Environmental change and human migration: A vicious cycle?

MigSoKo – Junior research group

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FONA Forschung für Nachhaltige Entwicklung BMBF

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Umweltflüchtlinge: "Irgendwann kommen nicht nur ein paar Boote, sondern Millionen"

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POLITIK WEGEN ERDERWÄRMUNG

Regierung fürchtet 200 Millionen Klimaflüchtlinge

Wie mit den Flüchtlingen umgehen, die nach Deutschland kommen? Innenminister de Maizière fordert europäische Kontingente. Entwicklungsminister Müller warnt vor dem Klimagipfel vor einer Katastrophe.

Klimaflüchtlinge

Millionen Menschen verlassen ihre Heimat

Der Klimawandel als Begründung fürs Bleiberecht – Neuseeland hat gerade zum ersten Mal einer Familie erlaubt, zu bleiben, weil die beiden kleinen

WISSEN UMWELT

Klimawandel treibt mehr Flüchtlinge nach Europa

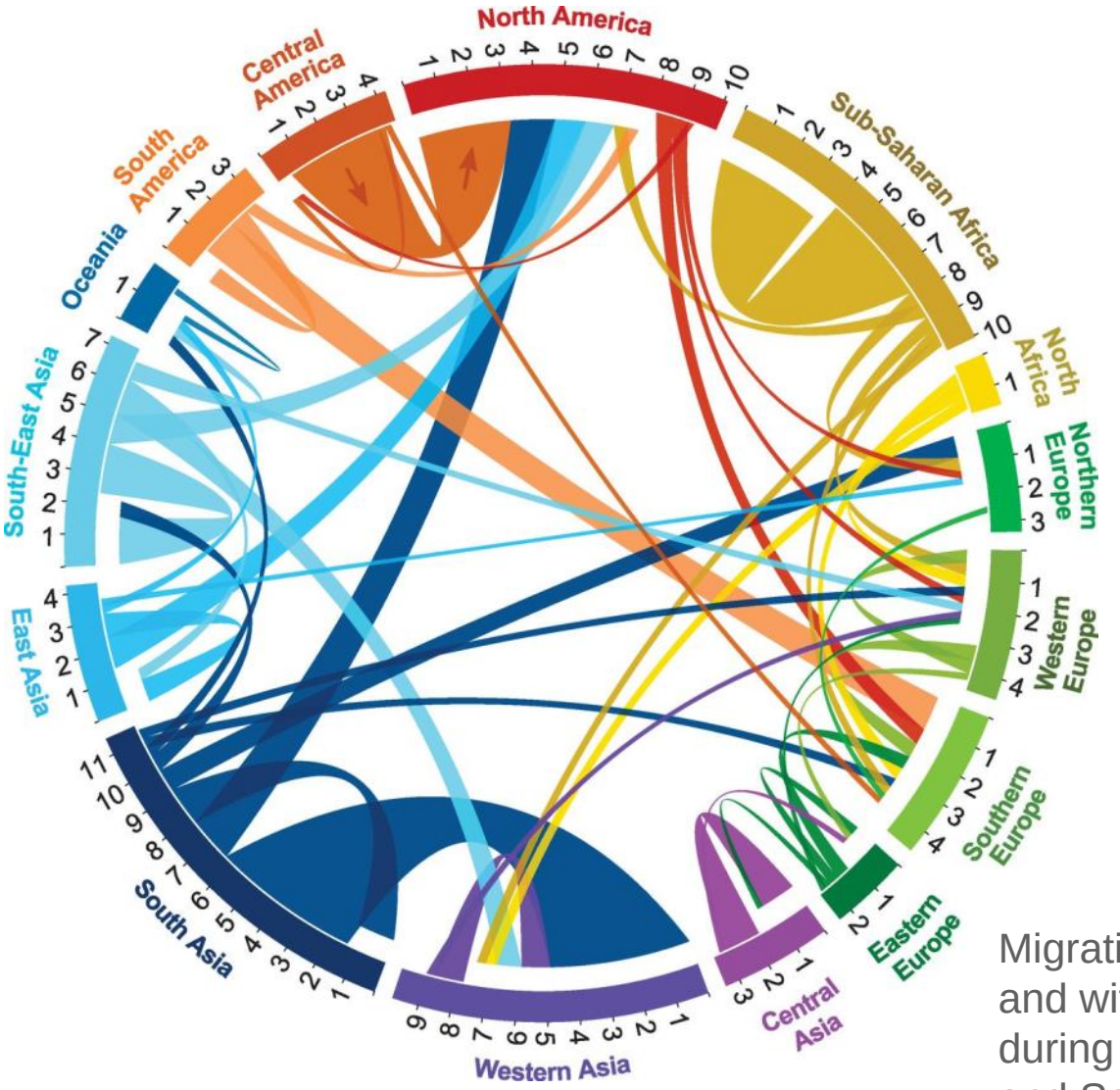
Der Klimawandel treibt nach Meinung von Umwelt-Vordenkern immer mehr Flüchtlinge nach Europa. Politiker würden eher von Wahl zu Wahl denken und so die Probleme nicht lösen.

Prognose

Deutschland müsste sechs Millionen Klimaflüchtlinge aufnehmen

Forscher warnen vor beispiellosen Flüchtlingswellen wegen des Klimawandels. Doch wer soll die geschätzten 200 Millionen Menschen aufnehmen, die bis zum Jahr 2035 ihre Heimat verlassen müssen? Eine Umweltstiftung hat die Folgen für Deutschland hochgerechnet.

Age of migration



Migration flows between and within world regions during 2005 to 2010, (Abel and Sander, 2014)

Environment-driven migration

- Reasons for out-migration: conflicts, society, economy, lifestyle
- Challenge: role of the environment
- Environmental change as potential threat to livelihoods

Migration-driven environment

- Deforestation
- Land degradation
- Climate change

Environmental change and migration: A vicous cycle?

MigSoKo Junior Research Group

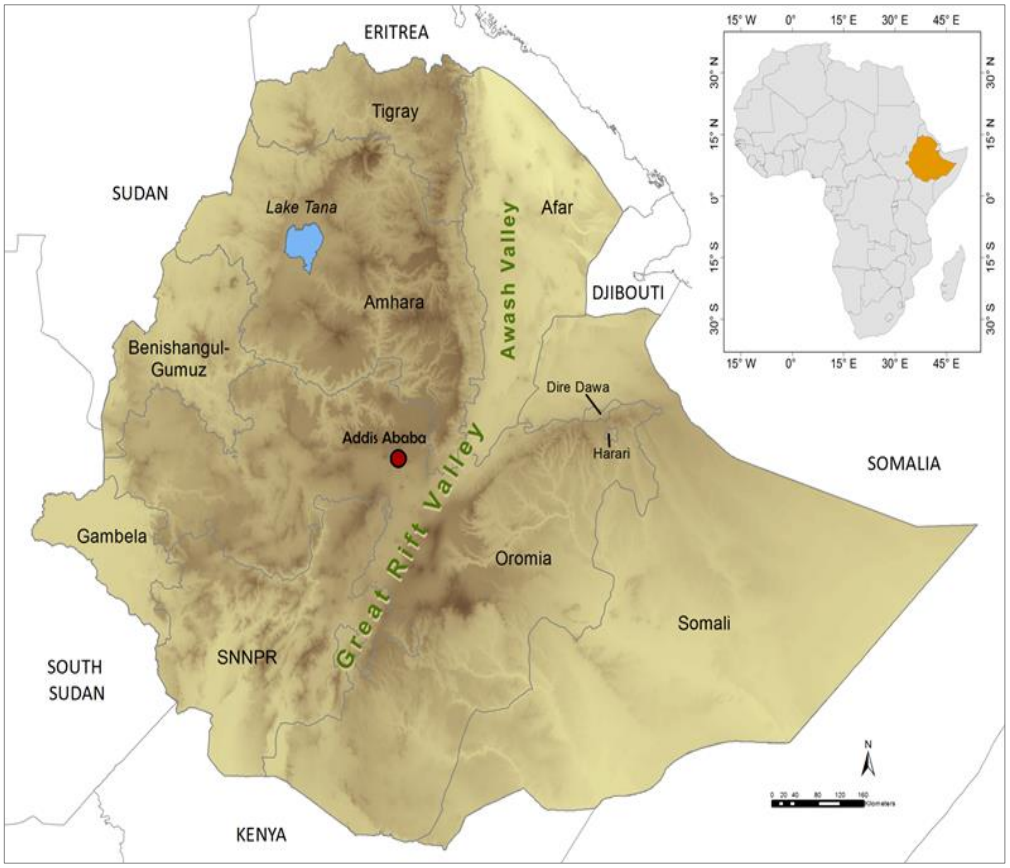
- BMBF funding priority socio-ecological research (SÖF)
- Budget: 1.5 Mio. Euro (BMBF+UFZ)
- Project lead+ 2 PhD‘s + 1 Postdoc
- + 1 project assistance
- Duration: 07/2016 – 06/2021
- UFZ, Department Landschaftsökologie (CLE)

Research objective

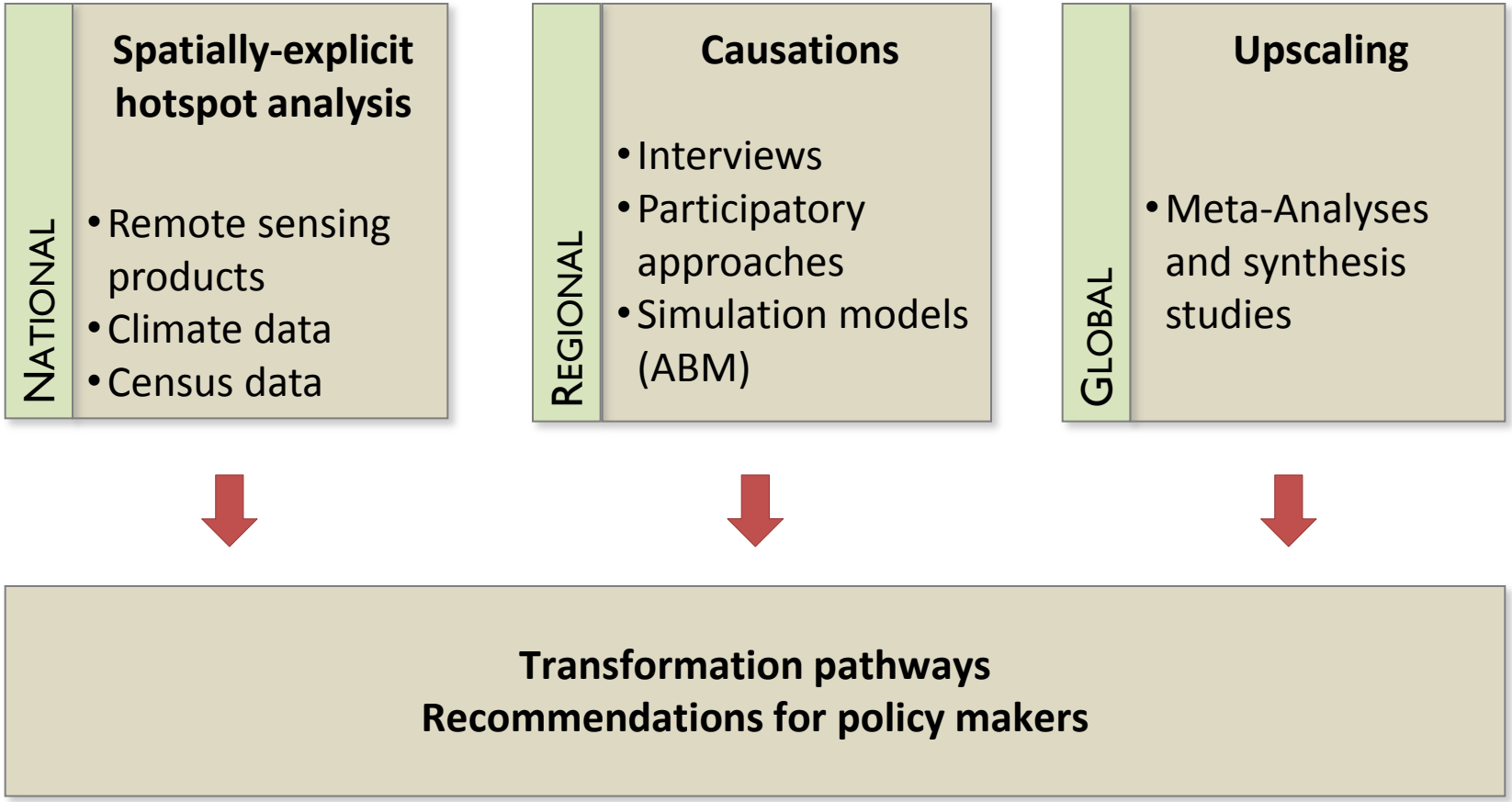
Disentangle the relationships between environmental change, population pressure, human migration, and environmental impacts of migration.

Case study Ethiopia

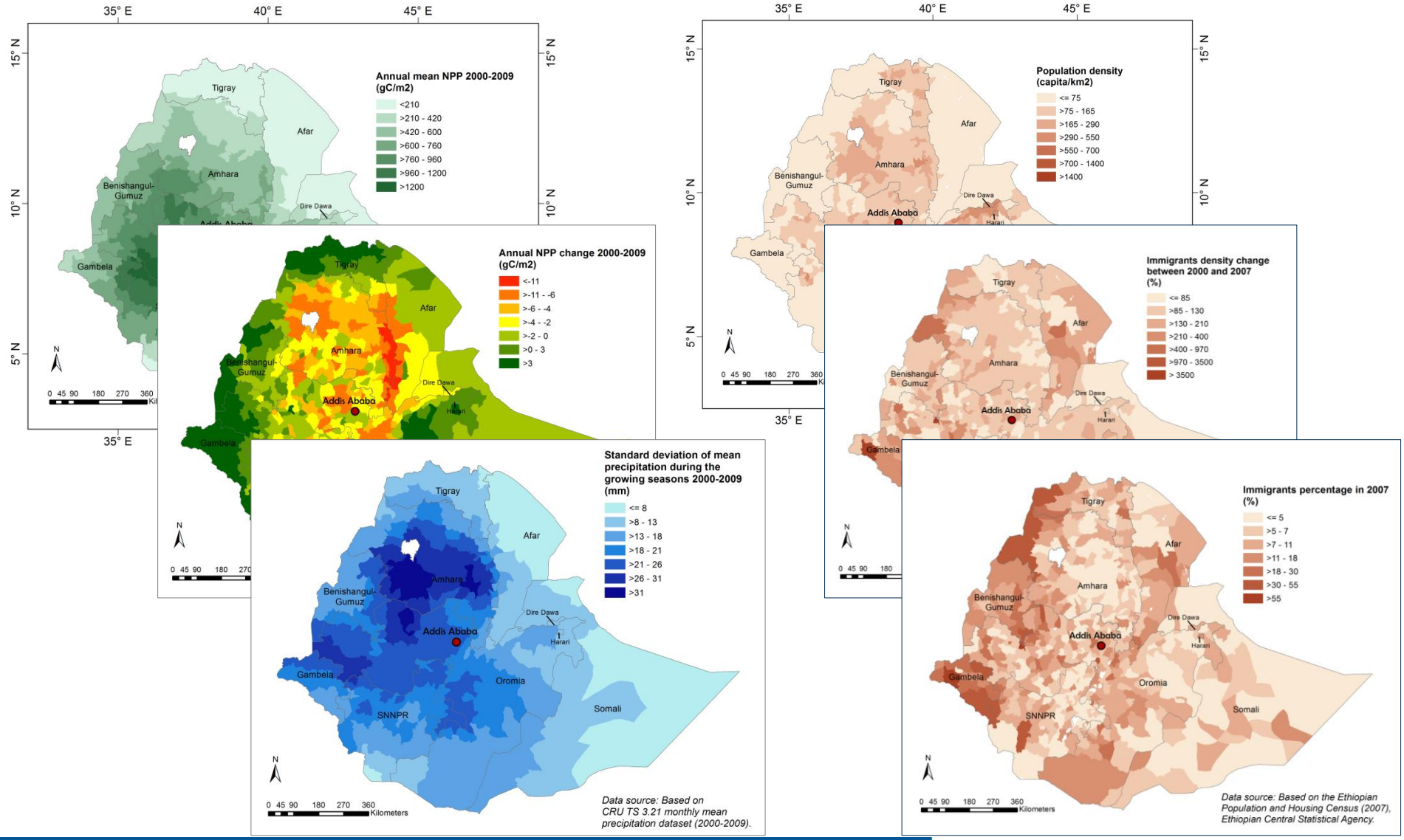
- Rainfall: -20%
- Droughts: >40 million AP since 2000 (2015/2016!)
- Substantial warming
- Land degradation and deforestation
- Food insecurity
- Rapid population growth and migration



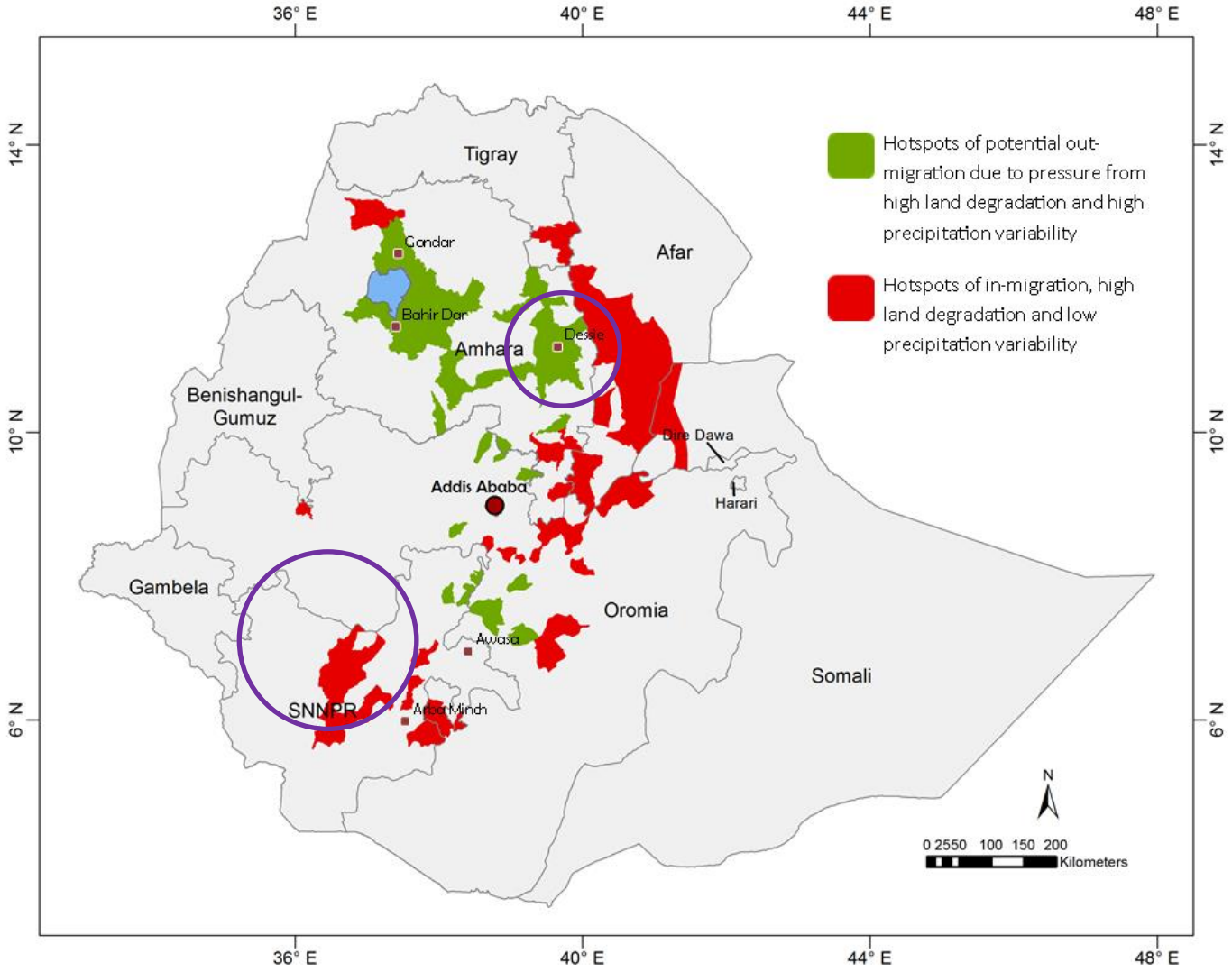
MigSoKo – Methodological approach



Hotspots of socio-ecological pressure

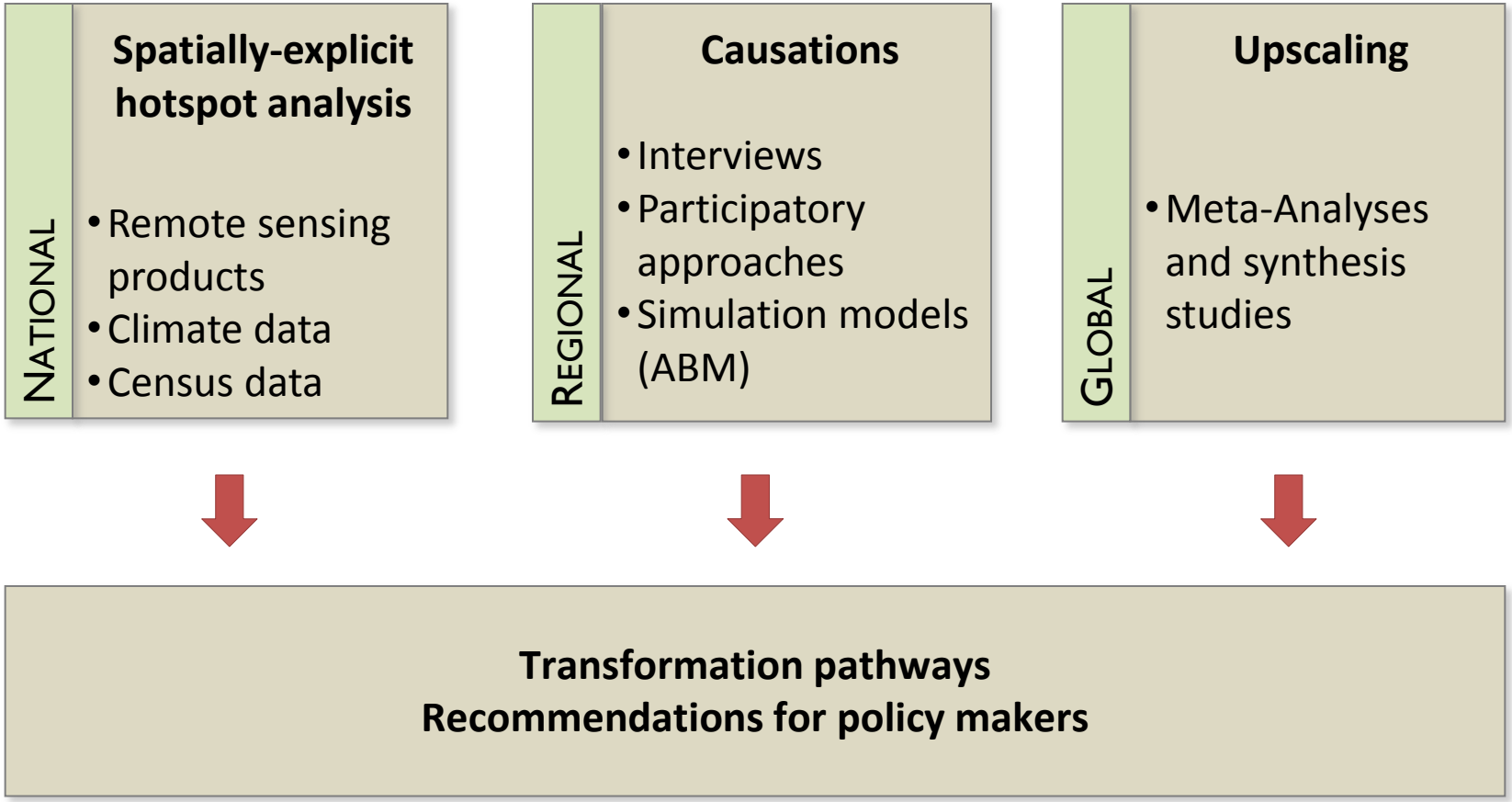


Hotspots of socio-ecological pressure



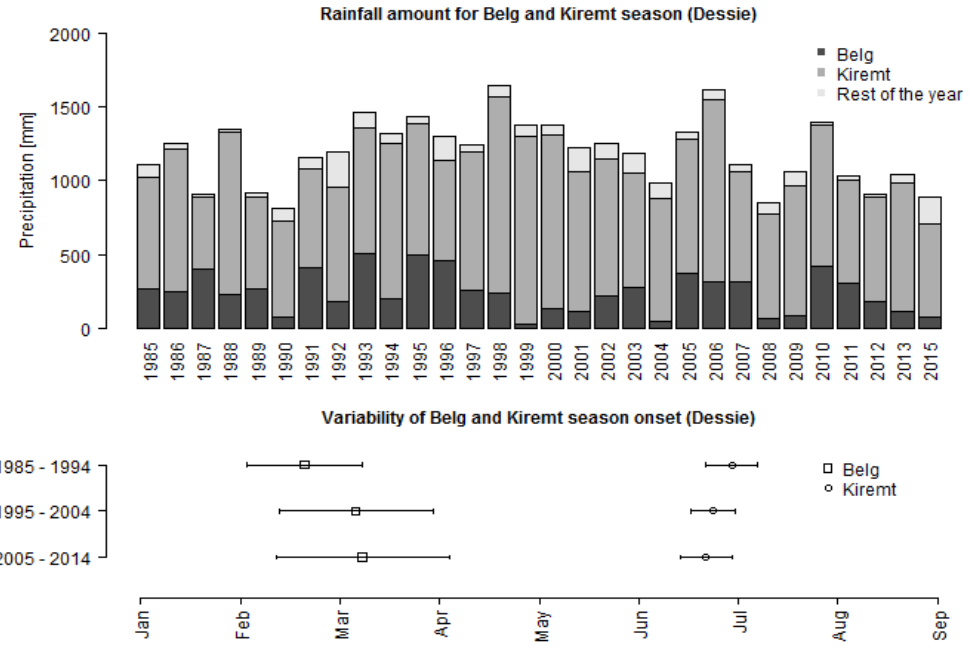
Hermans-Neumann, et al. (2017), *Regional Environmental Change*

MigSoKo – Methodological approach



Case study: South Wollo, Northern Ethiopian Highlands

- Altitude: 1400-3700masl (high agro-ecological heterogeneity)
- Mixed subsistence, rainfed agriculture
- ⌀ land size: ~ 0.5ha
- ⌀ household size: 5-6
- Bimodal rainfall pattern and increasing variability, especially for belg onset



Research design local case study

- Multi-site approach (8 villages, 3 agro-ecological zones)
- Quantitative Household Survey (n=313), 2016
  - 2015 drought (impacts, responses),
  - Land use, management, land productivity,
  - Livelihoods, strategies,
  - Migration
- Qualitative approach, 2017
  - Interviews with regional experts (n=6)
  - Focus Groups within villages (n=18)
  - Household interviews (n=42)
  - Interviews with returnees (n=20)
  - Qualitative Comparative Analysis (QCA)

Drought

Non-Drought

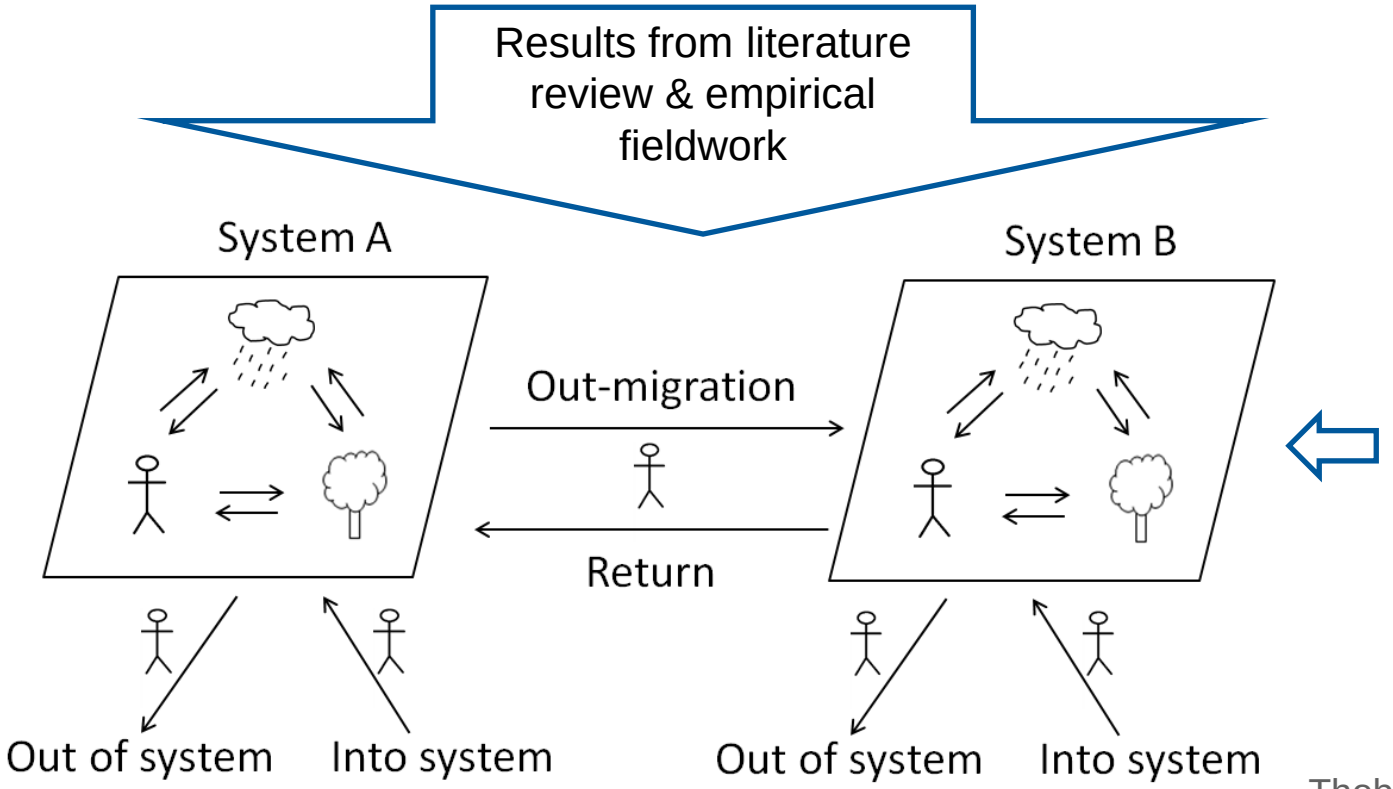
Results local case study I

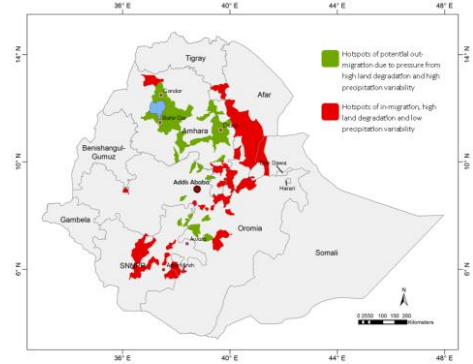
- Migration as rule, not as exception
- Migration as important livelihood strategy (adaptation) in all agro-ecological zones
- Under normal conditions, more diversification options through usage of additional rainy season or available activities outside agriculture enable migration
- Social factors are key to migration decisions

Results local case study II

- Agro-ecological conditions cause unequal socio-economic impacts of rainfall variability and drought, and as such shape the decision to migrate or to stay
- In drought situations, migration as important strategy to cope with risks (belg season dependency)
- Importance of the local context in migration processes

An ABM of Human Migration in Ethiopia





Thober, et al. (2018), *Ecology & Society*

Aim of the model:

- study interplay of multiple migration drivers
- study social-ecological impacts of environmentally-induced migration

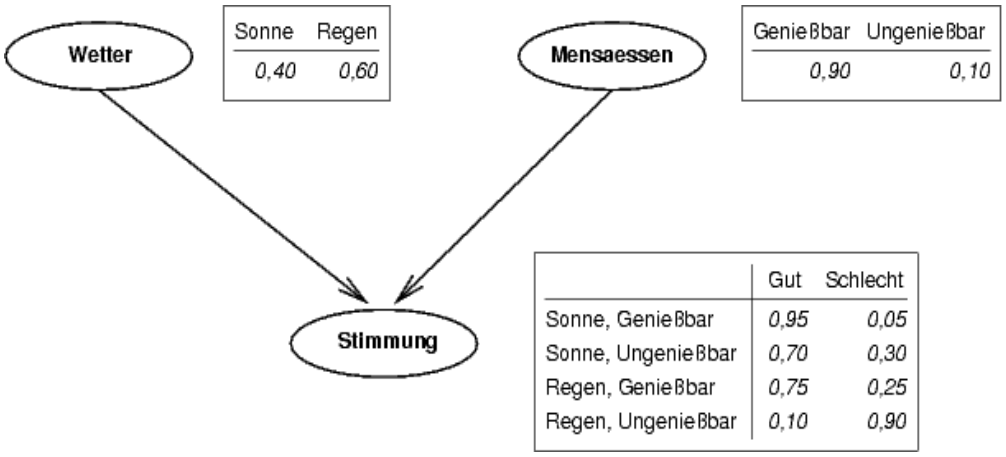
Bayesian networks (BNs) to model human decisions

Probabilistic model consisting of

- Directed acyclic graph of nodes (i.e. variables) connected by edges (i.e. statistical relationships between two variables)

BNs enable us to…

- model complex systems of many variables in an efficient way
- explicitly adress risk and uncertainties



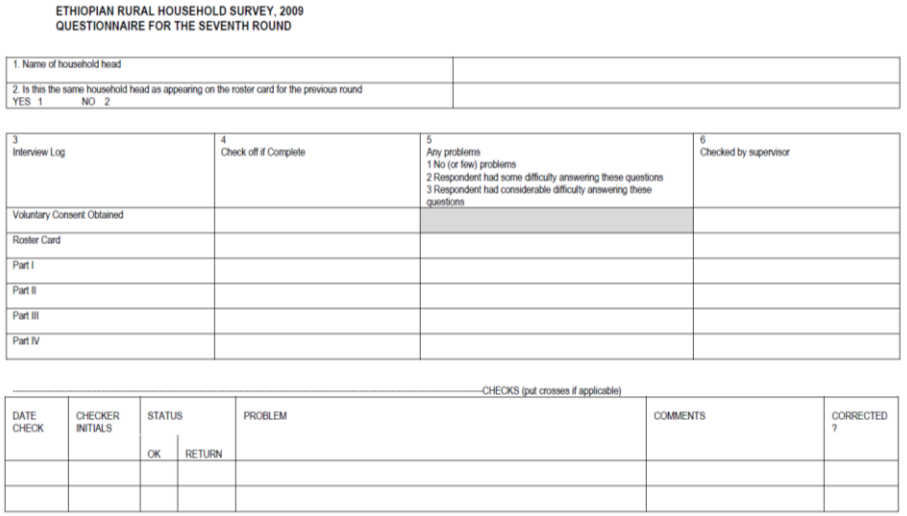
Quelle: Wikipedia

Developing a BN to model human migration decisions in the Ethiopian highlands

Influence factors of out-migration (based on 18 published empirical studies):
Age at migration
Sex
HH size
Farm size
Social dependency
Poverty
Looking for work
Number of livestock unit (TLU)
Food security

→ used to set-up network structure

To be combined with survey data:



ETHIOPIAN RURAL HOUSEHOLD SURVEY, 2009
QUESTIONNAIRE FOR THE SEVENTH ROUND

1. Name of household head	
2. Is this the same household head as appearing on the roster card for the previous round YES 1 NO 2	

3 Interview Log	4 Check off if Complete	5 Any problems 1 No (or few) problems 2 Respondent had some difficulty answering these questions 3 Respondent had considerable difficulty answering these questions	6 Checked by supervisor
Voluntary Consent Obtained			
Roster Card			
Part I			
Part II			
Part III			
Part IV			

CHECKS (put crosses if applicable)

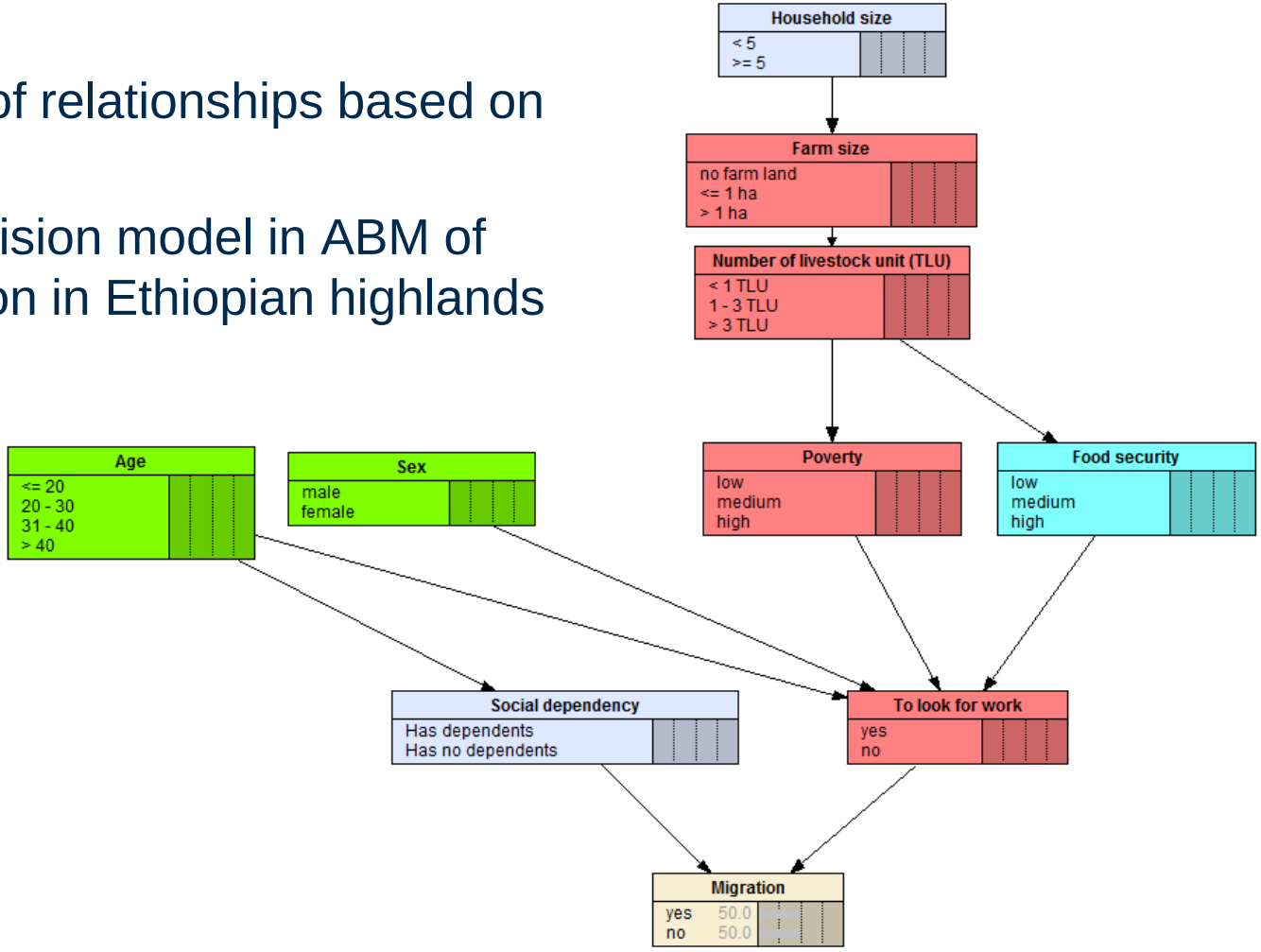
DATE CHECK	CHECKER INITIALS	STATUS		PROBLEM	COMMENTS	CORRECTED ?
		OK	RETURN			

→ used for training BN and quantifying the relationships

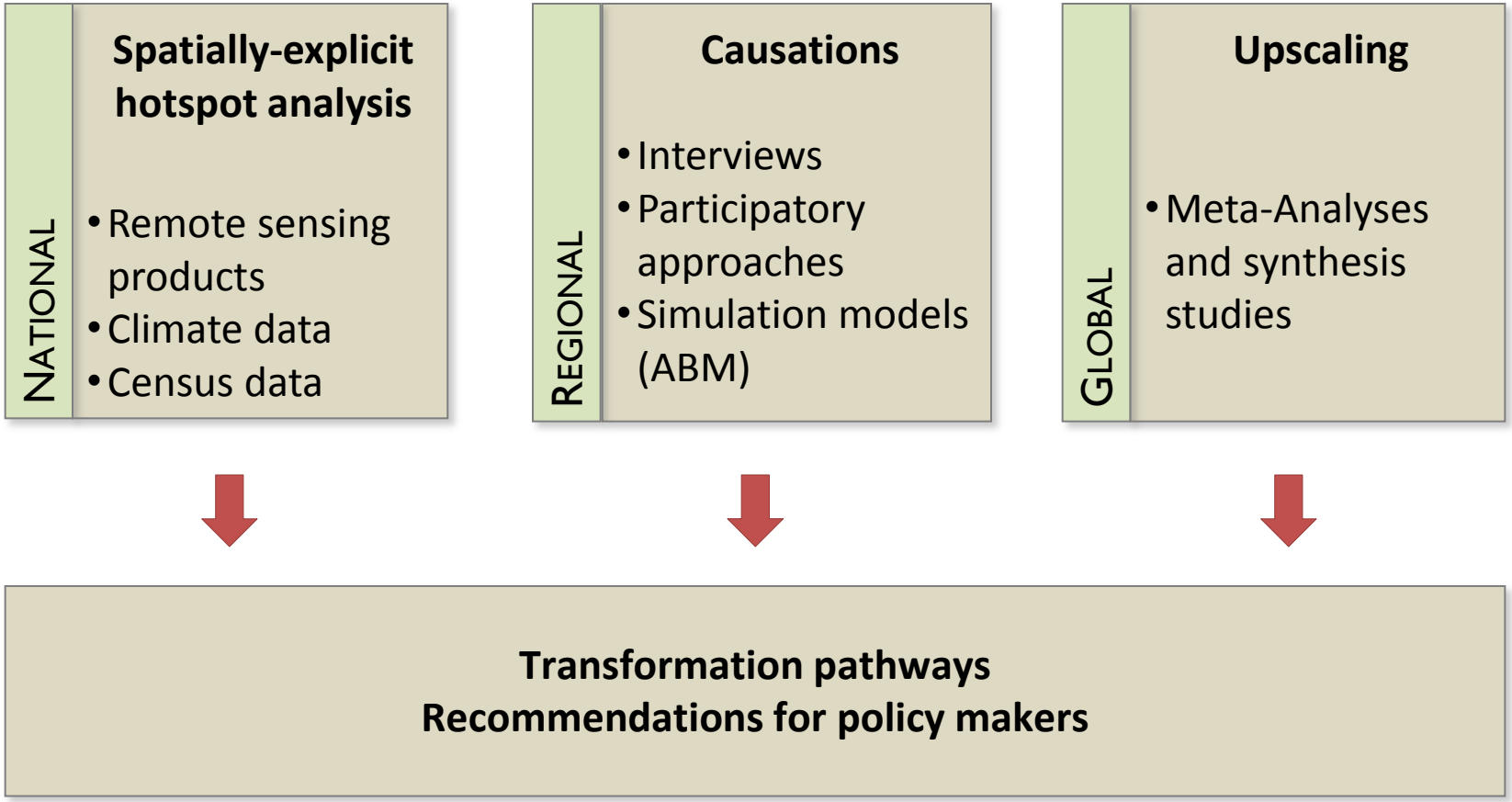
Developing a BN to model human migration decisions in the Ethiopian highlands

Next steps:

- Quantification of relationships based on EHRS survey
- Use BN as decision model in ABM of human migration in Ethiopian highlands



MigSoKo – Methodological approach



Methodological Approach

I. Systematic literature search

- In Web of Science (June 2017)
- Scientific literature in peer-review journals

II. Study selection

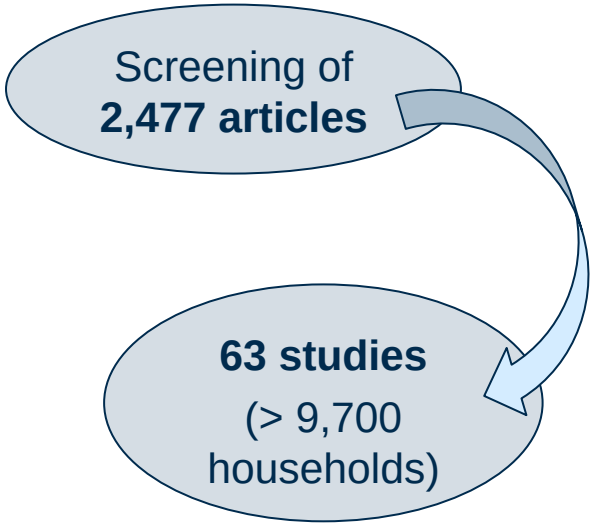
- based on formal eligibility criteria

III. Reading, data collection & coding

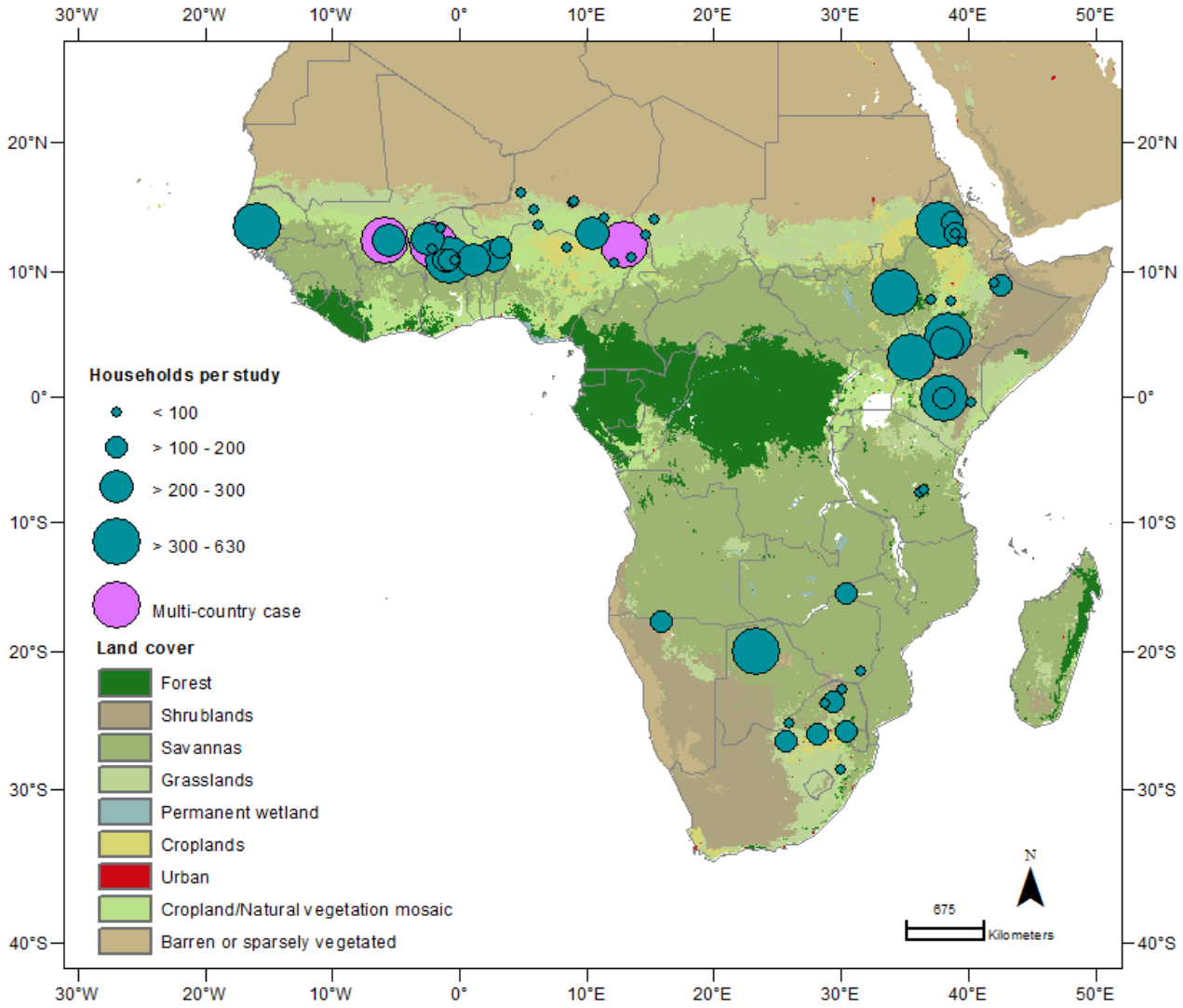
- Qualitative content analysis in Atlas.ti

IV. Statistical analysis & intepretation

- frequency distribution in R



Sample of Studies



63 studies in 16 countries

Central: 3

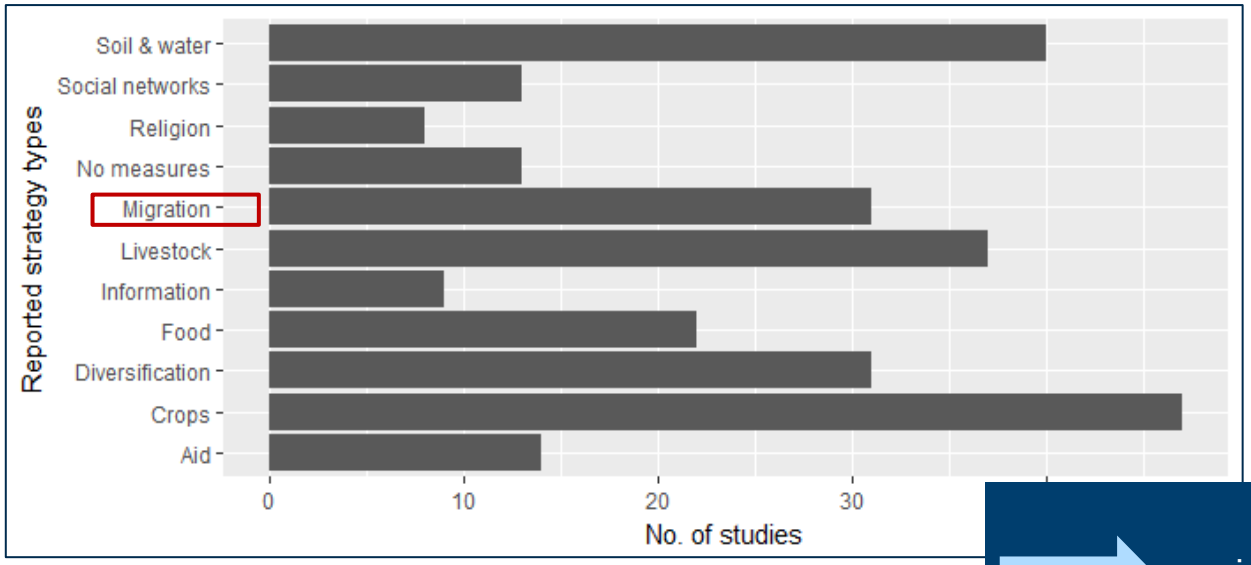
East: 20

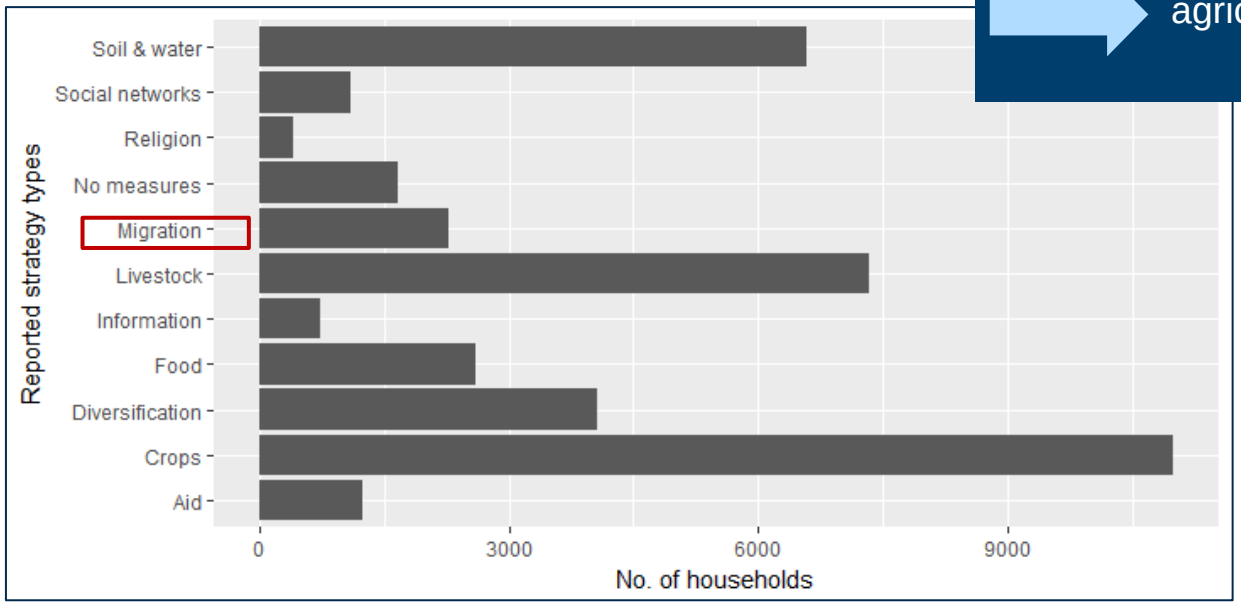
West: 29

Southern: 11

Wiederkehr, et al. (2018), *Environmental Research Letters*

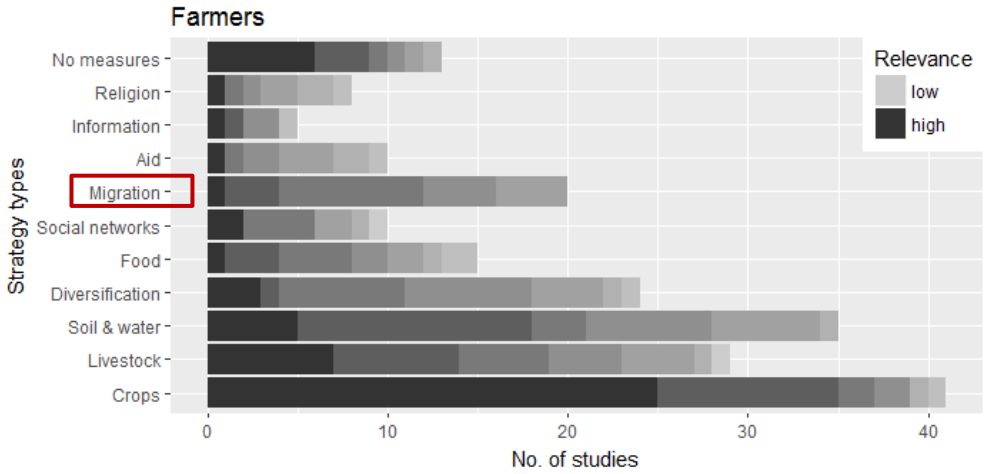
Results: Household strategies



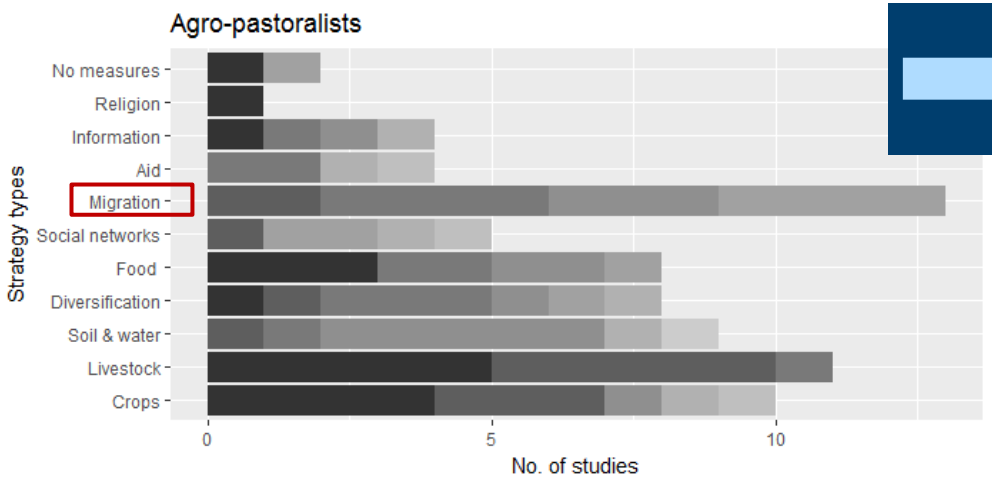


agricultural character of livelihoods

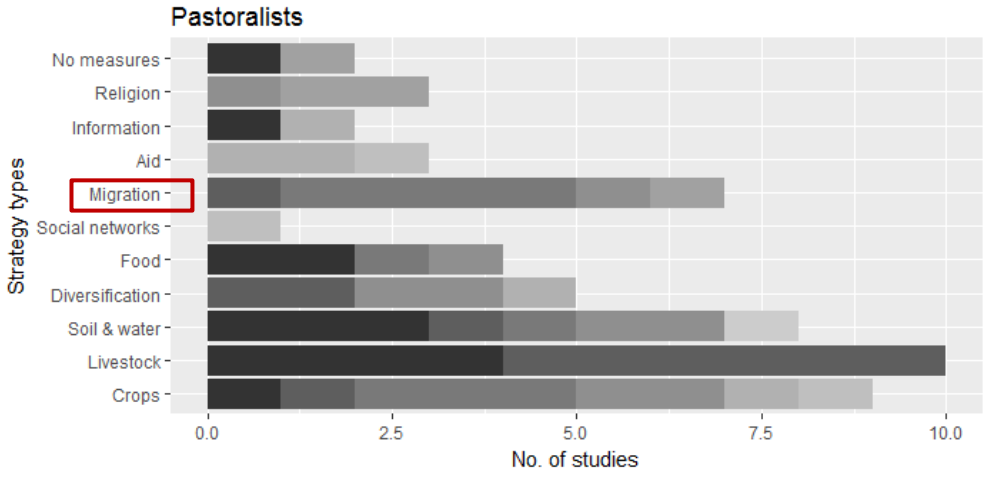
Wiederkehr, et al. (2018),
Environmental Research Letters



ranking approach based on frequency of adoption of each strategy relative to other strategies per study!



when migration is used as a strategy it is usually not the most common among households



Wiederkehr, et al. (2018), *Environmental Research Letters*

Take home message

- Environmental change and migration: no simple relationship (non-linear, multi-causal)
- Environmental change is likely to lead to more migration, but how much?
- People moving as consequence of environmental change typically do so within national borders
- Migration as important adaptation and coping strategy → mainly ignored so far
- Still big data gaps!