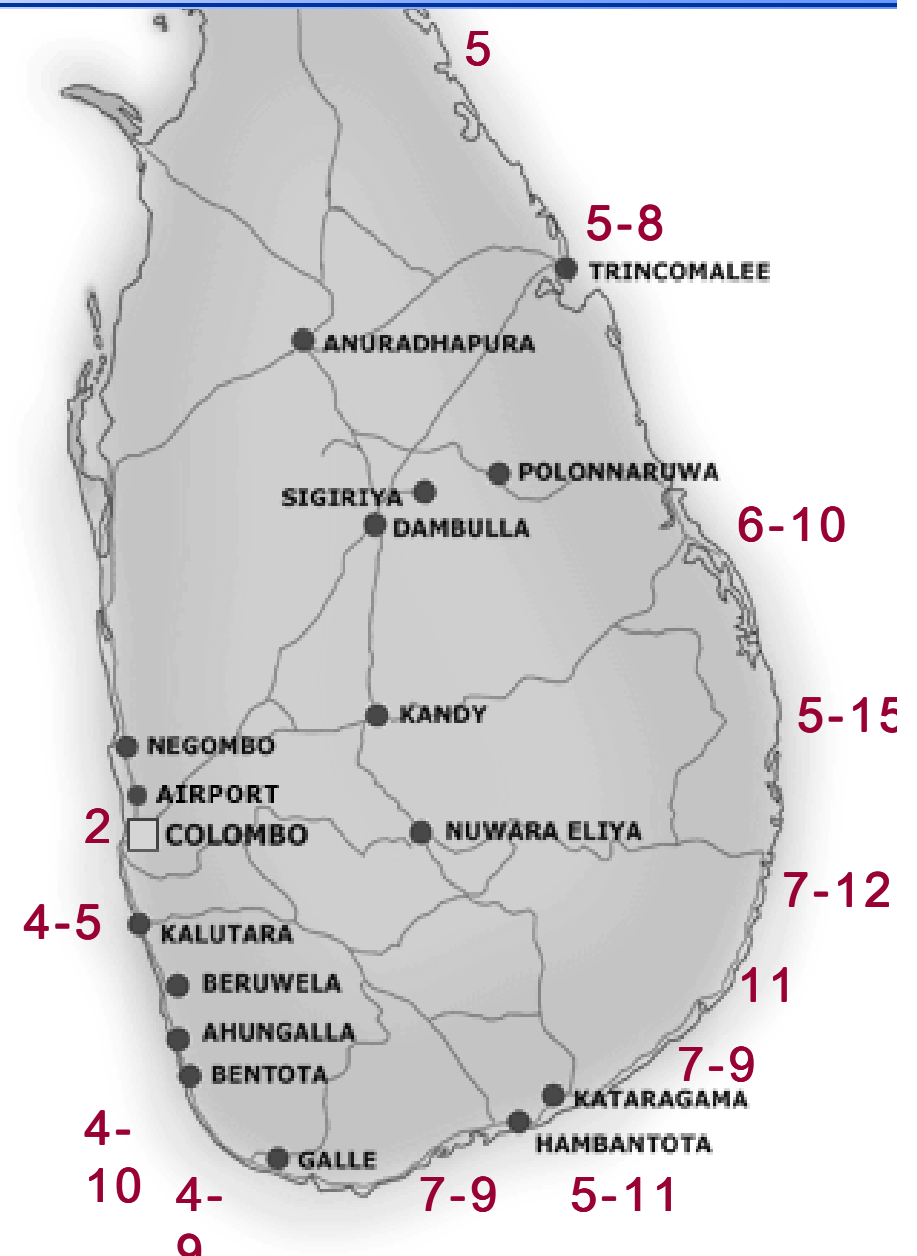
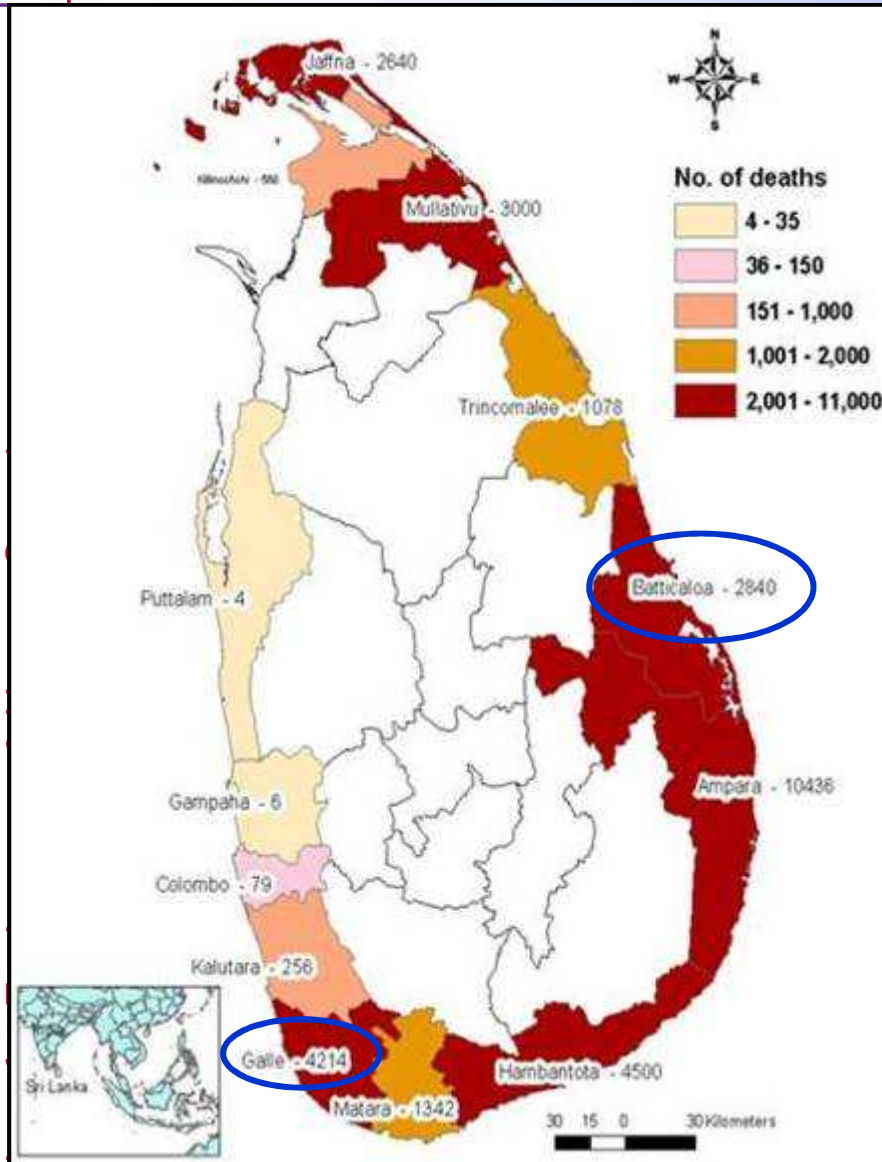
### intervention tools

- 10) relocation of housing and infrastructure to inland
- 11) early warning system
- 12) 100 meter “buffer zone” (implemented by the government)



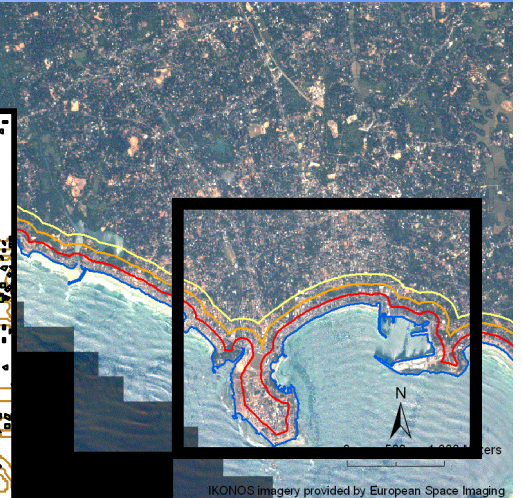
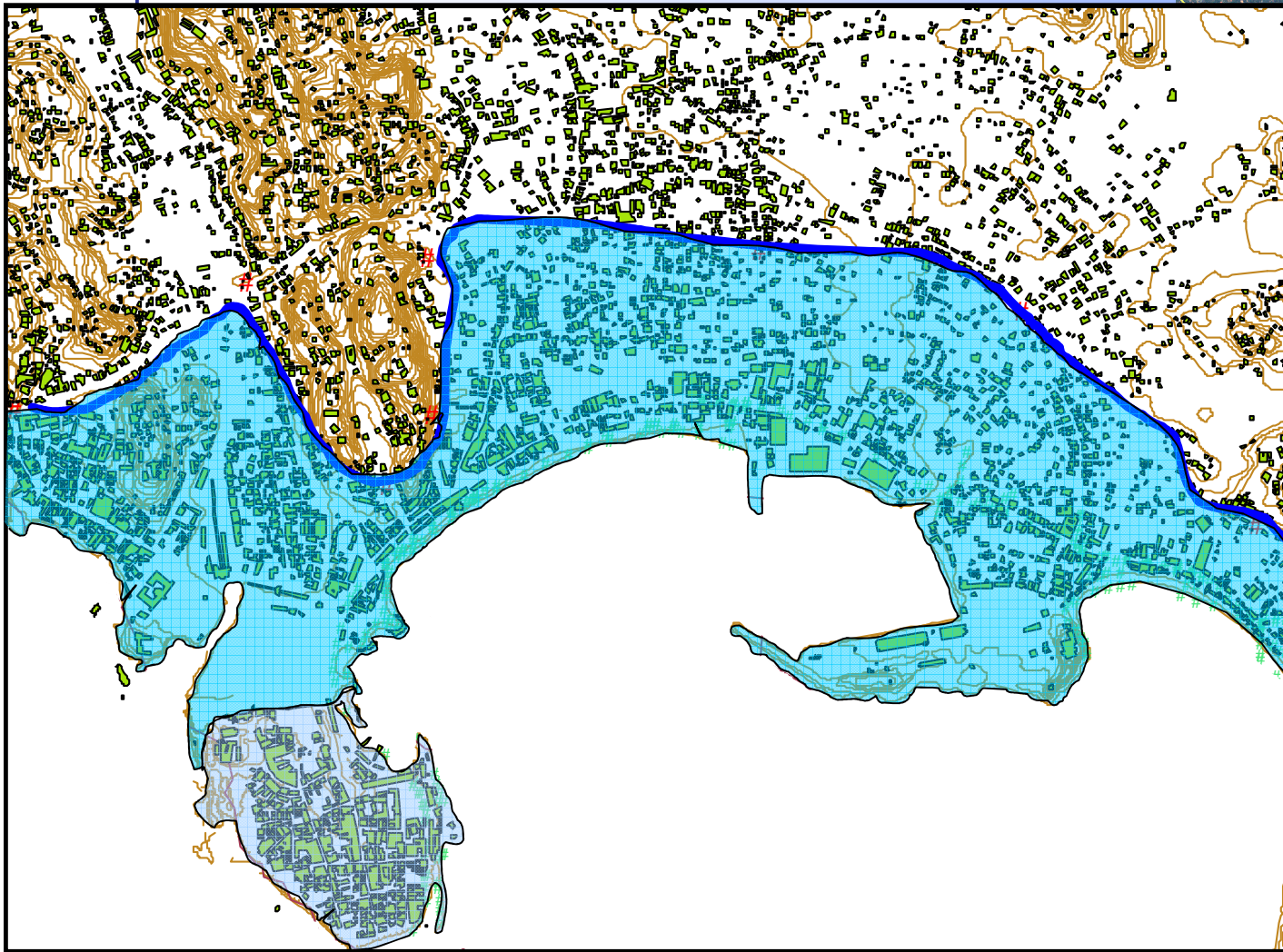


# Sri Lanka

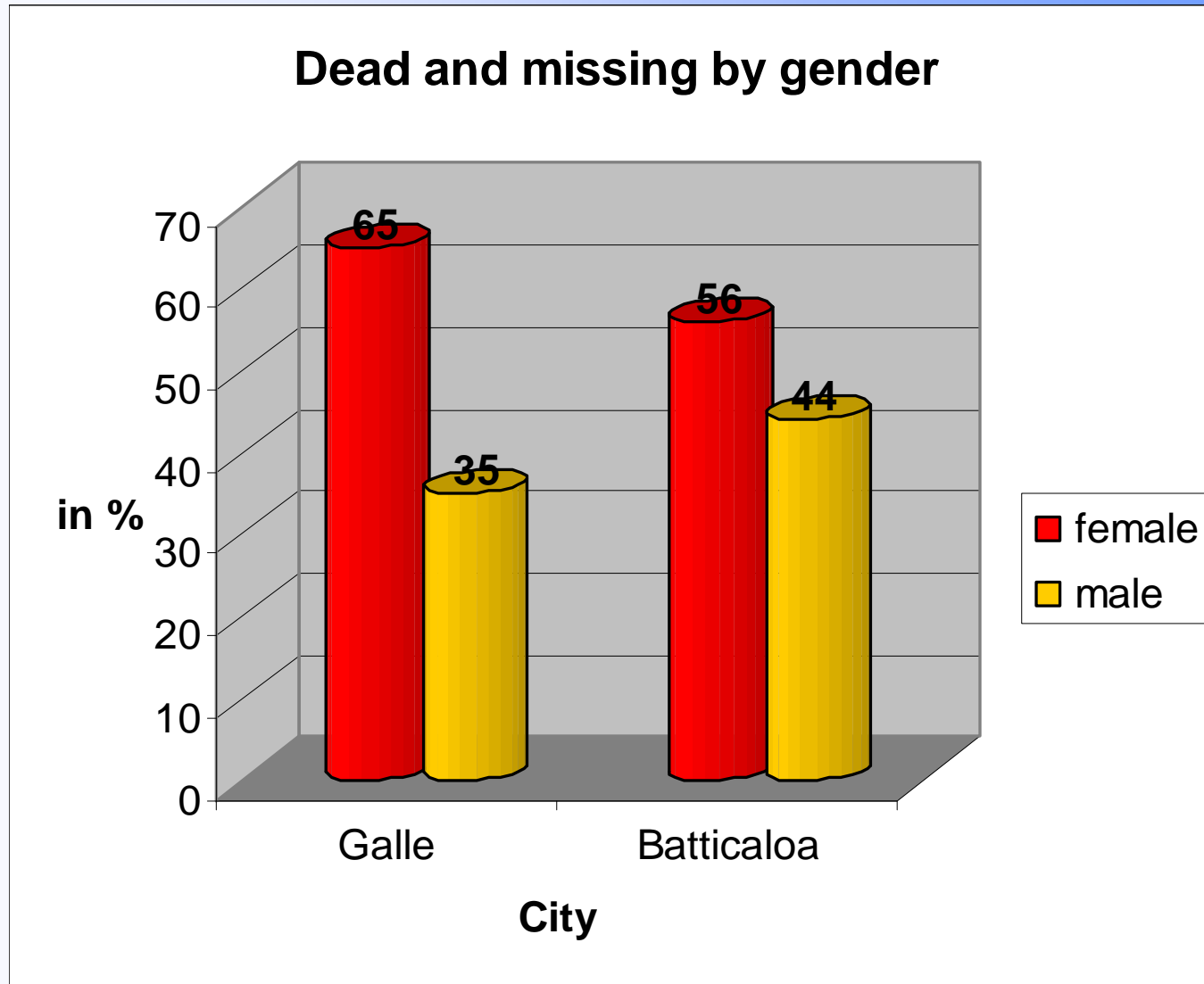




# Inundation went beyond 100 meter zone



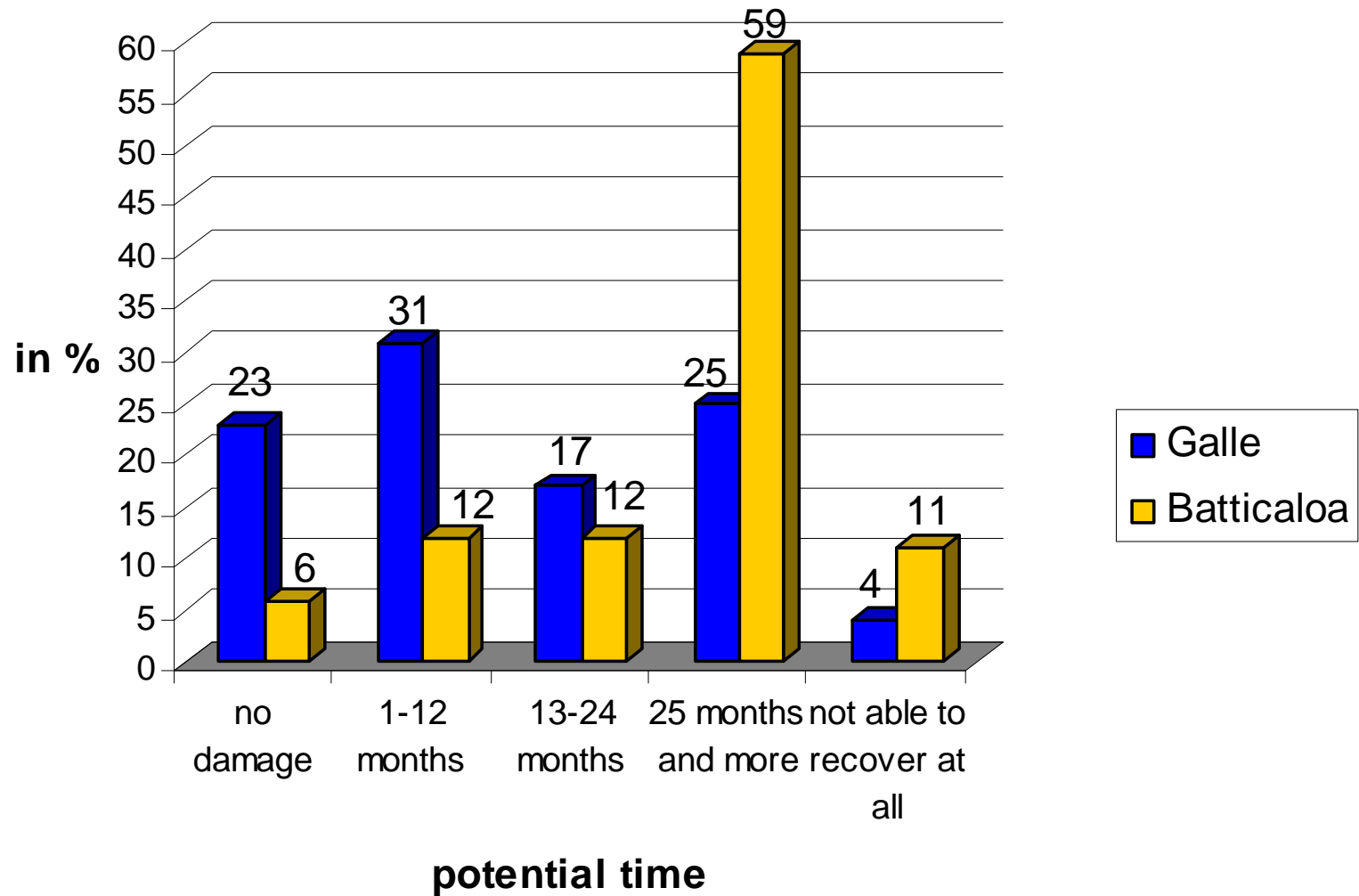
# Differences Reveal Vulnerability





# Differences Reveal Vulnerability

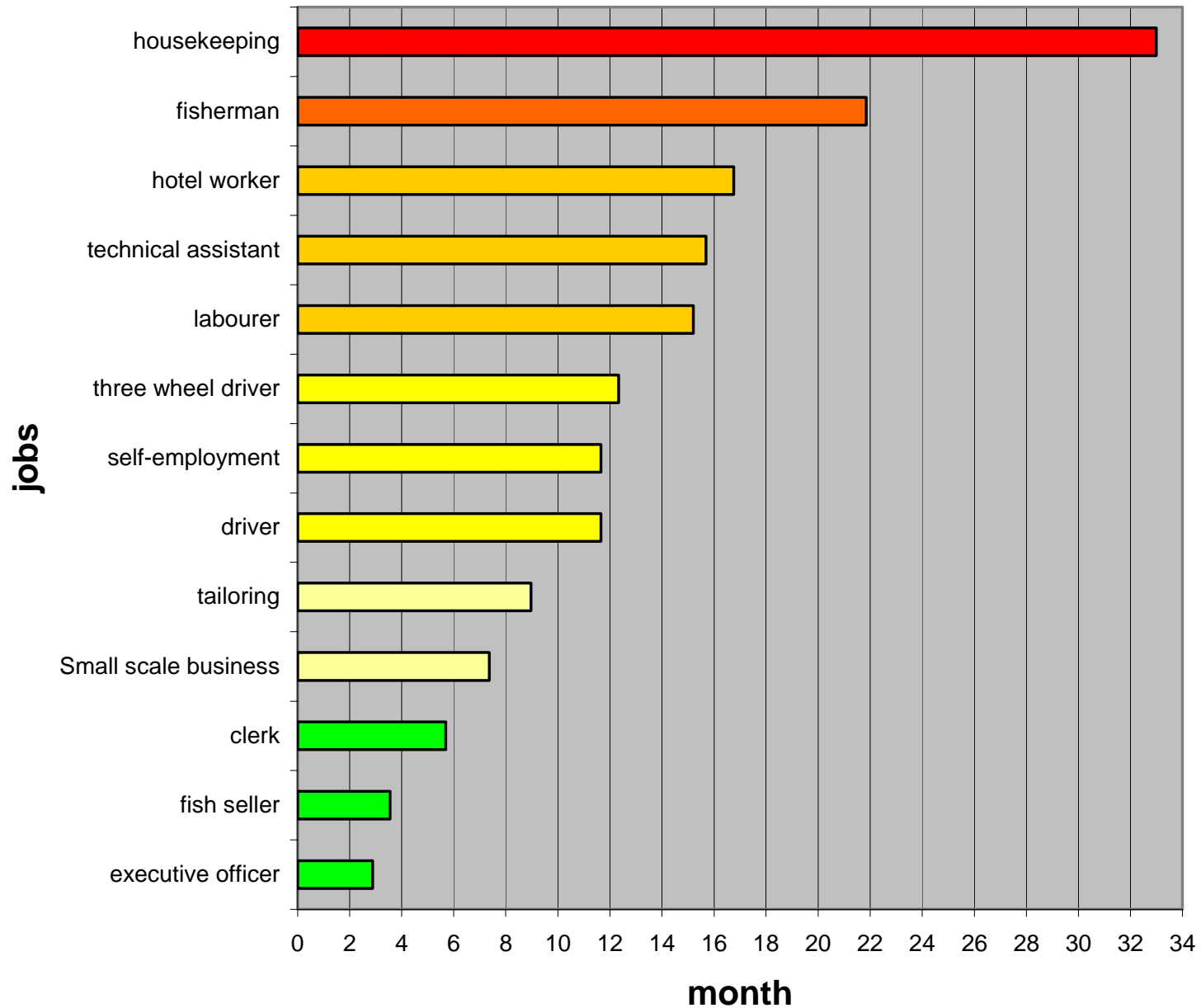
## Unusual difficulties in recovering







## Social Groups & Recovery

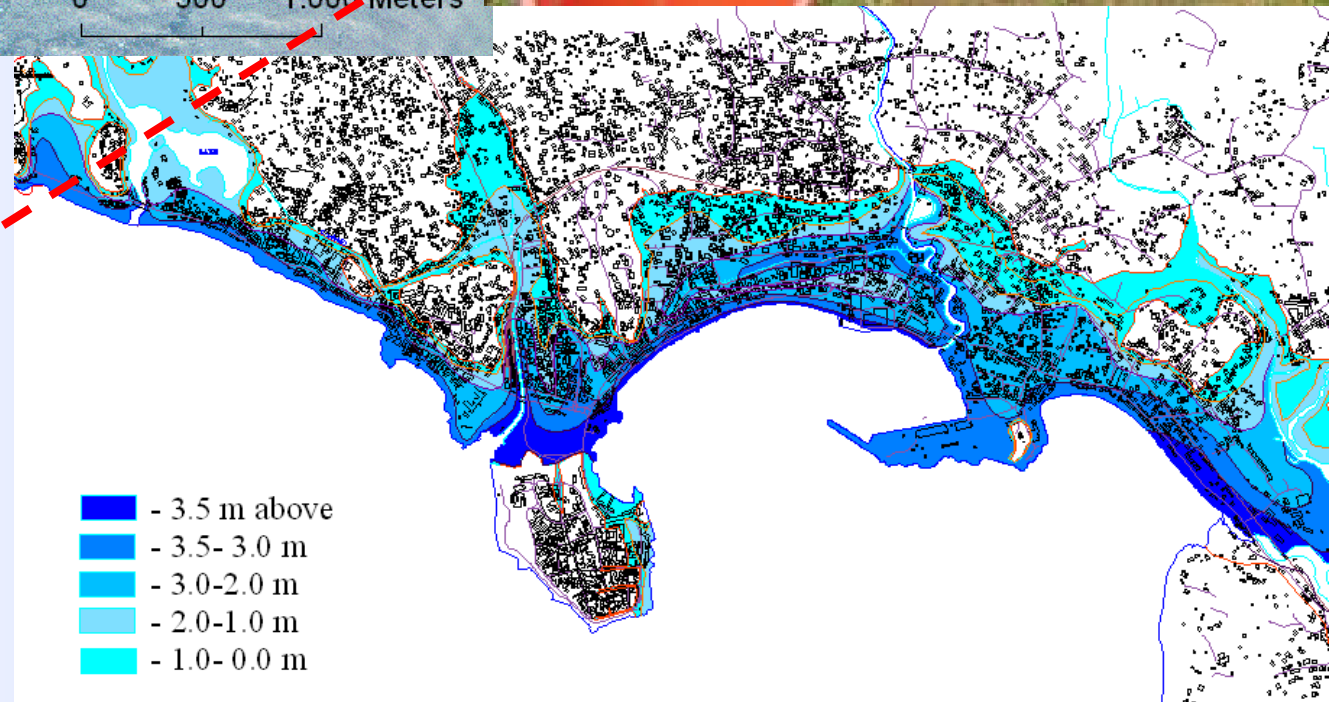
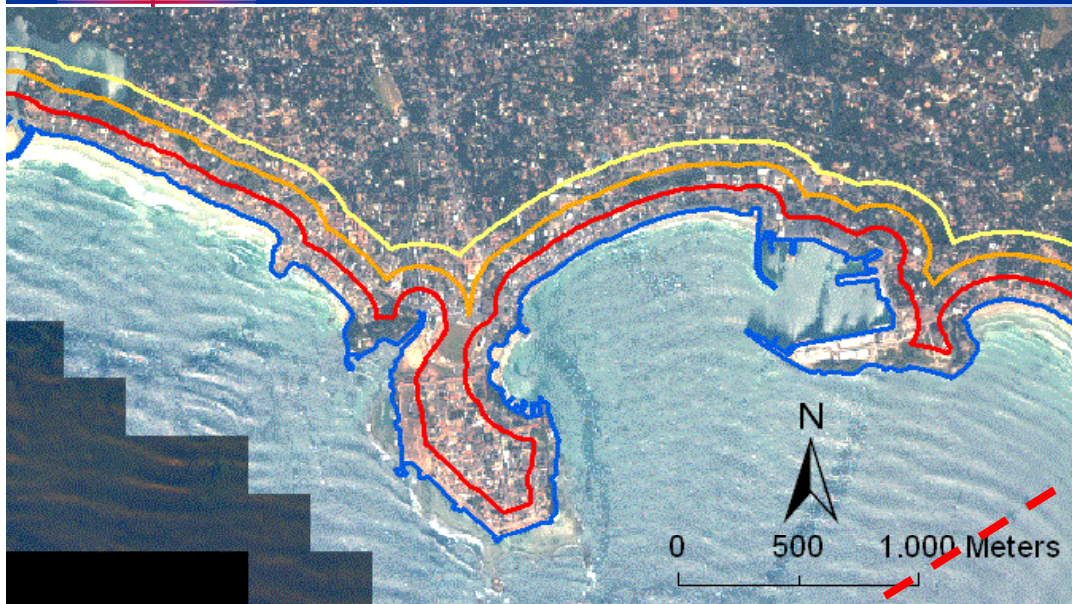




# **Evaluation of Strategies to Reduce Vulnerability and Risk**



# Intervention: 100 Meter Buffer-Zone



Source: DLR 2005;  
Hetterachi 2006

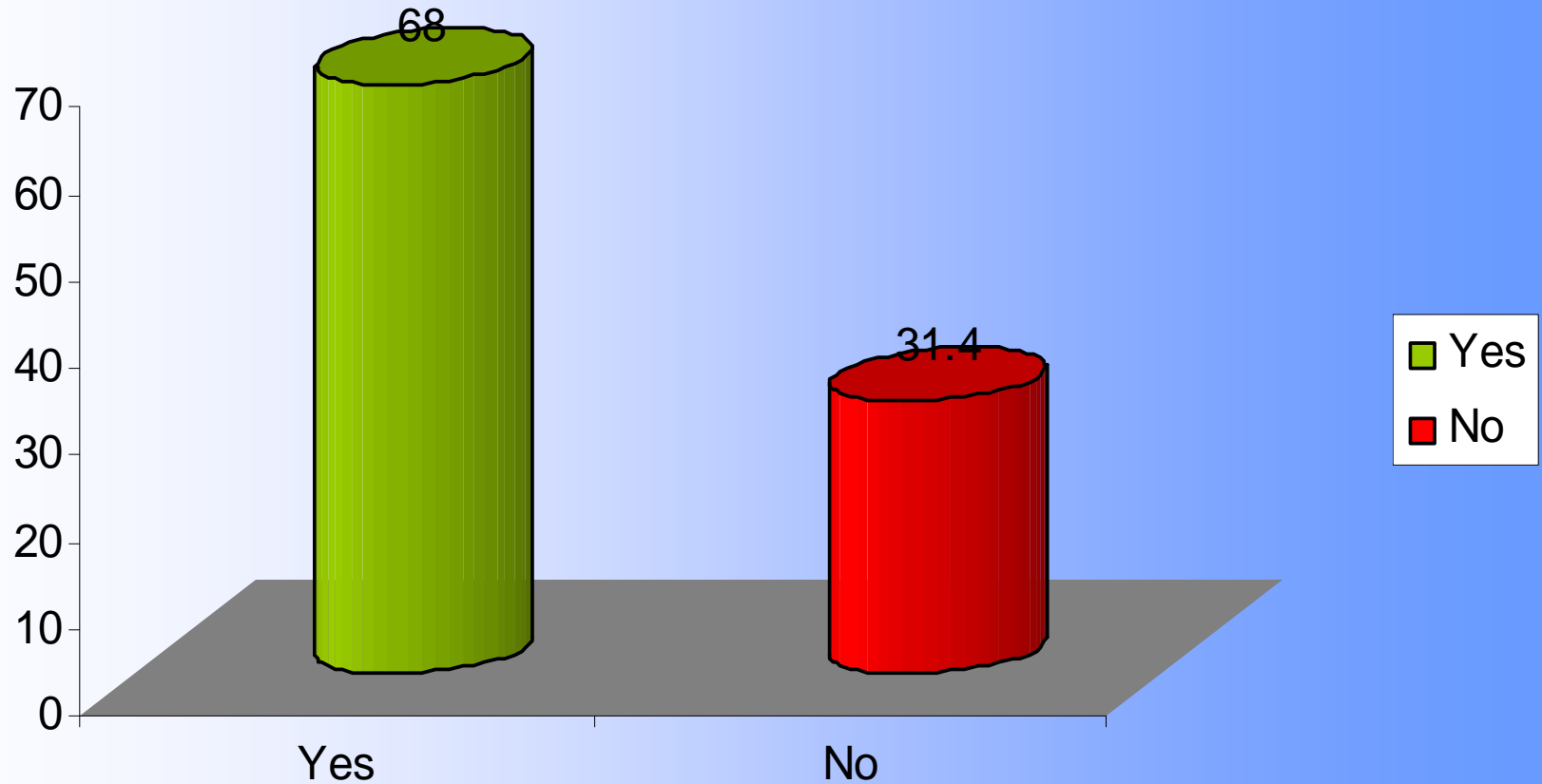




# Resettlement



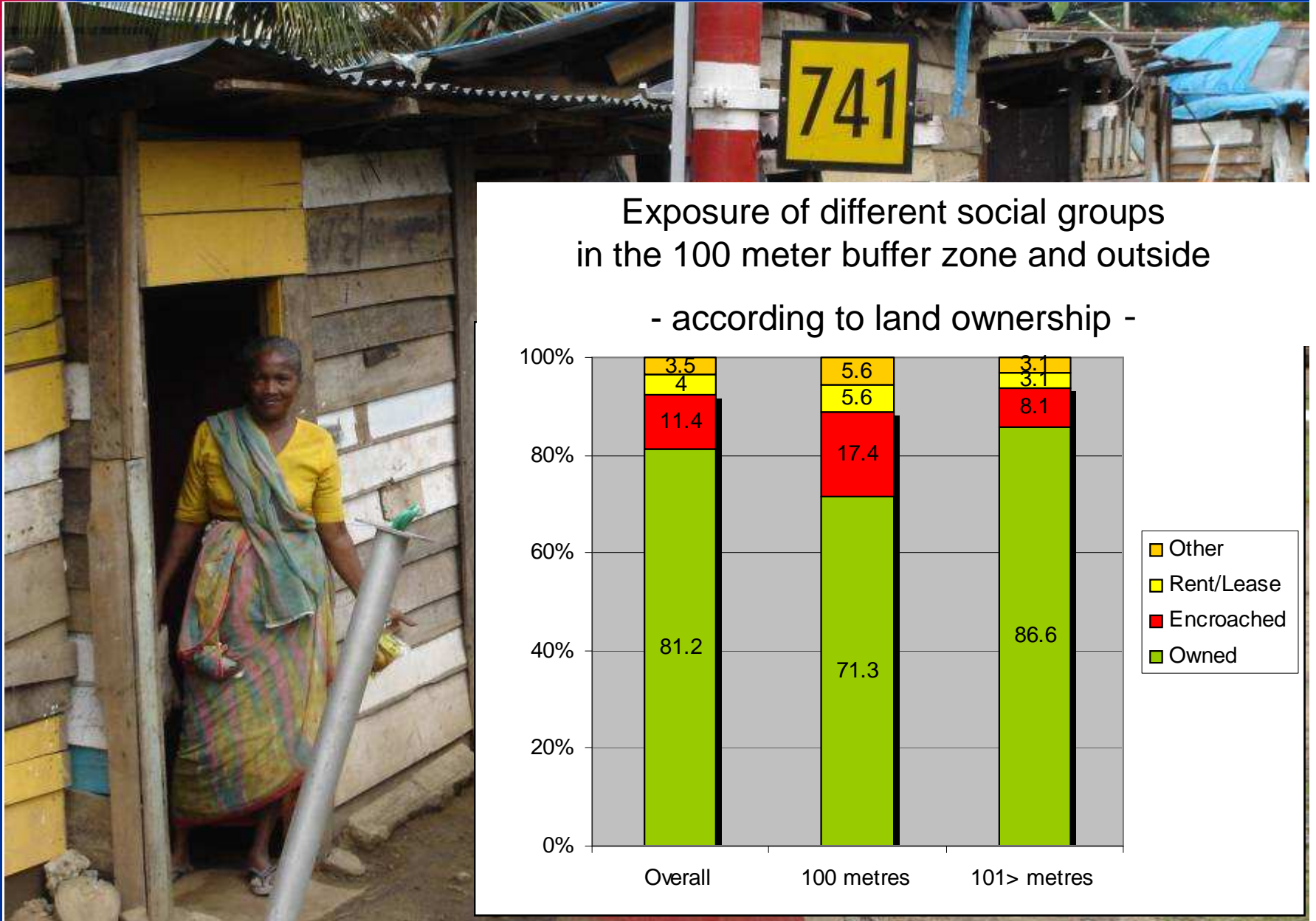
# Willingness to Resettle - Safer Location



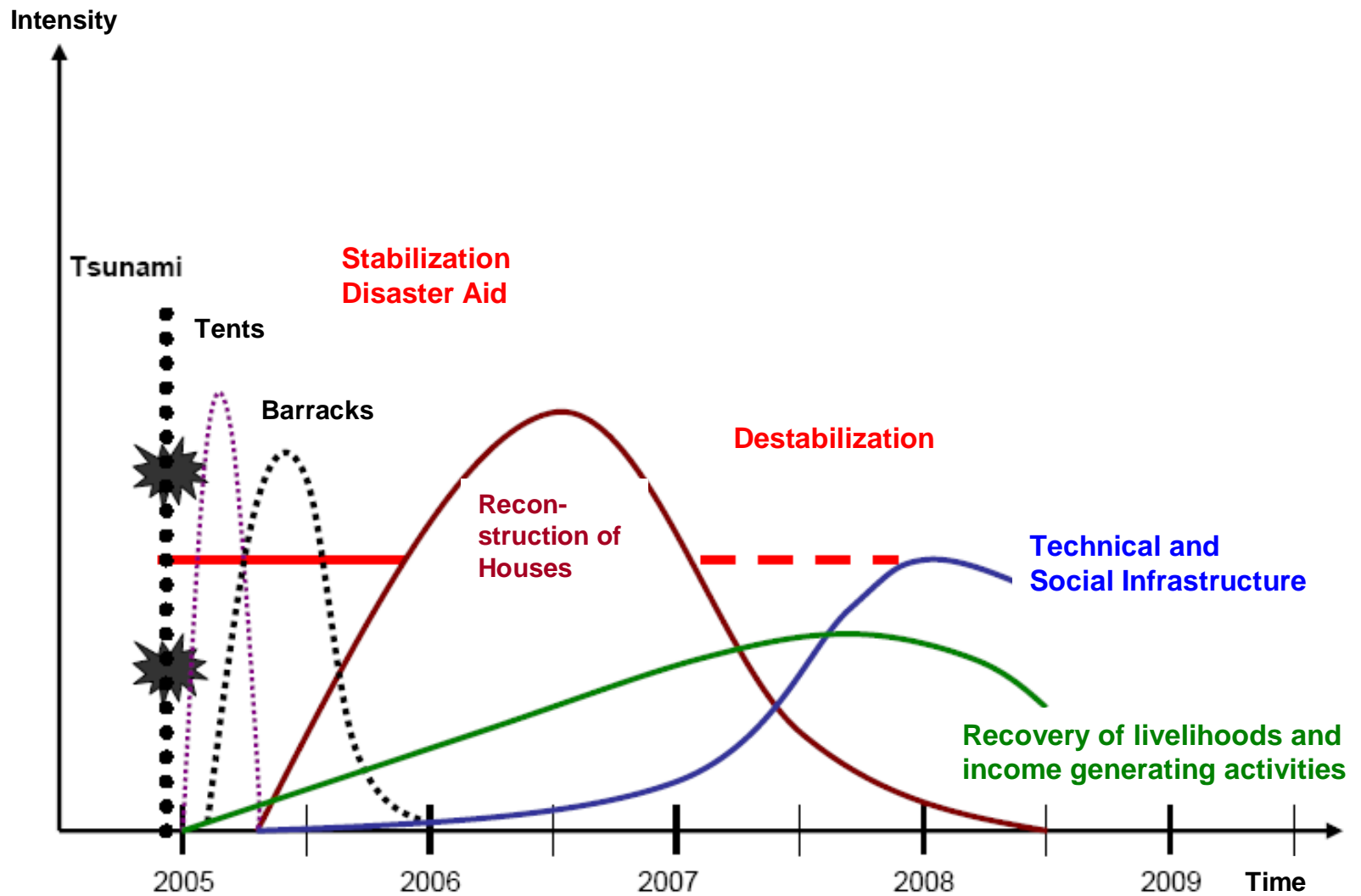




# Landownership and Exposure in Galle

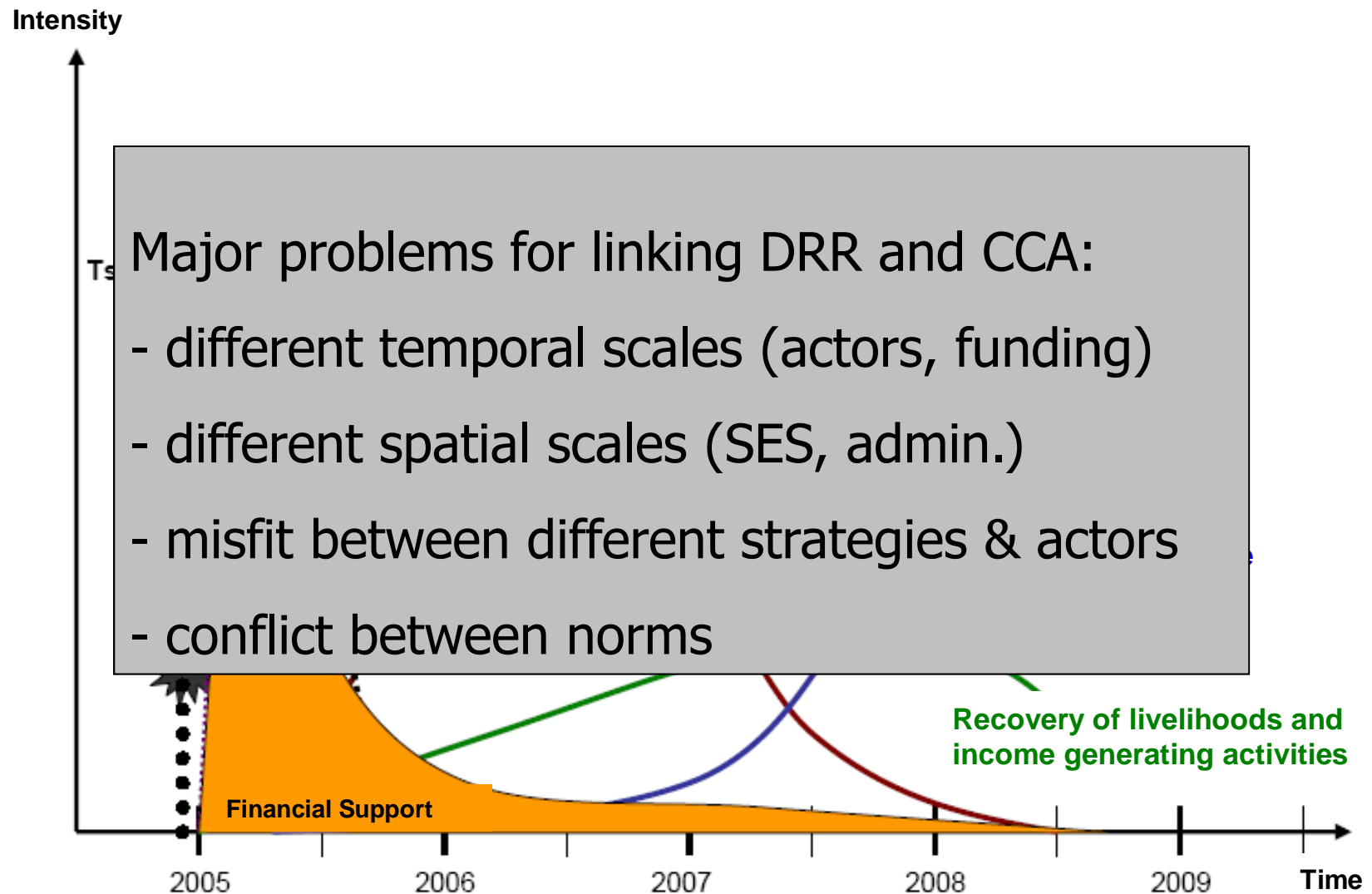


# Recovery and Social-Ecological Crises





# Recovery and Social-Ecological Crises





# Ongoing Research and Conclusions



2. How do different institutions and organizations cooperate regarding integrative strategies of Disaster Risk Reduction and Climate Change Adaptation – please indicate the level of cooperation and integration

Good

Medium

Low

The cross-sectoral and integrative character of current adaptation strategies is...

☐☐☐

The link between disaster risk reduction and climate change adaptation in current strategies and action plans is...

☐☐☐

The link between adaptation strategies at different governance levels (international, national, sub-national, local) is...

☐☐☐

The cooperation between different ministries regarding adaptation is...

☐☐☐

The synergies between different stakeholders in DRR and CCA is...

☐☐☐

The cooperation between scientists and practitioners is...

☐☐☐

The collaboration between different development organizations/ NGOs is...

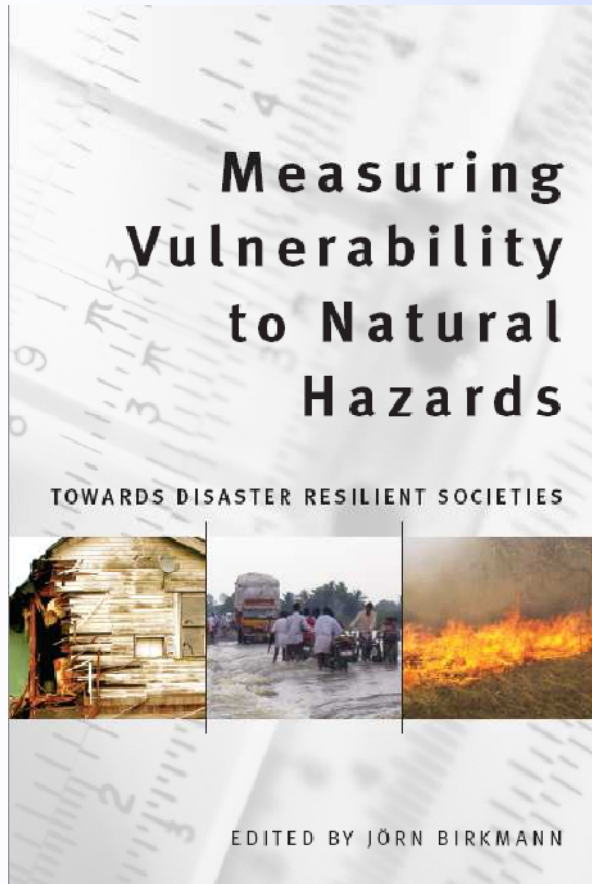
☐☐☐

Other:

# Conclusions

1. Disaster Risk Reduction and Climate Change Adaptation should be linked, however, conceptual and practical gaps have to be addressed.
2. CCA with a focus on global and national scales and DRR with an emphasis on the local scale – need to be linked at a “meso-level”
3. Disasters, recovery and reconstruction are heavily modifying the vulnerability of different regions, groups as well as social-ecological systems – thus they should be used also as catalysts for CCA
4. Vulnerability Assessment can help to identify priority areas for adaptation and might help as well to understand limits of adaptation

# Thank you for your attention



Birkmann, Jörn (2006): Measuring vulnerability to promote disaster-resilient societies: Conceptual frameworks and definitions, in: Birkmann, J. (ed.): Measuring Vulnerability to Natural Hazards, **UNU-Press Book**

Birkmann, Jörn; Fernando, Nishara (2008): Measuring revealed and emergent vulnerabilities of coastal communities to tsunami in Sri Lanka. In: **DISASTERS** 2008, (32) 1, S. 82-104 (peer-reviewed)

Birkmann, Jörn (2008): Assessing Vulnerability Before, During and After Natural Hazards Occurred in Fragile Regions – Case Study: Tsunami in Sri Lanka and Indonesia. In: **UNU-WIDER Research Paper** – Based on the Presentation at the UNU-WIDER conference on fragile groups and fragile states, Helsinki, 24 p. (peer-reviewed)

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