

**DEltas, vulnerability and Climate Change:
Migration and Adaptation (DECCMA)**

**Simulating Migration in deltas:
(early) insights from the DECCMA Project**

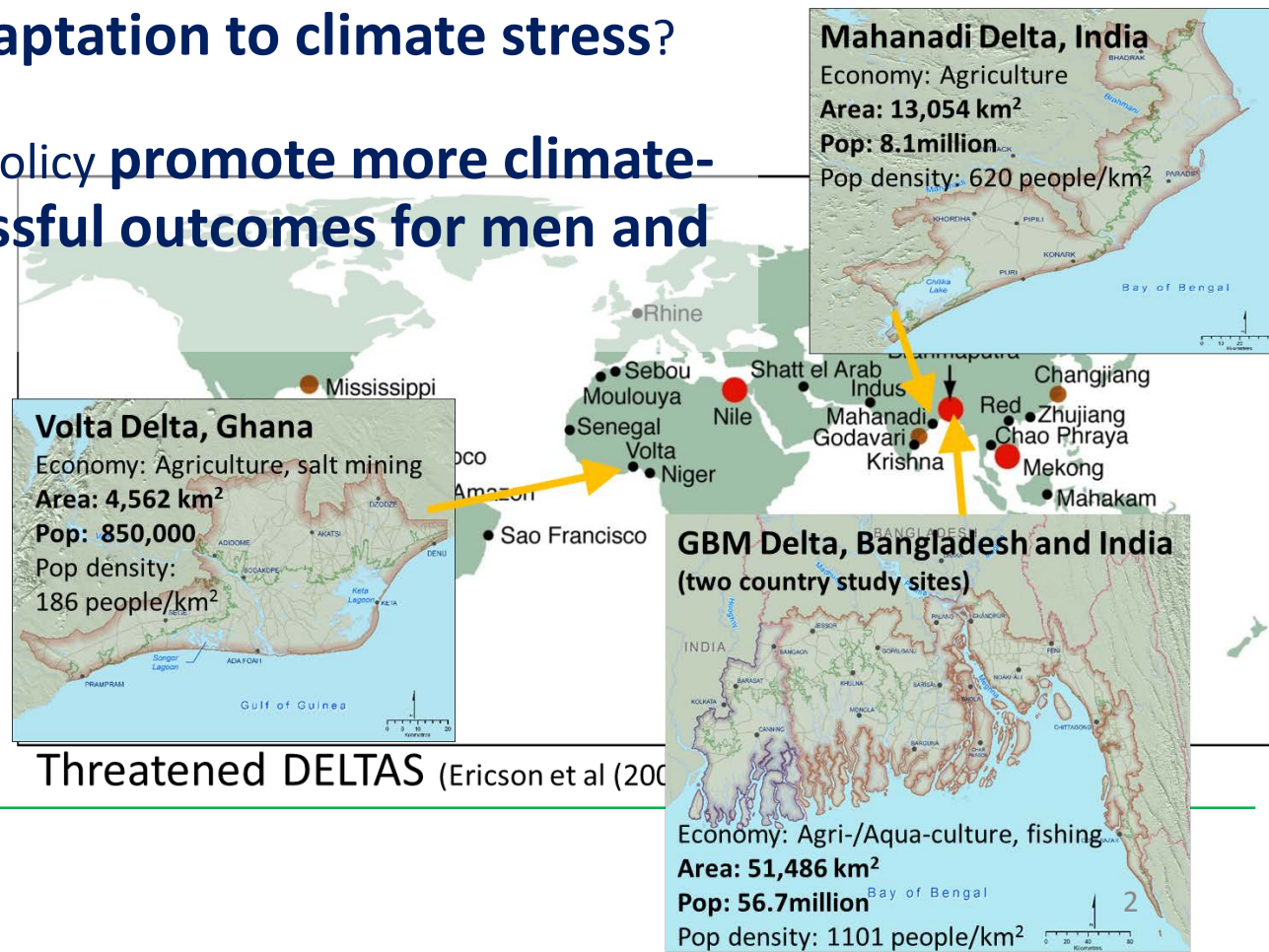
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R.J. Nicholls, H. Adams, R. S. De Campos, M. Abu, S. Das, M. H. Rocky

DEltas, Vulnerability and Climate Change: Migration and Adaptation (DECCMA, 2014-18)

www.deccma.com

Key research questions:

1. What are the **advantages and disadvantages of Migration as an adaptation to climate stress?**
2. How can government policy **promote more climate-resilient and successful outcomes for men and women** in the delta?

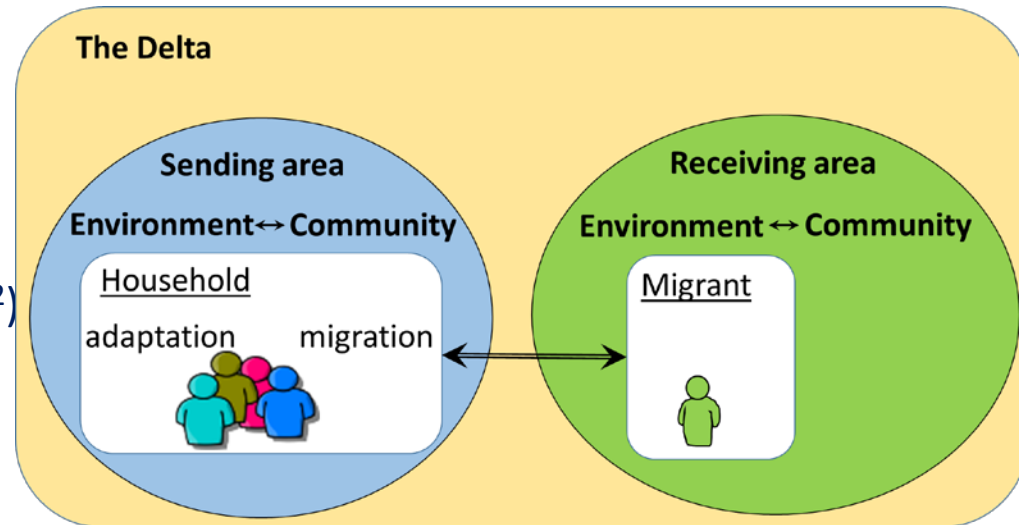


Threatened DELTAS (Ericson et al (2008))



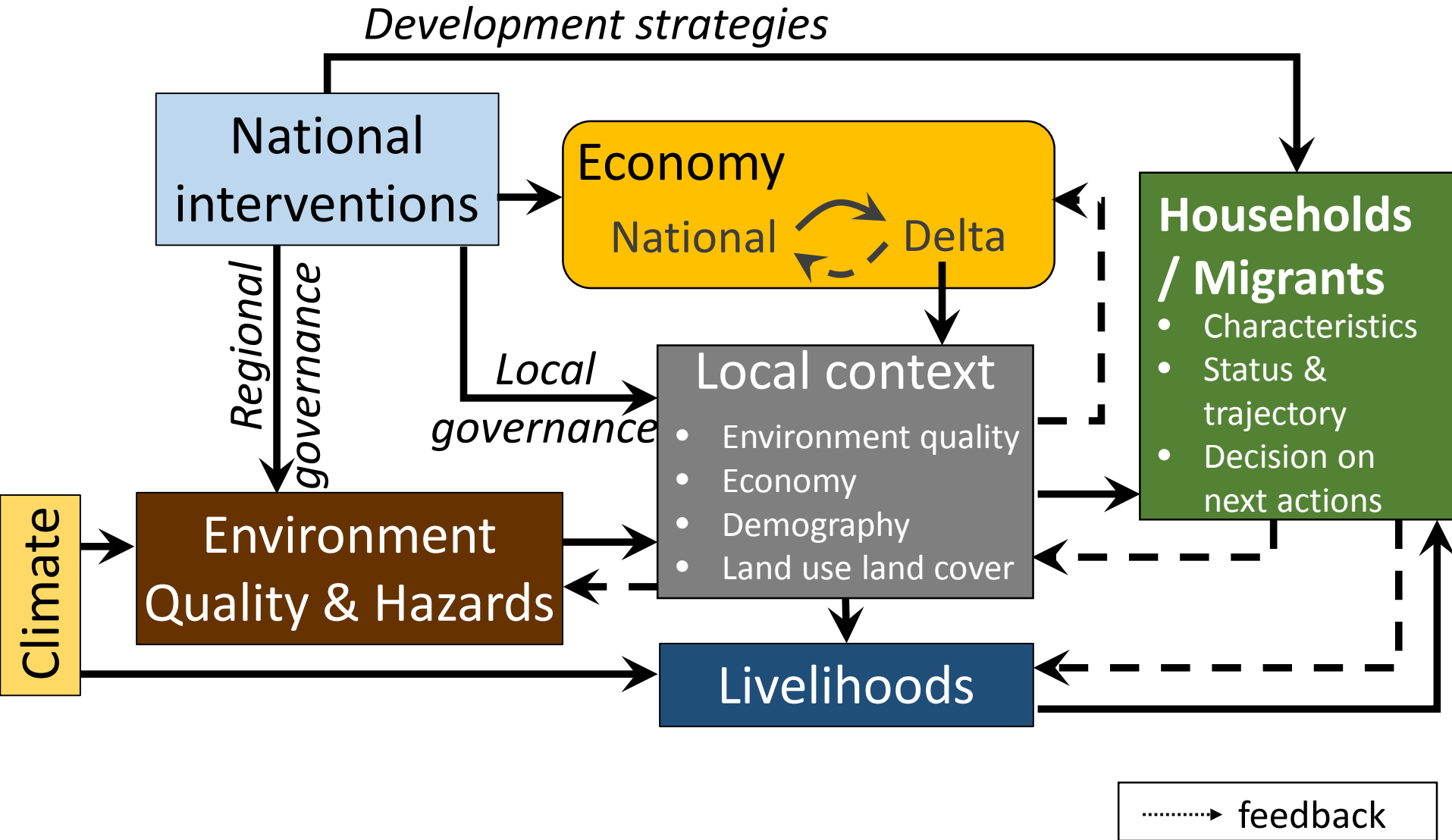
Integration within DECCMA

- to develop a **quantitative framework** of the environment, demography, socio-economy and governance using the project outputs (i.e. other WPs)
- to evaluate **plausible adaptation pathways up to 2050**
- to work **across scales:**
 - (national)
 - delta
 - broader community (~100km²)
 - household
 - men & women



Conceptual model overview

a hybrid method: using emulator, Bayesian Network, ABM components



Household decision model concept

1. Do nothing:

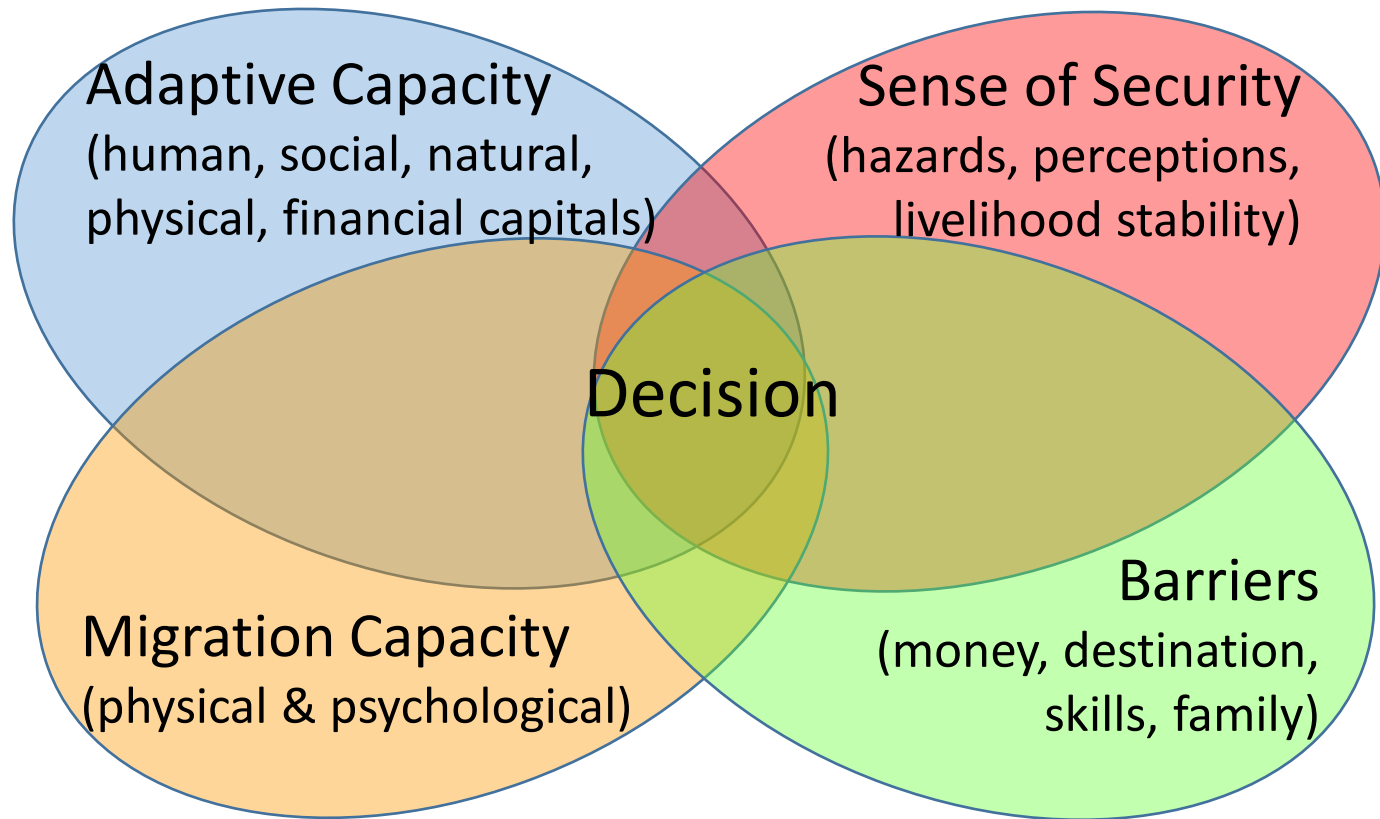
- reduce hhold exp.
- increase hhold exp.
- get a loan

2. In-situ adaptation:

- change crop
- diversify livelihood
- change livelihood
- women start working outside house

3. Migrate:

- who
- where
- how long

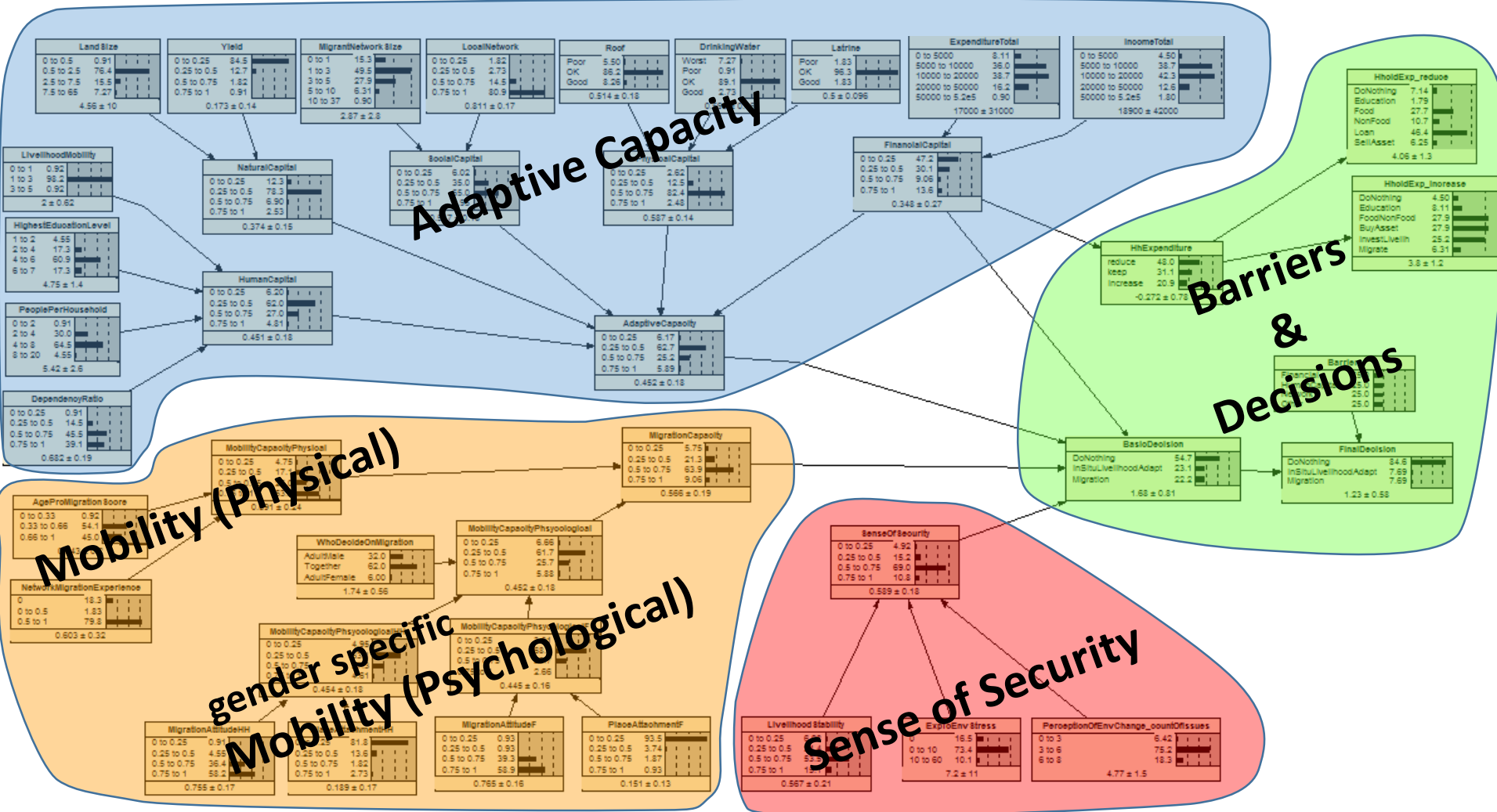


Input data

- **1500 household interviews** per study site
(N=6000, Sending Area)
 - ✓ Separate Household head & Female questionnaires
- **450-1000 migrant interview** per study site
(N=3000, Receiving Area)
- **Expert knowledge**

Household decision model – method 1

(expert opinion + PCA-based)



DECCMA



Household characteristics

- **Sense of security** is somewhat higher for non-Migrant households
- But **adaptive capacity** and **Migration capacity** is very similar
- So what makes households move? - > need another approach

Bangladesh
(Ghana is similar)

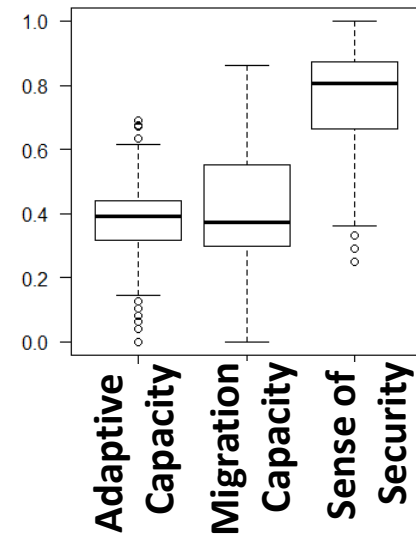
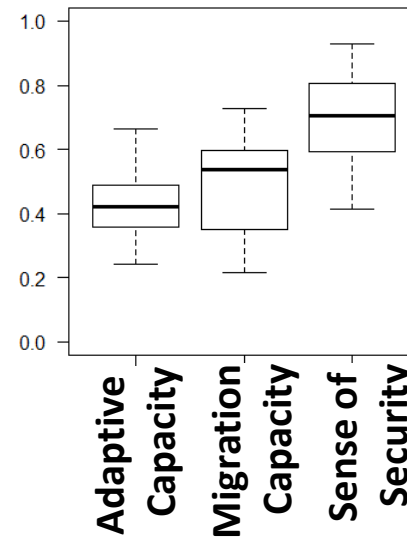
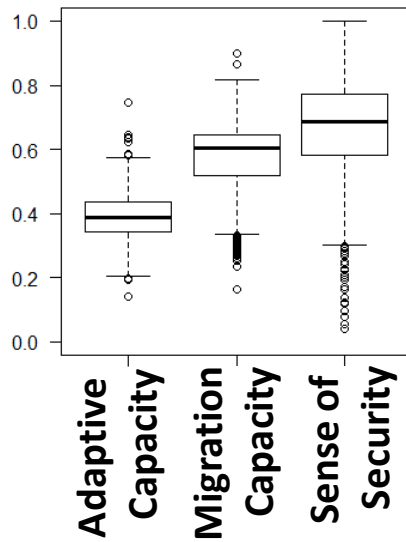
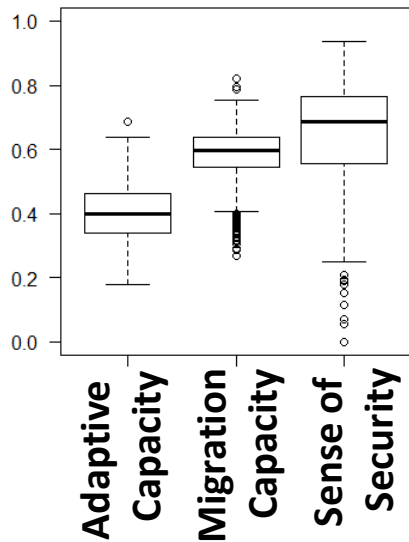
Indian Bengal Delta
(Mahanadi is similar)

Migrant households

Non-migrant households

Migrant households

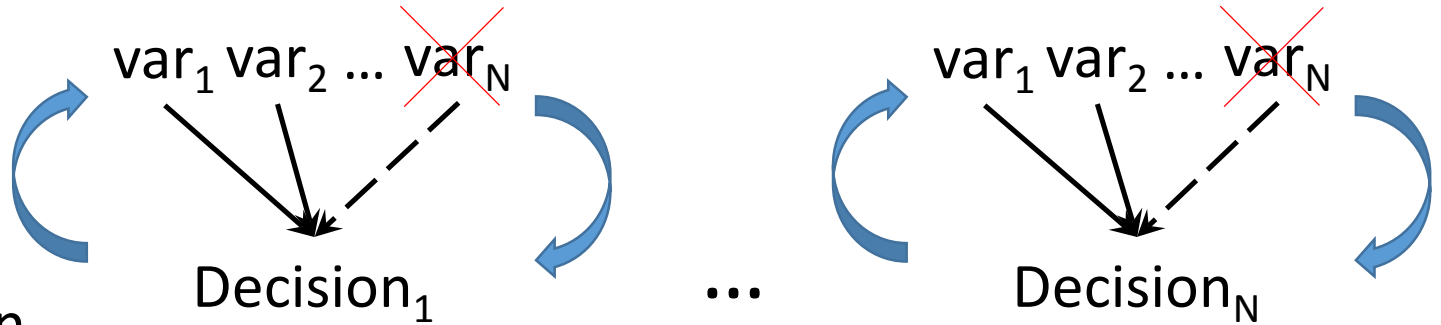
Non-migrant households



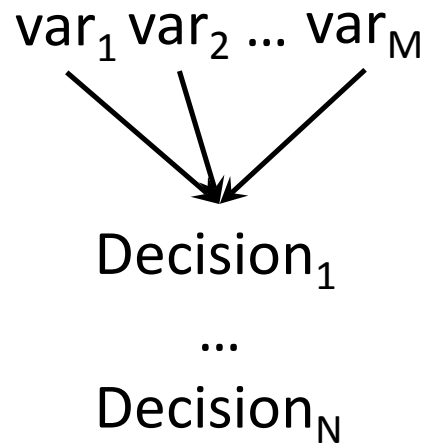
Household decision model – method 2

(stepwise model reduction method)

1. Training network through variable elimination

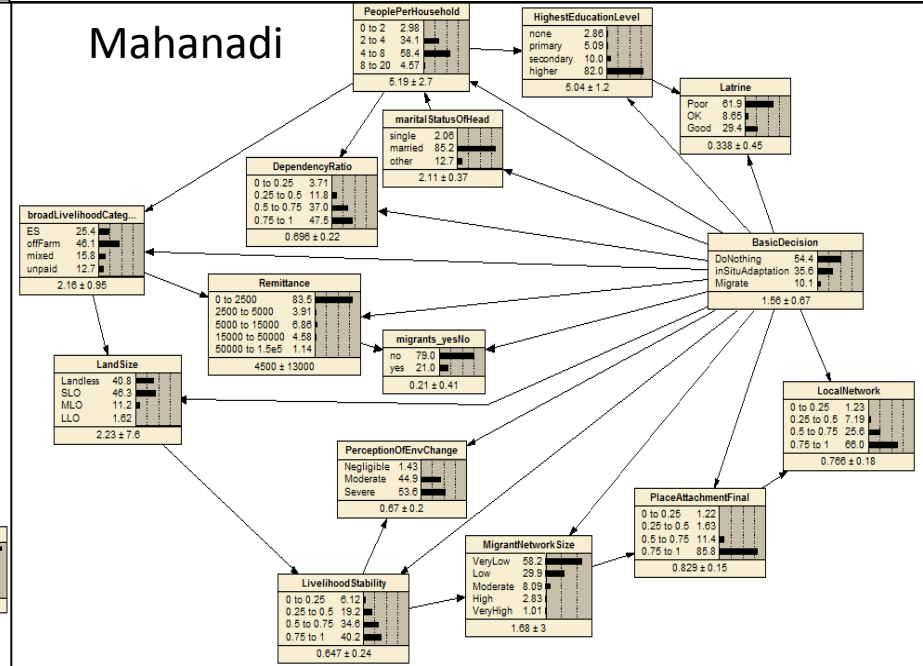
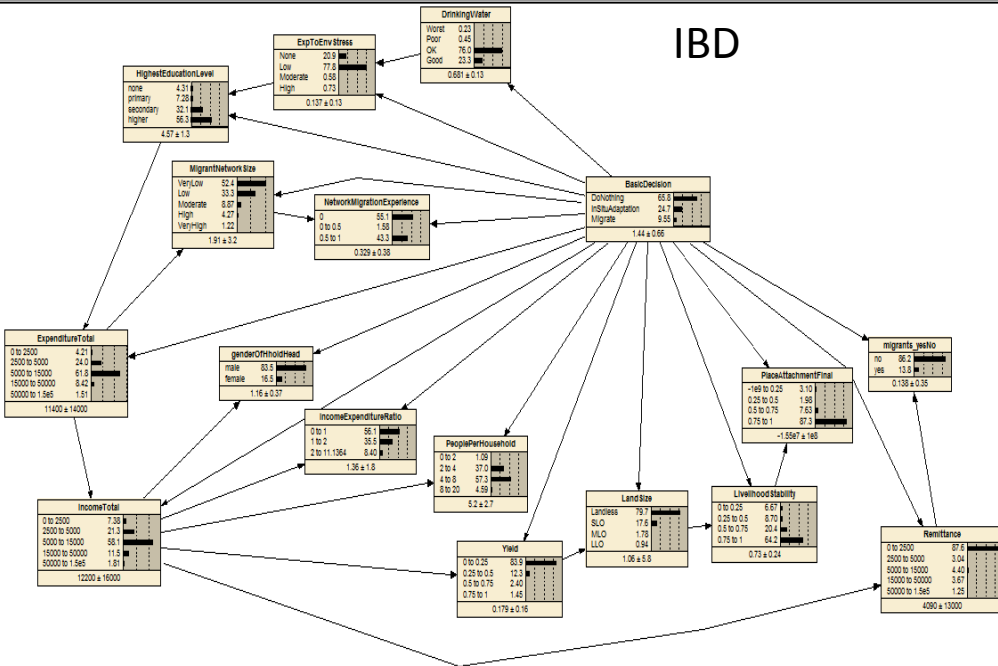
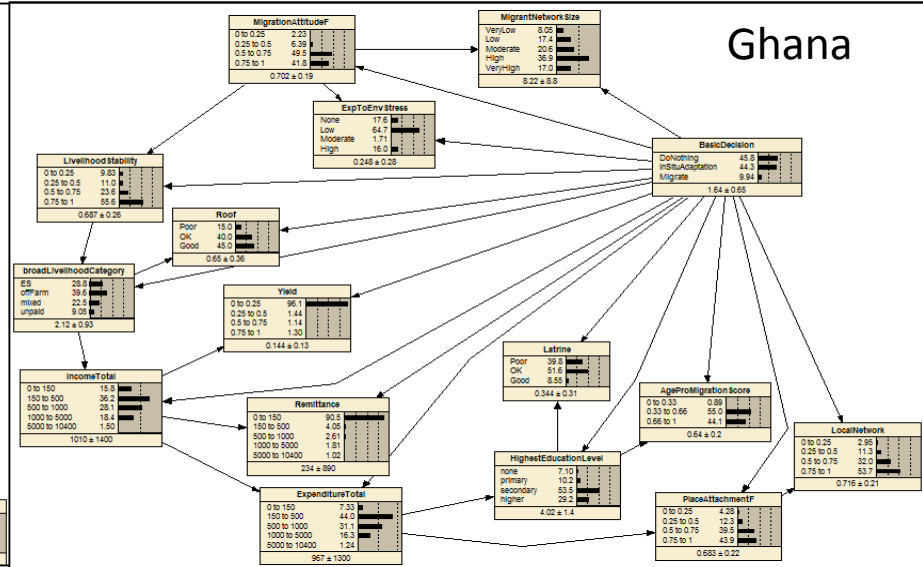
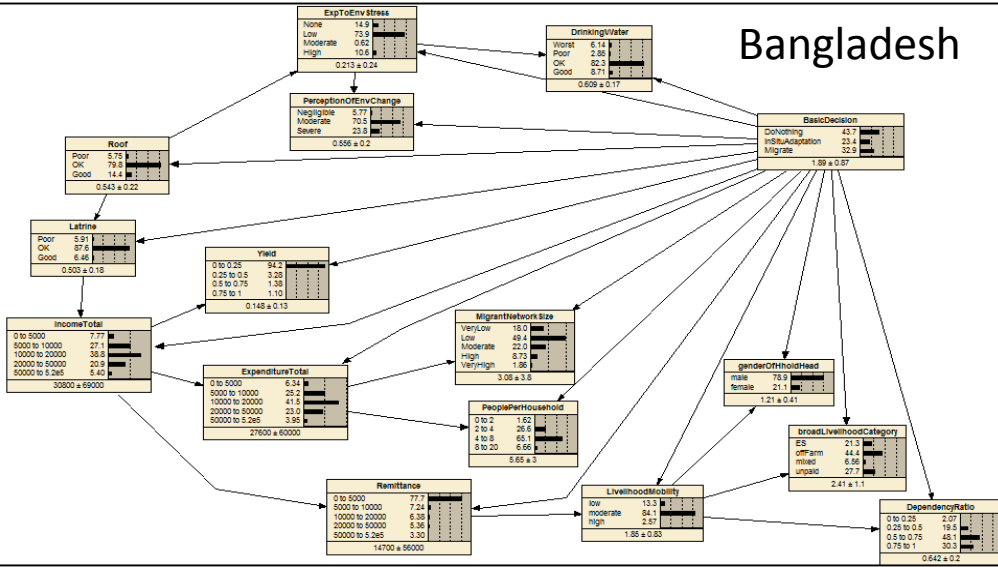


2. Combining final networks together and validation



Household decision model – method 2

(stepwise model reduction method)



Household decision model – attempt 2

(stepwise model reduction method)

		Bangladesh	Ghana	IBD	Mahanadi
Human Capital	genderOfHholdHead	DoN		Mig	
	maritalStatusOfHead				Mig
	Migrants_yesNo			Mig	Mig
	HighestEducationLevel		Mig	DoN-iSAd	DoN-Mig
	PeoplePerHousehold	DoN-Mig		DoN-iSAd	DoN-iSAd
	LivelihoodMobility (# of skills)	Mig			
	DependencyRatio	DoN-Mig			DoN-iSAd-Mig
Social Capital	LocalNetwork		DoN-iSAd-Mig		
	MigrantNetworkSize	DoN-iSAd	DoN-iSAd	iSAd-Mig	DoN-iSAd-Mig
Physical Capital	DrinkingWater	DoN-iSAd		Mig	
	Latrine	iSAd	DoN-iSAd		DoN-iSAd
	Roof	Mig	DoN-iSAd		
Natural Capital	LandSize			DoN-iSAd	DoN-iSAd
	Yield (ES-based income)	iSAd	Mig	iSAd	
	broadLivelihoodCategory	iSAd-Mig	iSAd-Mig		DoN-iSAd
Financial Capital	IncomeTotal	DoN-iSAd	DoN	DoN-iSAd	
	ExpenditureTotal	DoN	DoN-iSAd-Mig	DoN-iSAd	
	Remittance	Mig	Mig	Mig	Mig
	IncomeExpenditureRatio			DoN	
Migration Capacity	MigrationAttitude		Mig		
	PlaceAttachment		Mig	Mig	Mig
	NetworkMigrationExperience			Mig	
	AgeProMigrationScore		Mig		
Sense of Security	PerceptionOfEnvChange	DoN-iSAd			iSAd
	ExpToEnvStress	iSAd-Mig	DoN-iSAd-Mig	DoN	
	LivelihoodStability		DoN-iSAd	DoN-iSAd	DoN-iSAd

DoN –
do nothing
iSAd –
in-situ adapt.
Mig -
Migration

Household decision model – attempt 2

(stepwise model reduction method)

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	broadLivelihoodCategory	iSAd-Mig	iSAd-Mig		DoN-iSAd
Financial Capital	IncomeTotal	DoN-iSAd	DoN	DoN-iSAd	
	ExpenditureTotal	DoN	DoN-iSAd-Mig	DoN-iSAd	
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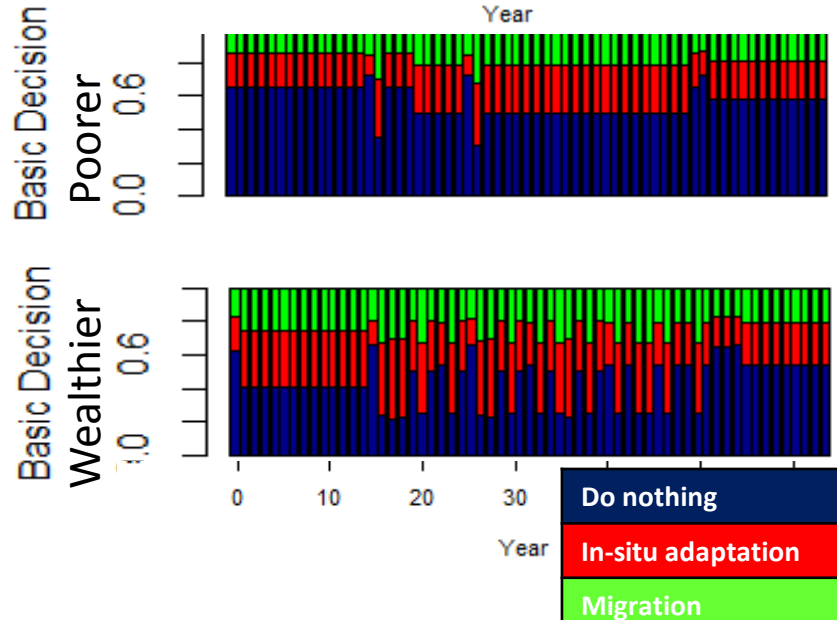
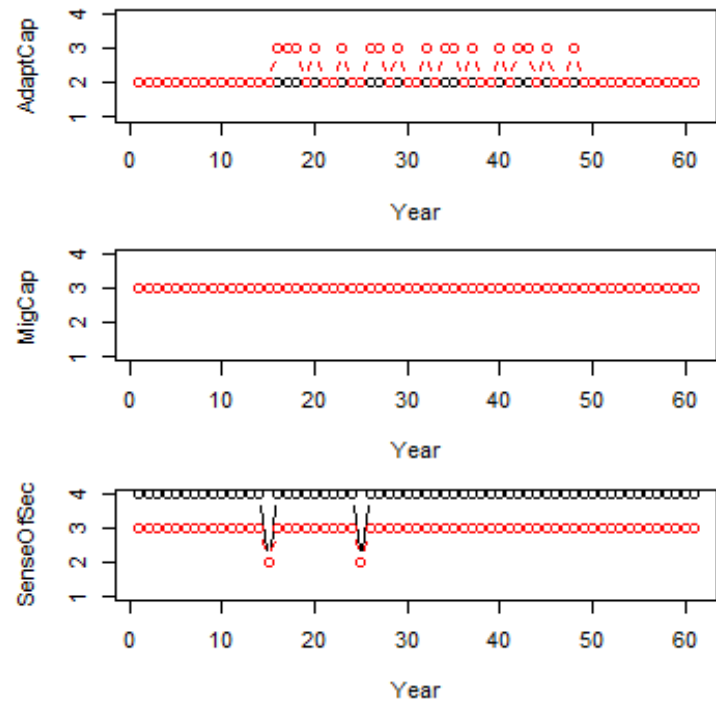
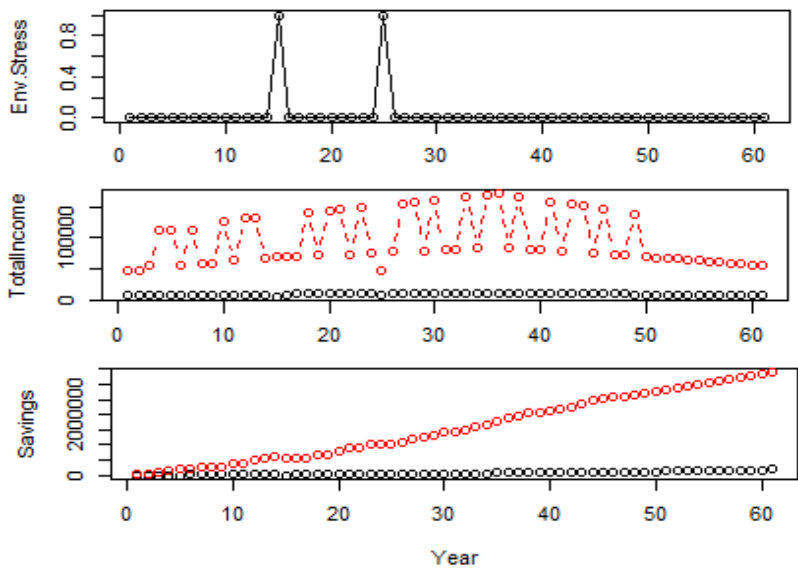
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Illustration of model outputs

○ Poor farmer
○ Wealthier farmer

- Bayesian statistics allow to model **distributions of inputs** (e.g. env. quality) and **distribution of responses** within a larger area and for an archetypal group.
- Sense of security can be higher for poorer household.
- Richer household have more options and accumulates wealth.



Summary

- a **hybrid modelling framework** is being developed based on
 - ✓ bespoke sending and receiving area surveys
 - ✓ bio-physical model results
 - ✓ Literature/expert knowledge
- to study **long-term social-environmental-governance interactions**
- different **thresholds, barriers and response strategies** are considered
- **spatial / temporal / archetypal heterogeneity** included
- about a year to finish

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Twitter: [@deccma](https://twitter.com/deccma)

Thank you for your attention!

Further information:

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