Agent Based Models (ABMs)

Dom Kniveton and Chris Smith – University of Sussex

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Agent Based Modelling

• Involves treating households or individuals as agents.
• Assumes agents interact with each other to produce non-linear outcomes
• Space is crucial to these interactions and the agent's positions within that space are not fixed.
• The population of agents is heterogeneous.
• The agents exhibit complex behaviour such as learning and adaptation
Smith et al 2009, Modified from Grothmann and Patt (2005)
Attitude Toward Act or Behavior

Subjective Norm

Perceived Behavioral Control

Behavioral Intention

Behavior

Source: Ajzen (1991)
Kniveton et al 2012. Emerging migration flows in a changing climate in dryland Africa. Nature Climate Change, 10.1038/NCLIMATE1447
Migration and climate in Burkina Faso

- Population of 15 million.
- North-South rainfall gradient.
- Long characterised by mobility, historically to coastal plantation economies of Côte d’Ivoire and Ghana.
- Migration is mostly seasonal with family members returning home to farm their own land for the wet season (October - April).
- Internal migration is very common, mostly directed towards the wetter southwest of newly found goldmines.
Household migration behaviour

Drivers of migration

Mass migration flows

Impacts

Feedbacks
Kniveton et al 2012. Emerging migration flows in a changing climate in dryland Africa. Nature Climate Change, 10.1038/NCLIMATE1447
Probabilities of migration from the Sahel region for different rainfall conditions

Age: 15-20 years

Gender: Male

Marital Status: Married
General probability of type of individual to migrate e.g. 15-20 yr old, single male.

Aggregate migration of community

Probability of individual to migrate with particular social network

Probability of individual to migrate with particular social network & asset base

Probability of migrating

No. of social network who have migrated
Conclusion

• An examination of the wider literature on decision-making outside of that concerning migration however highlights the importance of both conscious and non-conscious processing as well as the role of the social identity, the stage of change, social discourse, risk assessments, past experiences, emotions as well perception of behavioural and self-efficacy and subjective norms (for example see Grothmann and Patt 2005, Kuruppu and Liverman 2011, Beratan 2007, Damasio, 1996).

• Consideration of these variables opens up the study of climate-migration beyond the goal of producing projections of migration futures to question the nature of changing behaviour in the context of environmental and climatic change

• ABMs provide a means to explore emergent migration behaviour, test theories of decision making and derive heuristics around migration futures under certain assumptions
Ways forward?

• Do we really want to produce projections?
• Should we instead be testing theories about how people react to climate stresses and shocks and policies to manage these?
• Work of Cai et al 2016 & Cattaneo and Peri 2016 and project forward – i.e. using analog of annual temperature variability to understand mean changes
• ABMs based on country, livelihood climate stressor specific behavioural rules i.e. what would go do if...
• Combine above to explore how economic relationship is a function of previous migration and opening on new routes given heuristic of proximity (Cattaneo and Peri)