

Connecting micro and macro:  
bringing case studies and model-based approaches  
together in analysing patterns of vulnerability to global  
environmental change

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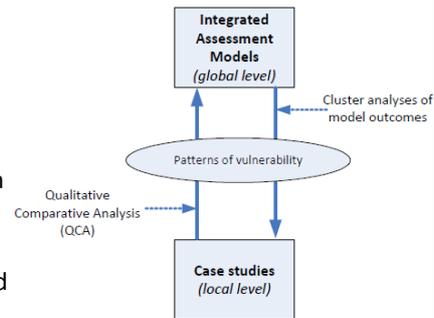
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## Research questions

1. Which causal mechanisms underlie patterns of vulnerability in drylands following a systematic analysis of local level case-studies of human-environment interactions?
2. Which patterns of vulnerability emerge out of a cluster analysis of model outcomes such as GISMO/IMAGE?
3. How can the outcomes of these analyses be synthesized and translated in possible coping and adaptation strategies and policies at intermediate level?

## Approach

- (Further) development of methodology for analysing patterns of vulnerability
- Improving GISMO model and indicator-based cluster-analysis, using model outcomes from PBL modelling framework GISMO/IMAGE
- Meta-analysis case-studies vulnerability in drylands and coastal areas, using Qualitative Comparative Analysis (QCA).
- Integrated assessment of vulnerability and possible coping and adaptation strategies drylands and coastal areas



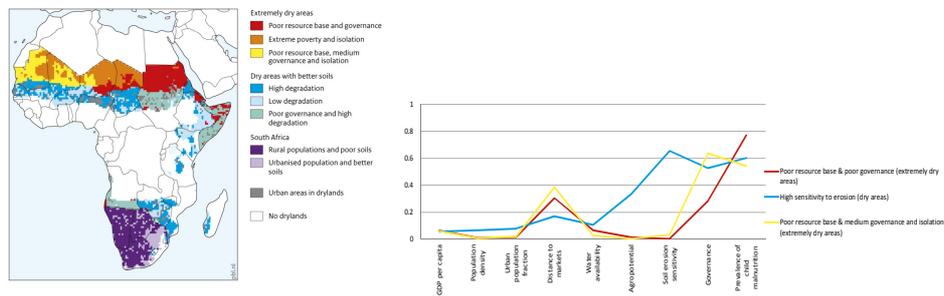
## Progress and current status

- Some delay due to personnel and personal issues
- Further focus on:
  - Drylands as main pattern of vulnerability, and Sub Saharan as most relevant region
  - Response strategies: 1) Soil-water conservation measures and 2) migration
- Main research elements:
  - A. Patterns of vulnerability (improvement and testing of methodology)
  - B. Linking migration in drylands to patterns of vulnerability
  - C. Meta analysis of case studies on SWC

## Patterns of vulnerability

- Typical combinations of sensitivity and adaptive capacity
- Methodology: Cluster analysis using global data sets (from IAMs and other databases)
- Applications to Sub-Saharan Africa (Ordoñez *et al* forthcoming, Hilderink *et al* 2012, Sietz 2011, Kok *et al* submitted)

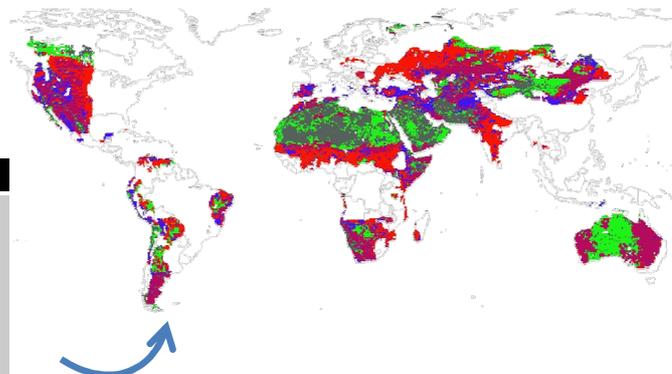
Vulnerability profiles for food security in sub-Saharan drylands



## Response strategy 1: migration

- Possible triggers and for environmental-induced migration
- Top-Down approach: Cluster analysis with global datasets (environmental and migration data)
- Linking archetypical migration pathways to patterns of vulnerability

- Indicators**
- aridity
  - precipitation
  - water stress
  - soil constraints
  - sensitivity to soil erosion
  - availability of agricultural land
  - agricultural yields
  - land degradation



## Response strategy 2: Soil and water conservation

- Understanding of conditions that favour SWC to reduce vulnerability
- Bottom-up: Meta-analysis of local and regional case studies
- Systematic inventarisation of 19 selected case studies

### Conditions for successful SWC adoption (some important examples)

- Land use rights
- Response to production decrease
- Lending quality of SWC measure
- Membership in farmers' organisation
- Social networks to access labour
- External financial assistance
- Land pressure

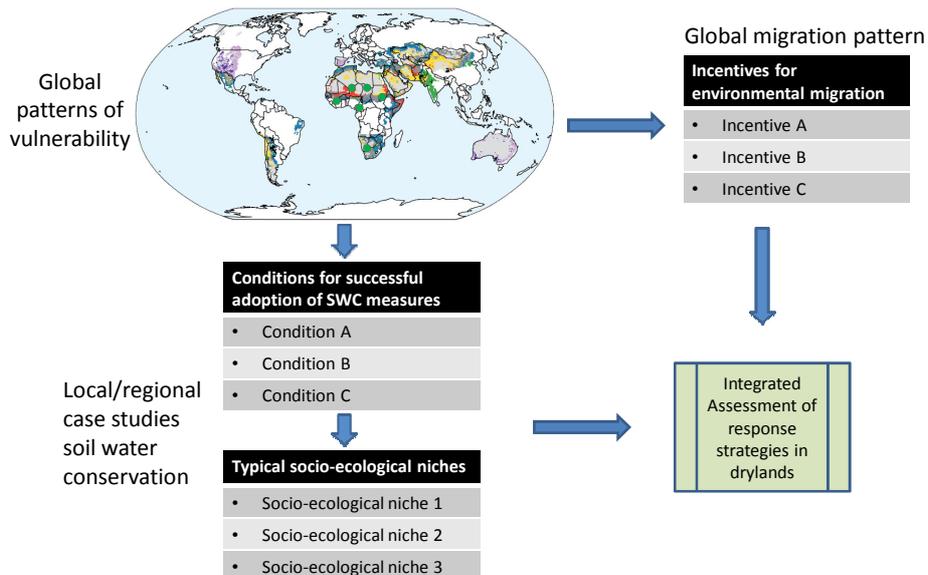
Case study knowledge →

### Typical socio-ecological niches of SWC adoption (some important examples)

| Niche   | Land tenure security | Sufficient labour availability | Good socio-cultural compatibility of SWC measures | Economic feasibility |
|---------|----------------------|--------------------------------|---|----------------------|
| Niche 1 | X                    |                                | X   | X                    |
| Niche 2 |                      | X                              | X   |                      |
| Niche 3 | X                    | X                              |   | X                    |

← Aggregation

## Synthesis: Multi-scale approach



## Outlook

- Main challenge: How to link socio-ecological niches with patterns of vulnerability and migration incentives at global scale?
- Foreseen output: several papers (e.g. on environmental drivers of migration, meta analysis of SWC case studies, synthesis)
- Scientific value and contribution to broader debate
  - Integration across scales: up-scaling of findings from case study analysis to complement/refine global modelling of vulnerability and adaptation options
  - Insights in crucial socio-ecological conditions for SWC adoption in western Africa, transferable to similar vulnerable situations