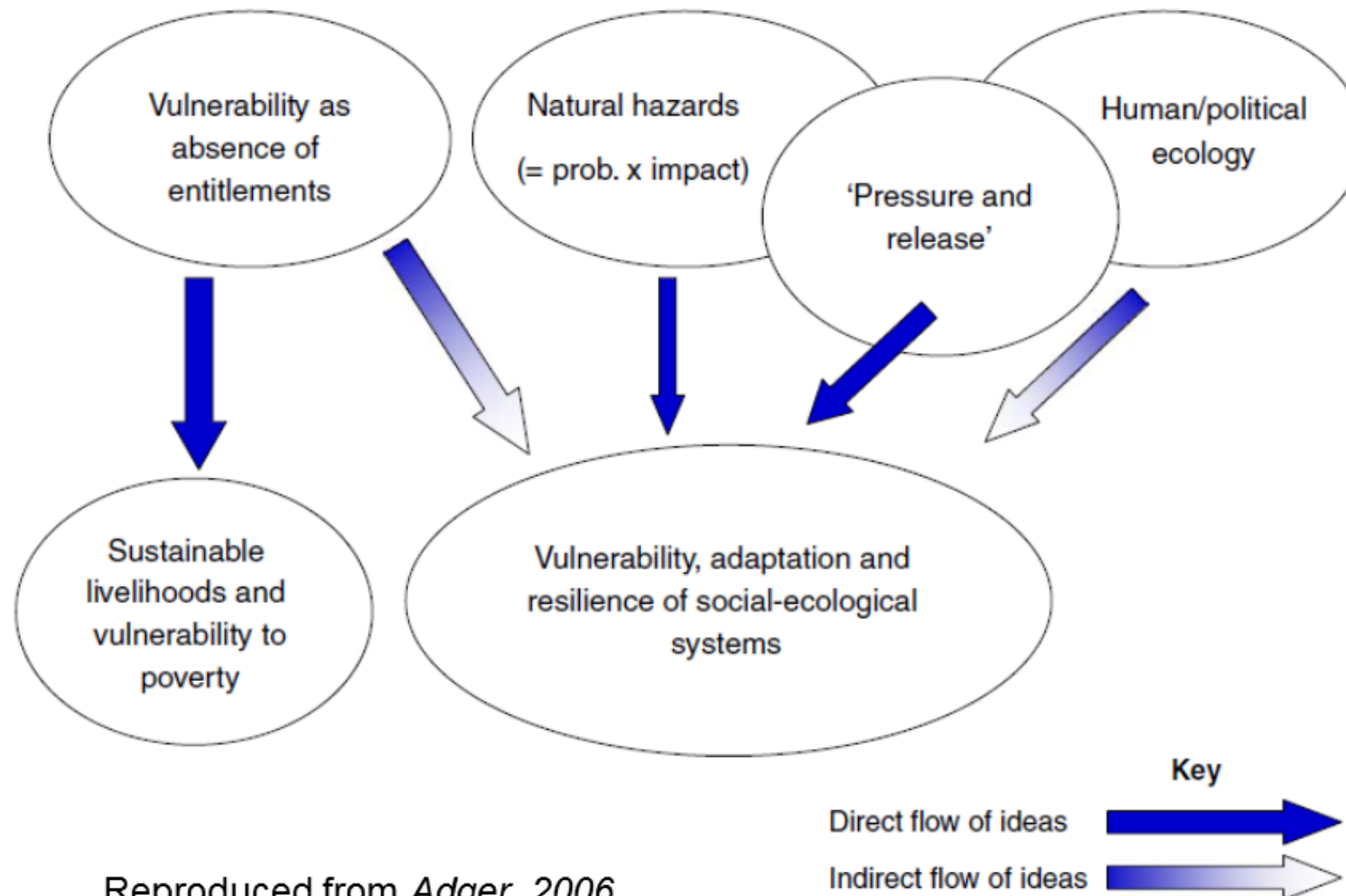


Vulnerability and adaptation  
framework  
Resilience  
Social-Ecological Systems

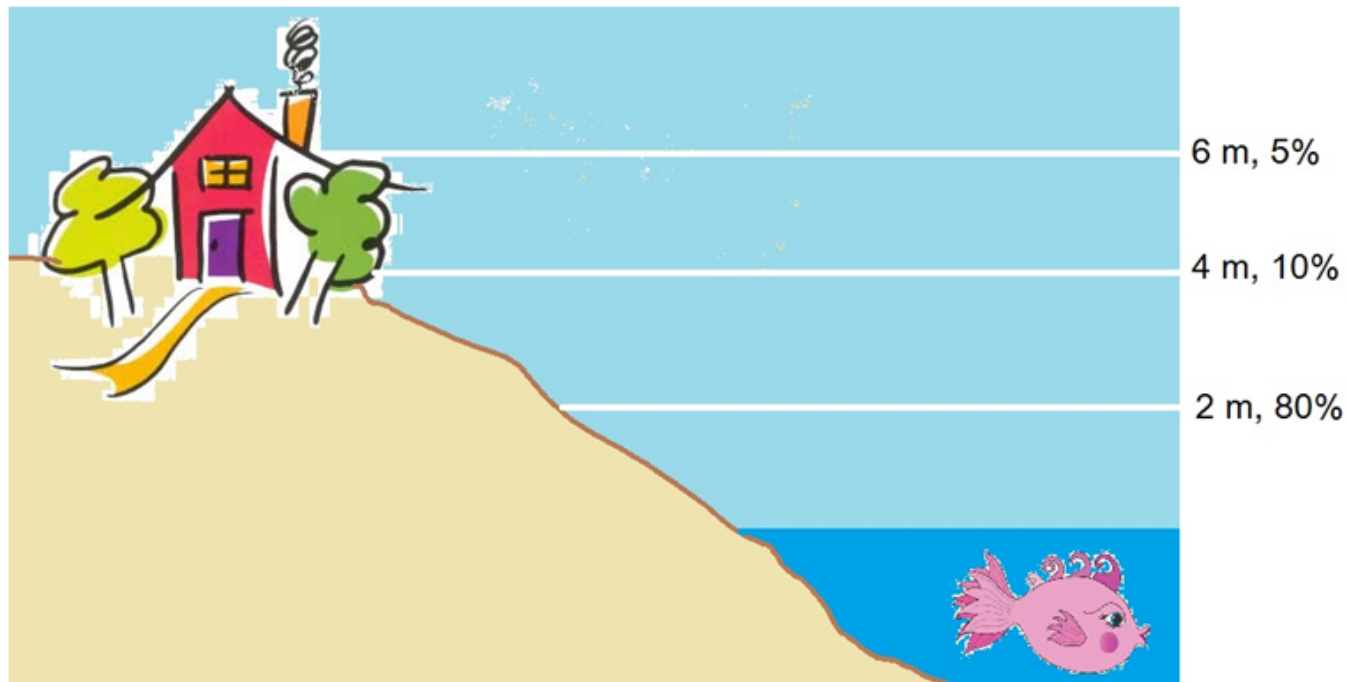
# Vulnerability: evolution of the concept



Reproduced from *Adger, 2006*

# Vulnerability: risk – hazard framework

- Vulnerability: a dose – response relationship between the hazard a system is exposed to and the range of adverse effects caused by the hazard



$$\text{Vulnerability} = \frac{\text{sensitivity to stress}}{\text{state relative to threshold}} \times \text{Prob. of exposure to stress}$$

# Vulnerability: social constructivist framework

- ...an intrinsic characteristic of a community determined by socioeconomic and political settings
- ...socioeconomic causes of differential sensitivity and exposure (*Füssel and Klein, 2006*)



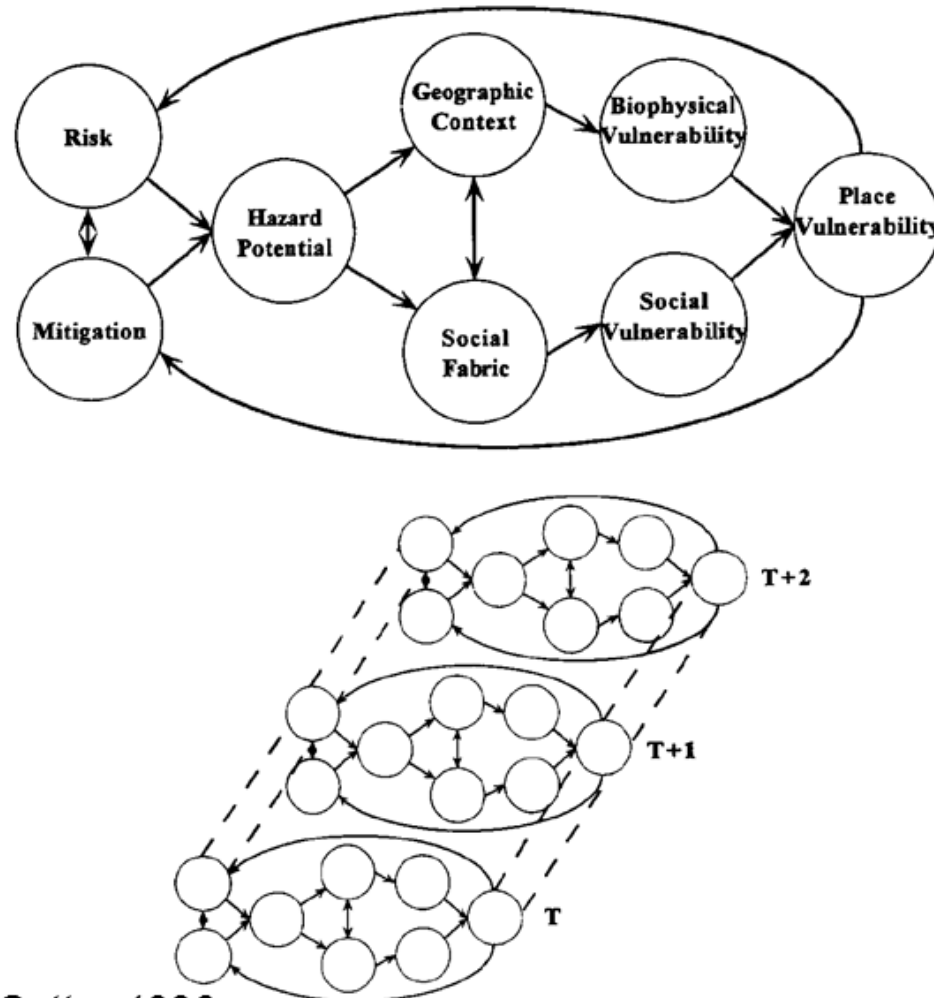
# Vulnerability: integrated framework

- ...combination of possible impacts to a system triggered by external stressors
- external dimension – ‘exposure’ of a system to an environmental change
- internal dimension – ‘sensitivity’ and ‘adaptive capacity’ to the environmental change

$$\text{Vulnerability} = \frac{\text{sensitivity to stress}}{\text{state relative to threshold}} \times \text{Prob. of exposure to stress}$$

# Vulnerability: hazard of place

- Hazard potential = risk + mitigation =>
- => filters through the social fabric OR the geographic context => social or a biophysical vulnerability
- Vulnerability of place is at the intersection of social and biophysical vulnerability



Reproduced from Cutter 1996

# Vulnerability: IPCC, ATEAM

- "...the degree to which a system is susceptible to, or unable to a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity" (*IPCC 2001*)
- "...the degree to which an ecosystem service is sensitive to global change plus the degree to which the sector that relies on this service is unable to adapt to the changes" (*Metzger et al. 2005*)

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"ALWAYS GIVE THEM THE BILL BEFORE  
THEY GET THEIR CLOTHES BACK ON --  
THEY'RE MOST VULNERABLE THEN."

# Definitions of adaptation – a snapshot

- ...a process, action or outcome in a system (household, community, group, sector, region, country) in order for the system to better cope with, manage or adjust to some changing condition, stress, hazard, risk or opportunity (*Smit, Wandel 2006*)
- ...adjustments in a system's behavior and characteristics that enhance its ability to cope with external stress (*Brooks 2003*)
- ...adjustments in individual groups and institutional behavior in order to reduce society's vulnerability to climate (*Pielke 1998*)
- Based on their timing, adaptations can be **anticipatory** or **reactive** (*Fankhauser et al. 1999*)



# Adaptation – disciplinary approaches

- **Biology:** individual adaptations are features of organisms which have developed to ensure survival (*Dobzhansky et al. 1977; O'Brien and Holland 1992*)
- **Anthropology / Cultural ecology:** “one by which groups of people add new and improved methods of coping with the environment to their cultural repertoire” (*O'Brien and Holland 1992, p. 37*)
- **Social science:** cultural practices that allow societies to survive (and, beyond that, flourish) are considered adaptations which can be distinguished based on behavior and (technological) innovation (*Denevan 1983*)



# Adaptation: IPCC

- “any adjustment in natural or human systems in response to actual or expected climate change, which moderates harm or exploits beneficial opportunities” (IPCC 2001)
  - **Autonomous adaptation** is ...triggered by ecological changes in natural systems and by market or welfare changes in human systems, but does not constitute a conscious response to environmental change”
  - **Planned adaptation** ...can take place locally, as adaptive management decisions by individuals or small planning groups, such as planting a drought resistant crop type. Adaptation measures are developed for specific impacts of environmental change

