The Integration of Land Use/Land Cover Data within the Modelling of Socio-economic Vulnerabilities

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Overview

- **Introduction**
- **Vulnerability: Conceptualisation following the IPCC approach**
- **Modelling vulnerability units in a European vs. Asian context**
- **Integration of Land Use/Land Cover data**
- **Conclusions**

BRAHMATWINN

- **Assessment of Natural Dimension (WP 3)**
  - Land Use/Land Cover, Change detection, Snow distribution, Permafrost, Glacial retreat, Hydrological Response Unity (HRU)
- **Assessment of Human Dimension (WP 4)**
  - Governance Analysis, Social Network Analysis & **Vulnerability Mapping for Asia & Europe**

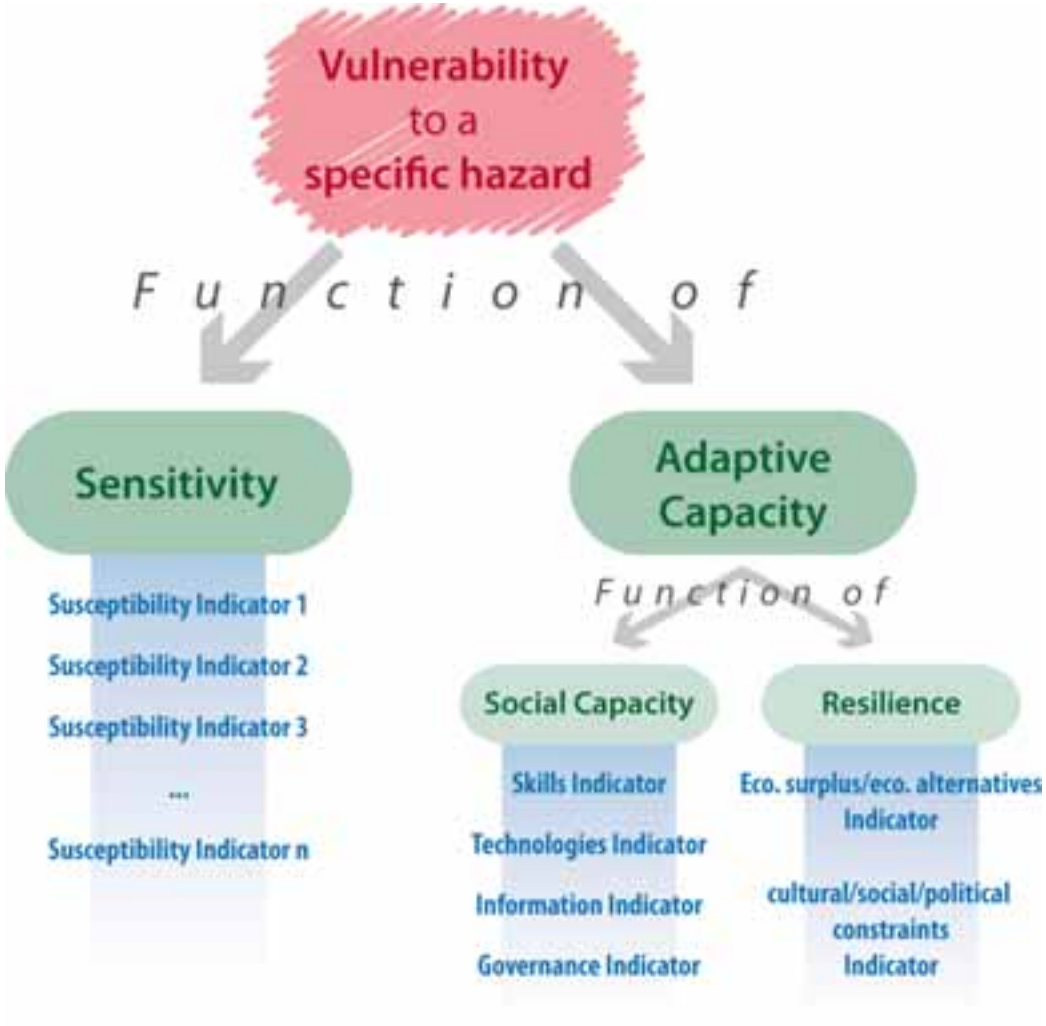
Final Aim: Integration within ‚Water Resource Response Units (WRRU)' → ‚What-if scenarios'

Vulnerability definition in Brahmatwinn

In IPCC terms:

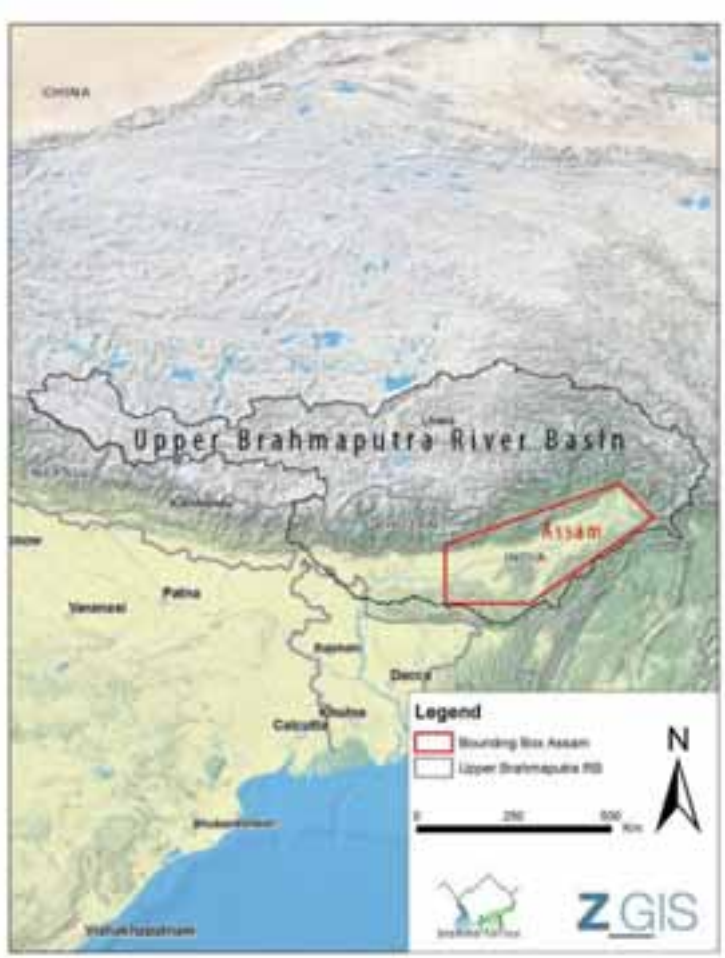
- **Risk = f (Hazard , Vulnerability)**
  - (H) = f (Probability, Magnitude)
  - (V) = f (Sensitivity, Adaptive Capacity)
- **Vulnerability (V)**
  - The degree to which a system is **susceptible** to or **unable to cope** with adverse effects of climate change.

Vulnerability definition in BrahmaTWinn

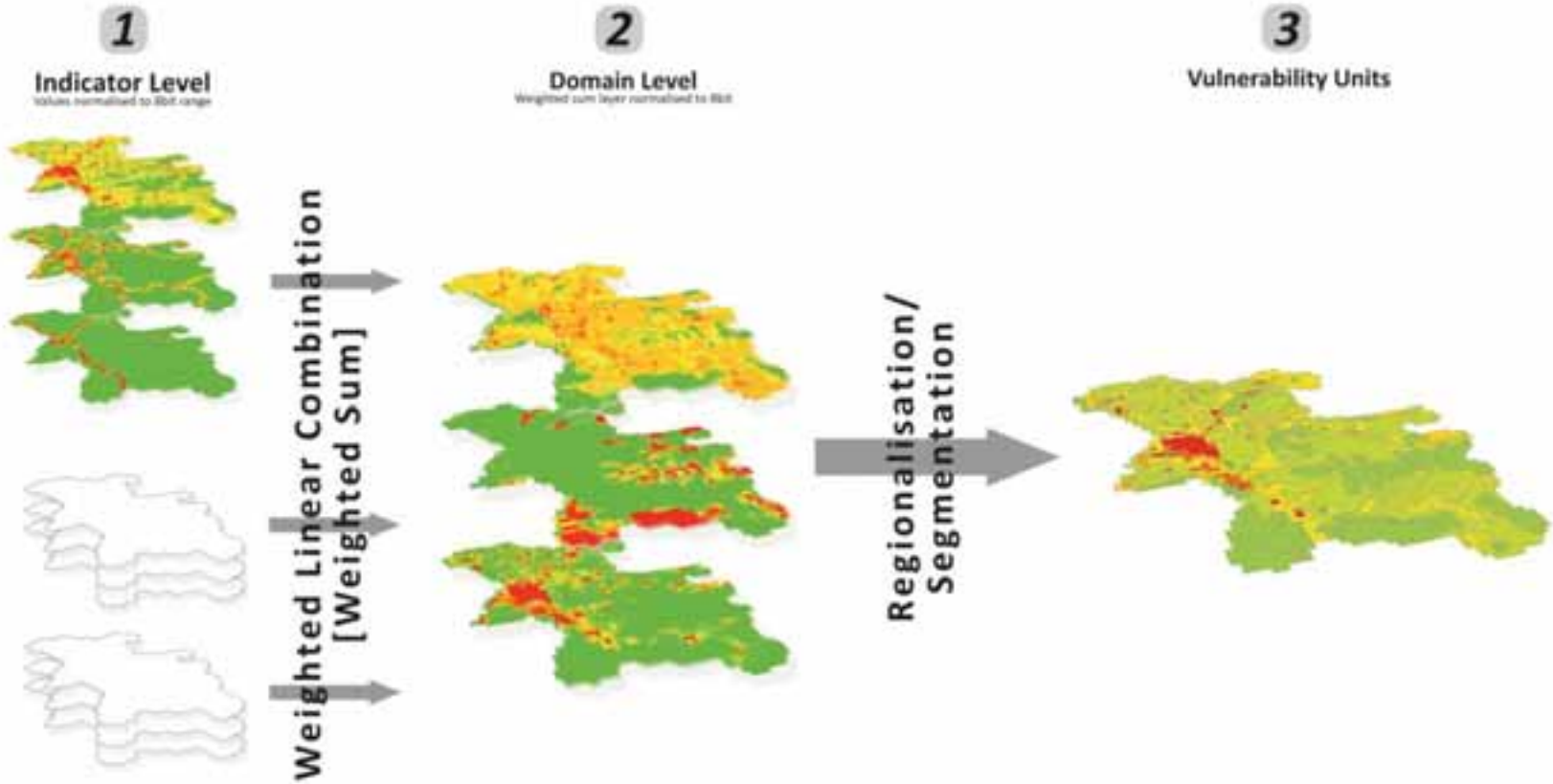


‚Europe vs. Asia‘

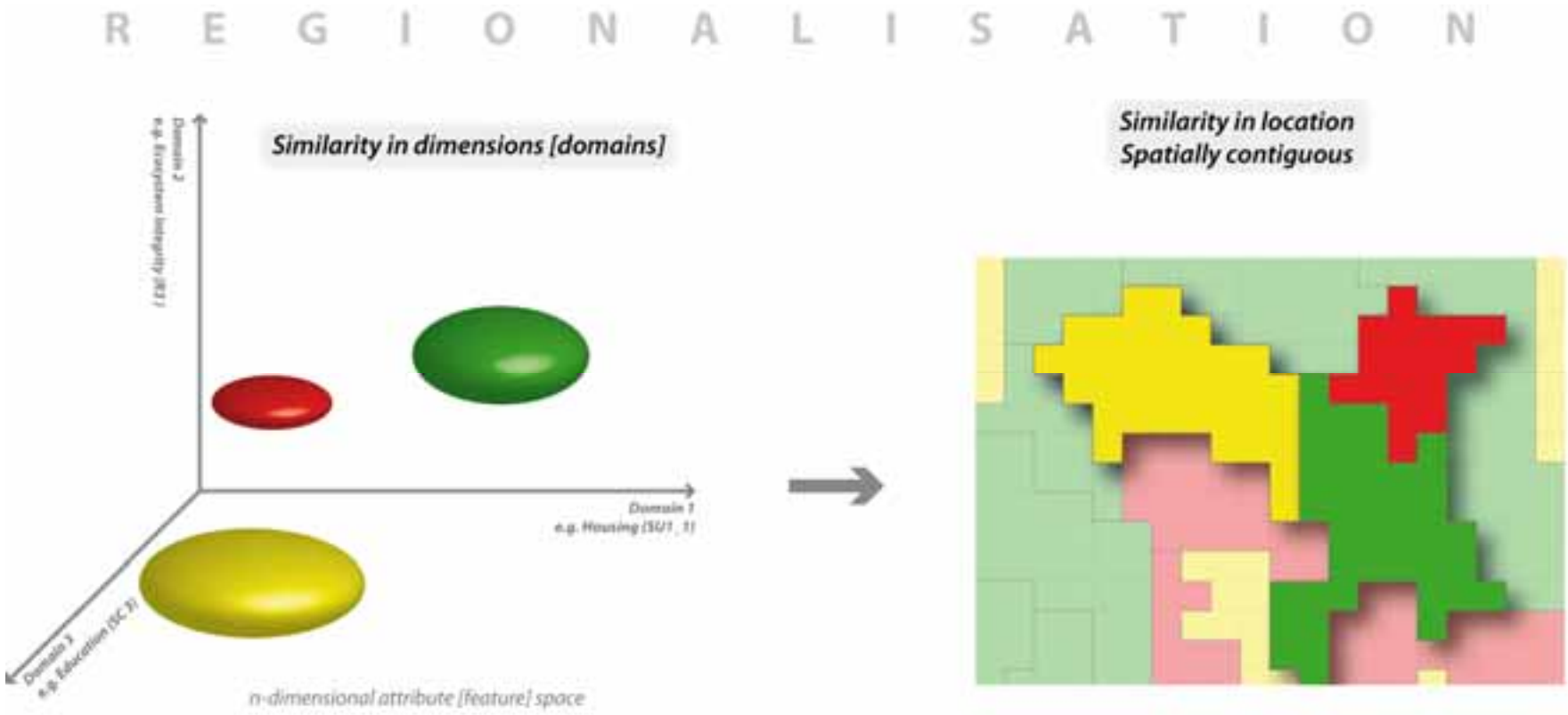
European and Asian Case Study Area



Salzach Catchment
From data to indicators to information

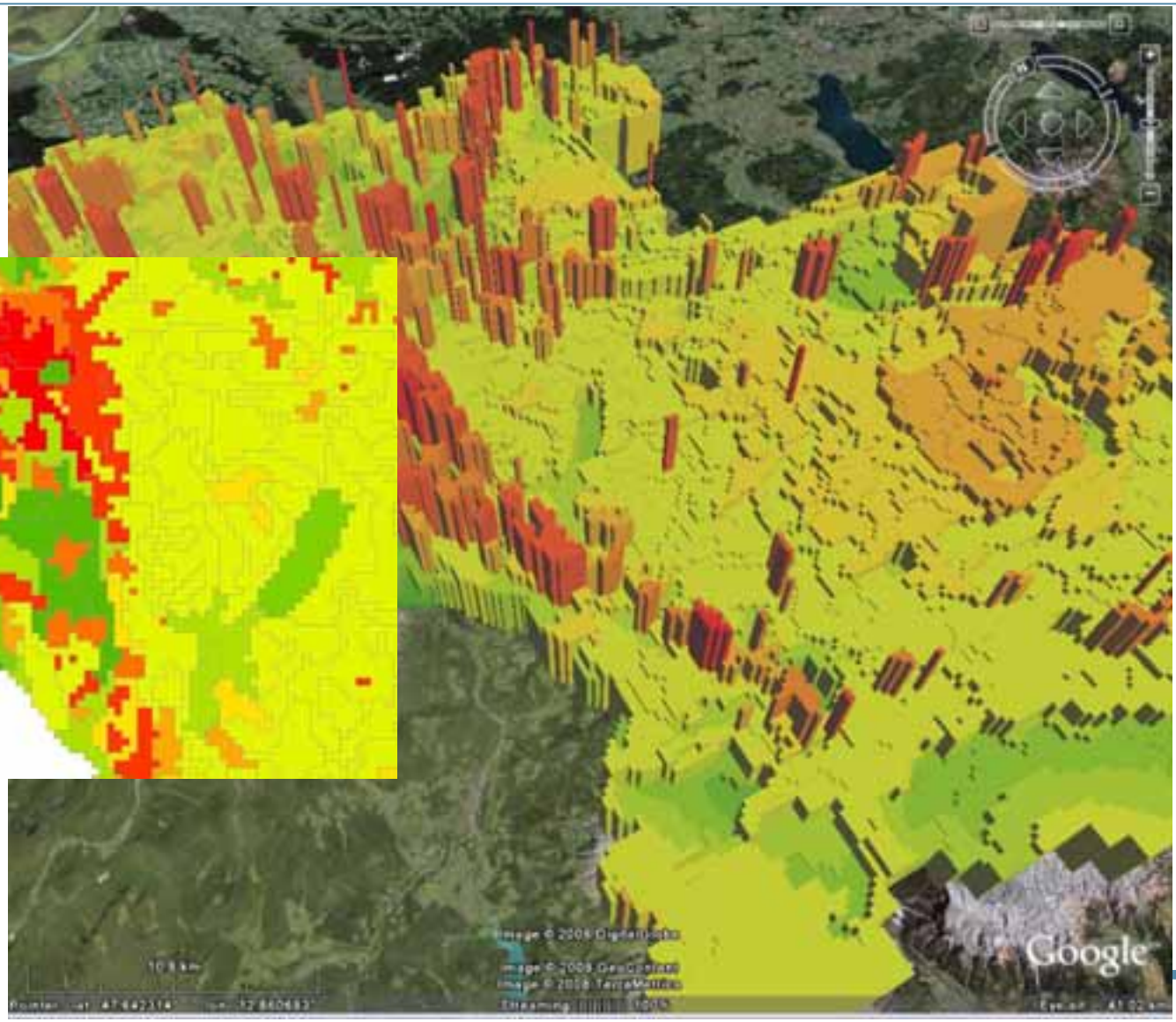


Salzach Catchment
Regionalisation



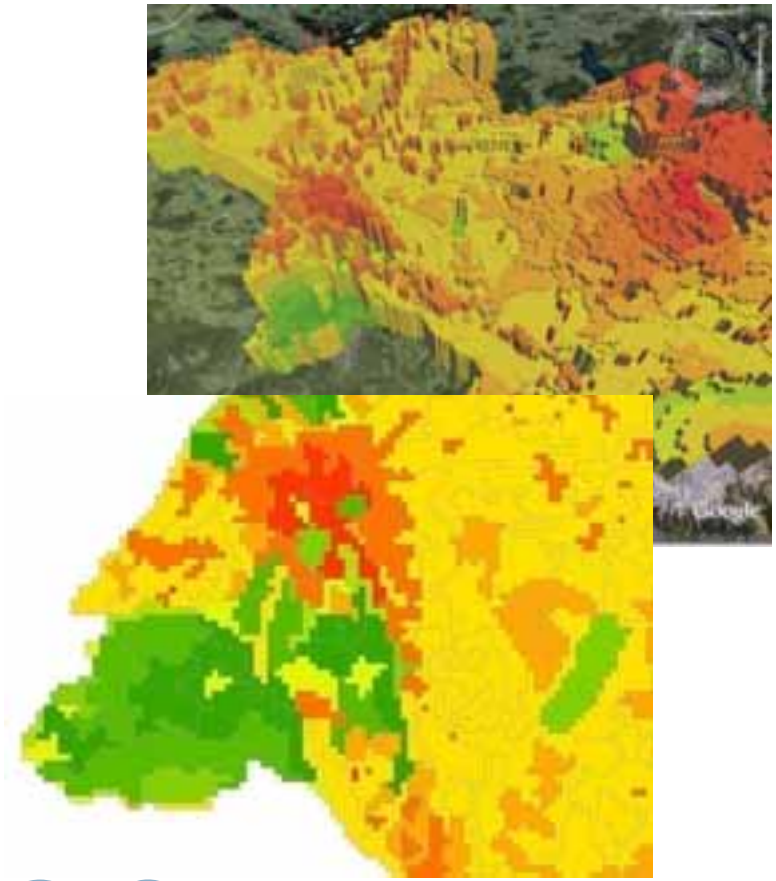
Algorithm after Baatz & Schäpe (2000)

Salzach Catchment
Vulnerability Units

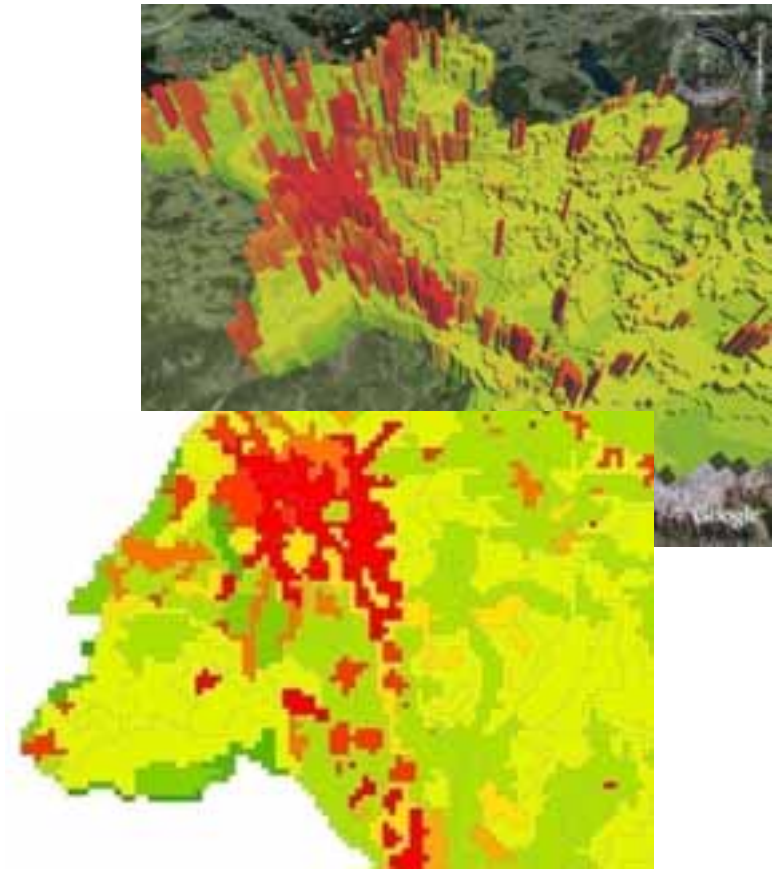


Salzach Catchment
Decomposability

Adaptive Capacity

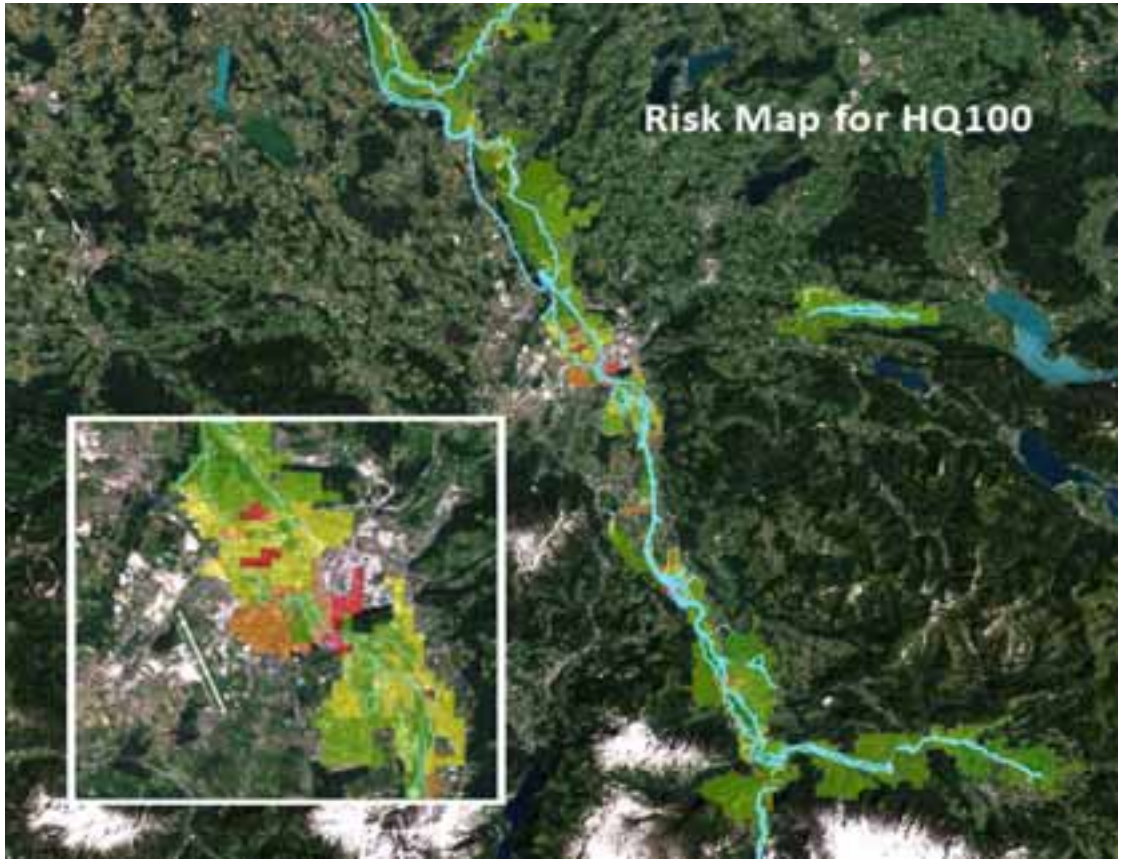


Sensitivity

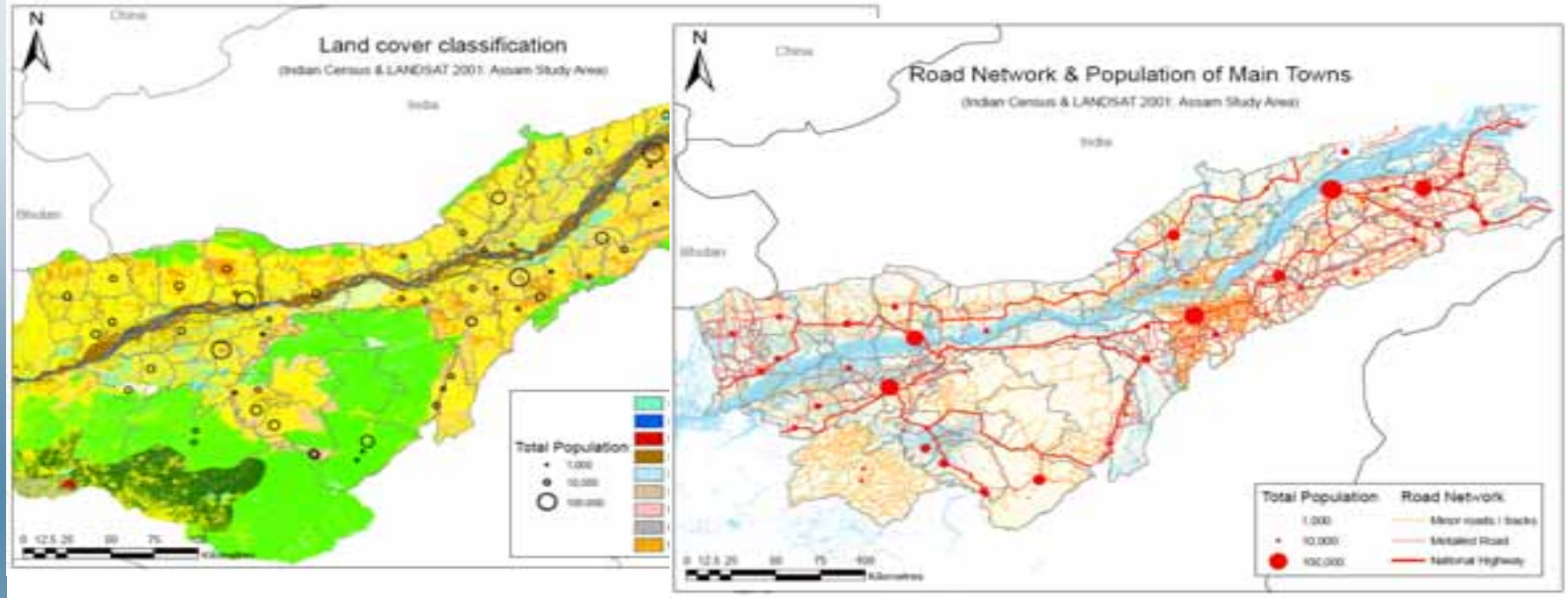


Salzach catchment
Integration: Risk Maps

Risk = f (Hazard , Vulnerability)

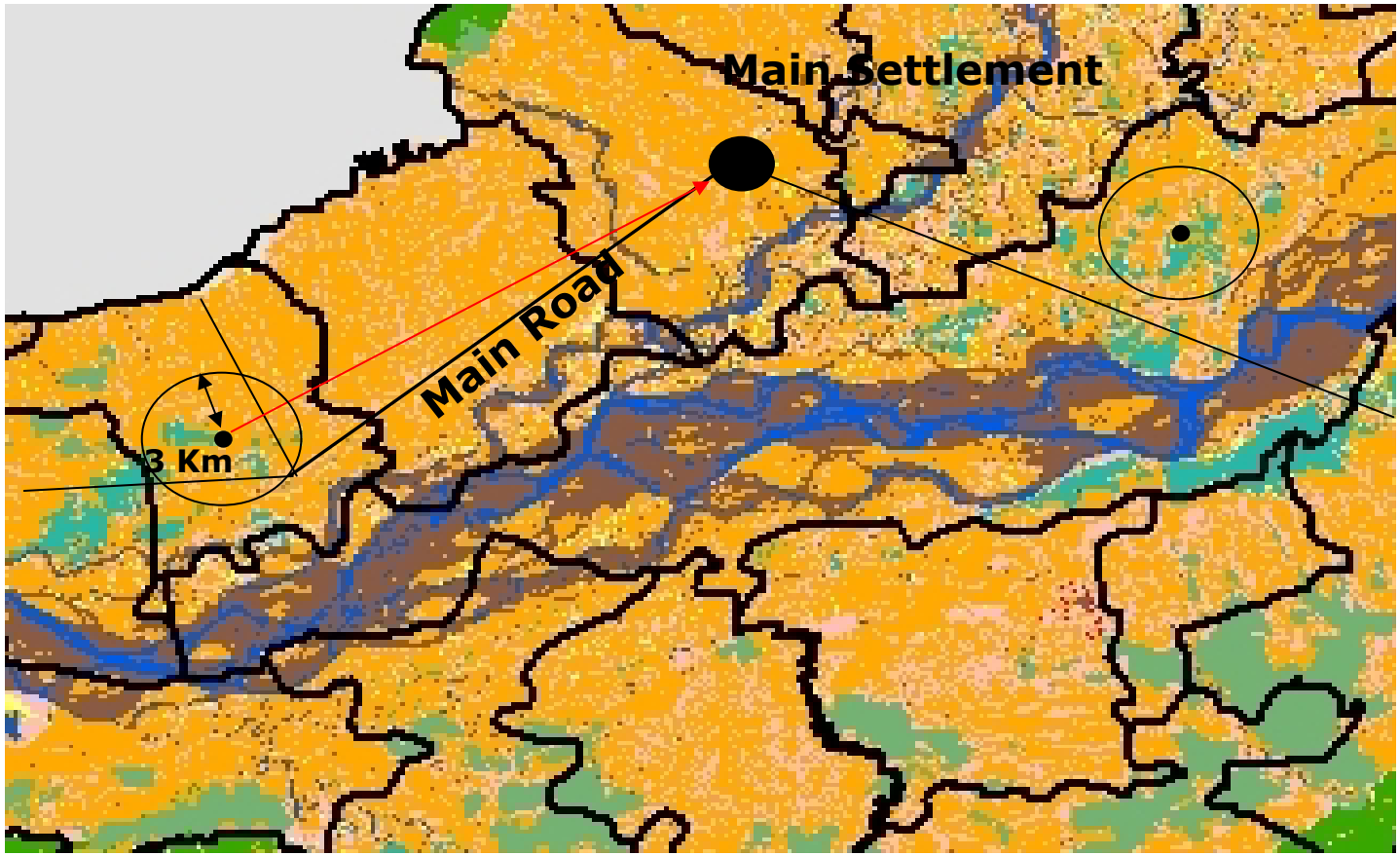


Derivation of socio-economic data from RS data



- **Domains extracted from RS data**
  - Distance metrics between objects and areas of relevance to socio-economic development
  - Land Use/Land Cover in relation to a given settlement

Derivation of socio-economic data from RS data



3 Km Buffer: road density and agricultural land use data were extracted

Participatory Approach to Domain Weightings (Delphi)

Table 17 Domain weights derived for the village/town level analysis (%)

Domains	Floods	Droughts	Bank erosion
Sensitivity			
Livelihood	25.0	26.9	27.8
Human health	21.2	18.0	15.0
Road infrastructure	12.0	6.6	14.4
Gender	10.9	12.6	9.1
Adaptive capacity			
Economic alternatives	20.7	23.4	23.5
Human resource capacity	10.3	12.6	10.2
TOTAL	100.0	100.0	100.0

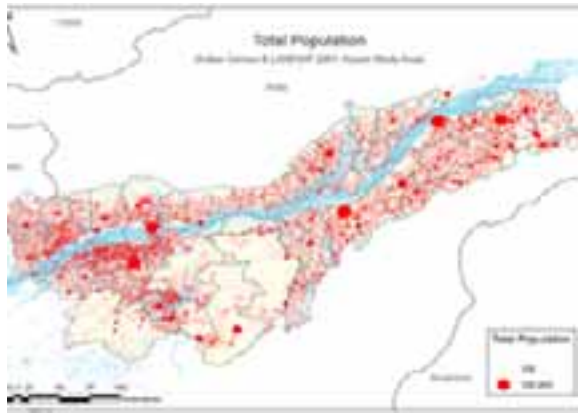
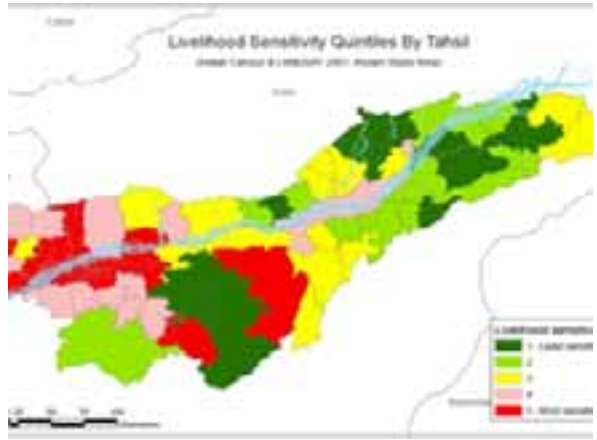


Table 18 Domain weights derived for the Tehsil level analysis (%)

Domains	Floods	Droughts	Bank erosion
Sensitivity			
Livelihood	14.0	13.9	16.0
Health	11.9	9.3	8.6
Housing and settlement	10.7	4.6	14.2
Water	17.1	20.4	10.8
Sanitation	8.2	12.4	11.1
Road infrastructure	6.1	3.4	8.3
Gender	6.1	6.5	5.2
Adaptive capacity			
Economic capacity	8.5	10.8	6.2
Economic alternatives	11.6	12.1	13.6
Human resource capacity	5.8	6.5	5.9
TOTAL	100.0	100.0	100.0

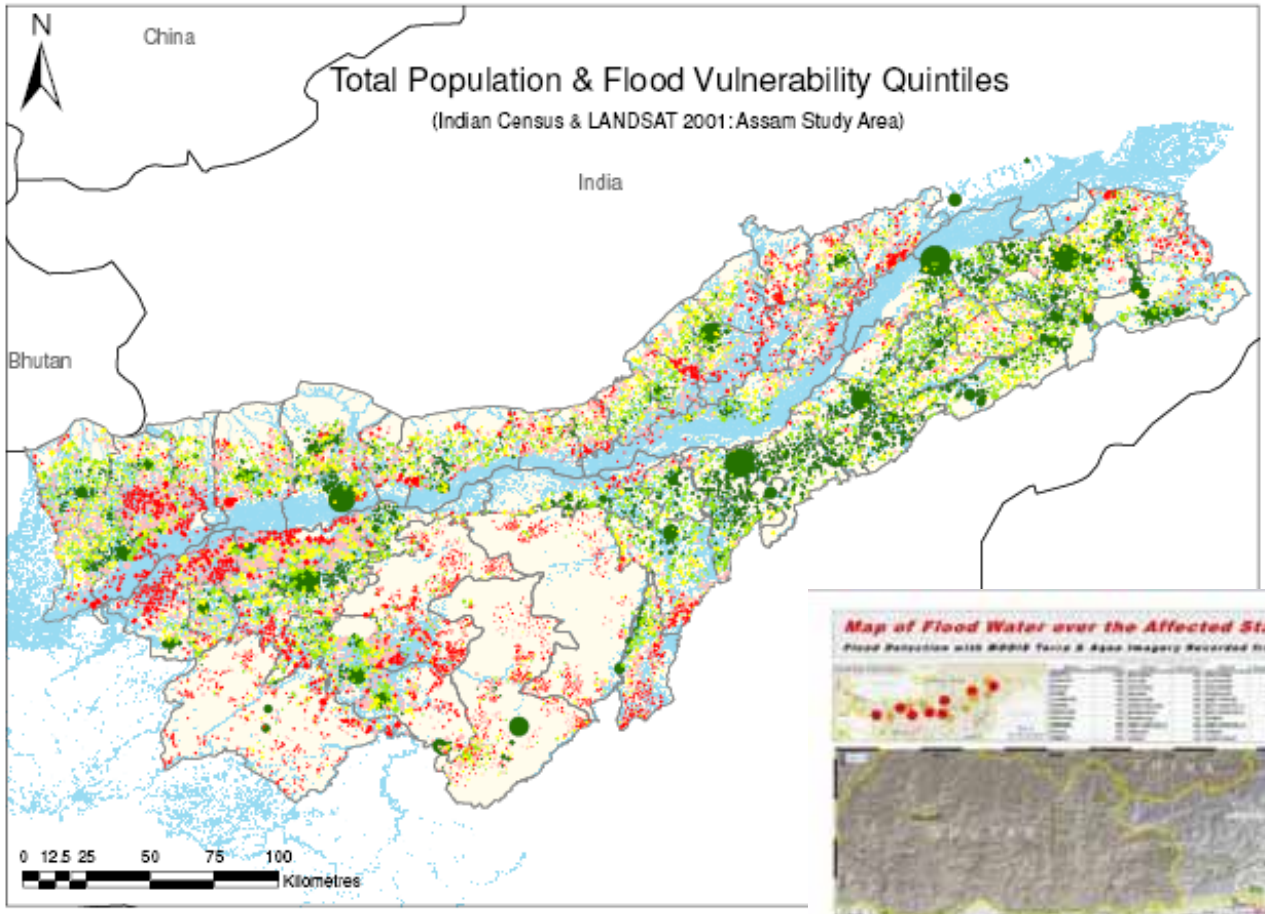


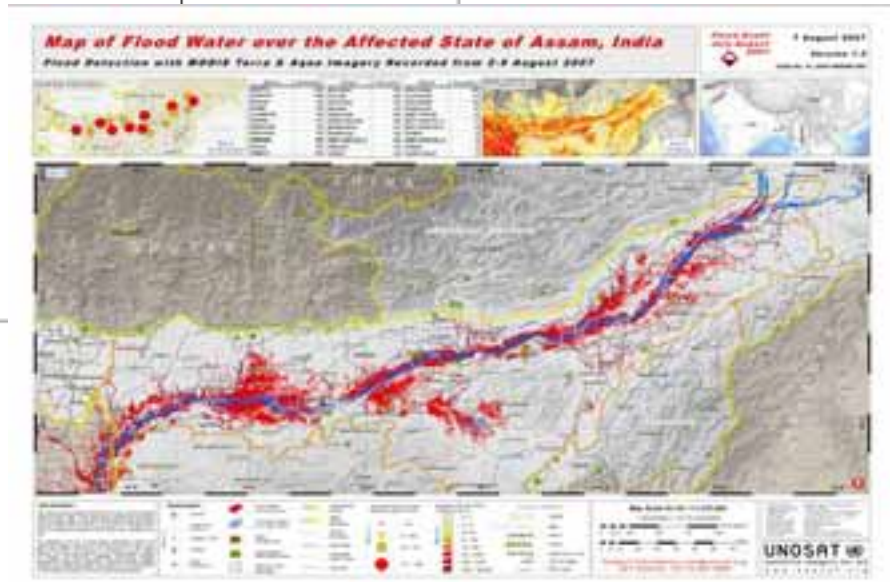
- **Multi-dimensional matrix of indicators**
  - Reduce its dimensionality
  - Indicators measured on different units

→ Avoid biasing by converted to standardised Z scores

→ Maximum likelihood factor analysis → single factor for each domain

Assam Results





Integration Land Use/Land Cover

- **'Land Cover' → properties of the Earth's surface**
  - → Invariant spatial property (background matrix)
  - → No vulnerable assets directly attached ('silent land cover')

- **'Land Use' → functional utilization of a particular subset by human activity**
  - → qualified and ranked as other assets

Constraints:

- 'no places' without any use? (esp. Europe)
- indirect functions attached to virtually any land cover → ecosystem services ('economic value')

→ Land Use/Land Cover as a one conceptual entity, with a focus on 'use' and assigning it an asset in terms of (human) vulnerability

Integration Land Use/Land Cover

- **Monitoring of LULC → operational ‚standard service‘**

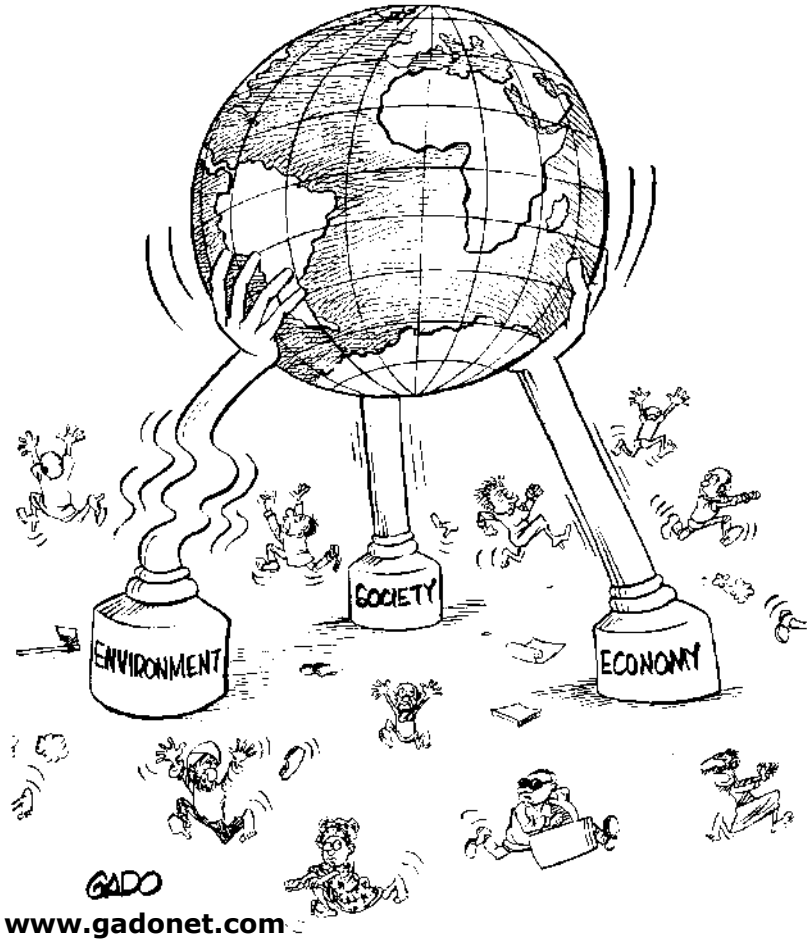
  → Socio-economic data difficult to obtain (e.g. Census surveys)
  → Comparison of Land Use vs Land Cover → easier for ‚Land Cover‘
  → Importance of LULC as vulnerability indicator
  → Knowing the importance of LULC → estimates on impacts (after flood) possible

→ **From assessment to MONITORING**

Conclusions

- **Dependency on data sources → influence the development of integrating methods**
- **Delineation of two clear paradigms**
  - EU: focus upon asset as a defining characteristic of vulnerability
  - ASIA: map of asset vulnerability is the inverse of a vulnerability map based upon community vulnerability
- **LULC as important indicator**
  - Ecosystem services
  - Assessment to monitoring
- **Integration within ‚Water Resources Response Units‘**

Thank YOU very much!



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