

# Rooting Conservation

Embedding Conservation Initiatives in Local Communities Inhibits Deforestation

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# Research question

To what extent does successful conservation rely on communities participating in different kinds of management schemes?

Is successful conservation mediated by the network characteristics of conservation initiatives and the local communities that carry out conservation in practice?

# Networks and community-based resource management

- ❑ Large chunk of work on “networked” environmental governance (Fransen et al. 2018, Henriksen and Ponte 2018; Blitzer et al. 2012)
- ❑ Some work tracking sustainable resource practice to participation regulatory or policy schemes (Schneider et al. 2003; Lubell 2007).
- ❑ Vainio et al. (2018) found that regulatory participation embedded in surrounding social networks enhances regulatory effectiveness of conservation issues e.g. through better diffusion of conservation certificates or agreements
- ❑ Alexander et al. (2018) found that social networks also make regulatory monitoring and enforcement more effective
- ❑ SNA work on sustainable forestry mostly looks at transnational dynamics of FSC / REDD+ (Gallemore and Munroe 2013) with exception of Moeliono et al.’s (2014) work on Indonesia

# Networks and community-based resource management

“Currently, many approaches to solving policy problems seek to create community-based, less coercive solutions that are creating the conditions for the birth of new regional governmental institutions. We argue that networks form the core of these emergent structures and that federal programs can play a positive role in developing local networks. Our empirical work compares networks in estuaries included in National Estuary Program with networks in comparable estuaries that were not. We find that the networks in NEP areas span more levels of government, integrate more experts into policy discussions, nurture stronger interpersonal ties between stakeholders, and create greater faith in the procedural fairness of local policy, thus laying the foundation for a new form of cooperative governance.” (Schneider et al. 2003, p. 143)”

# Our contribution

- ❑ The aforementioned work maps out social networks of “regulatory bodies” and link this to rather diffuse sustainability outcome measures (e.g. certification and monitoring outcomes), and without accounting for the degree to which communities inhabiting the resource areas, and depending on them for livelihood, are actually embedded in the social networks
- ❑ We contribute with a multilevel network account by linking the social networks that connect conservation initiatives that establish and diffuse management schemes and the local communities that manage the resources on the ground
- ❑ We also contribute with high quality data on sustainability outcomes using machine learning on remote sensing and ground truth validation methods

# The case of forest conservation and social networks

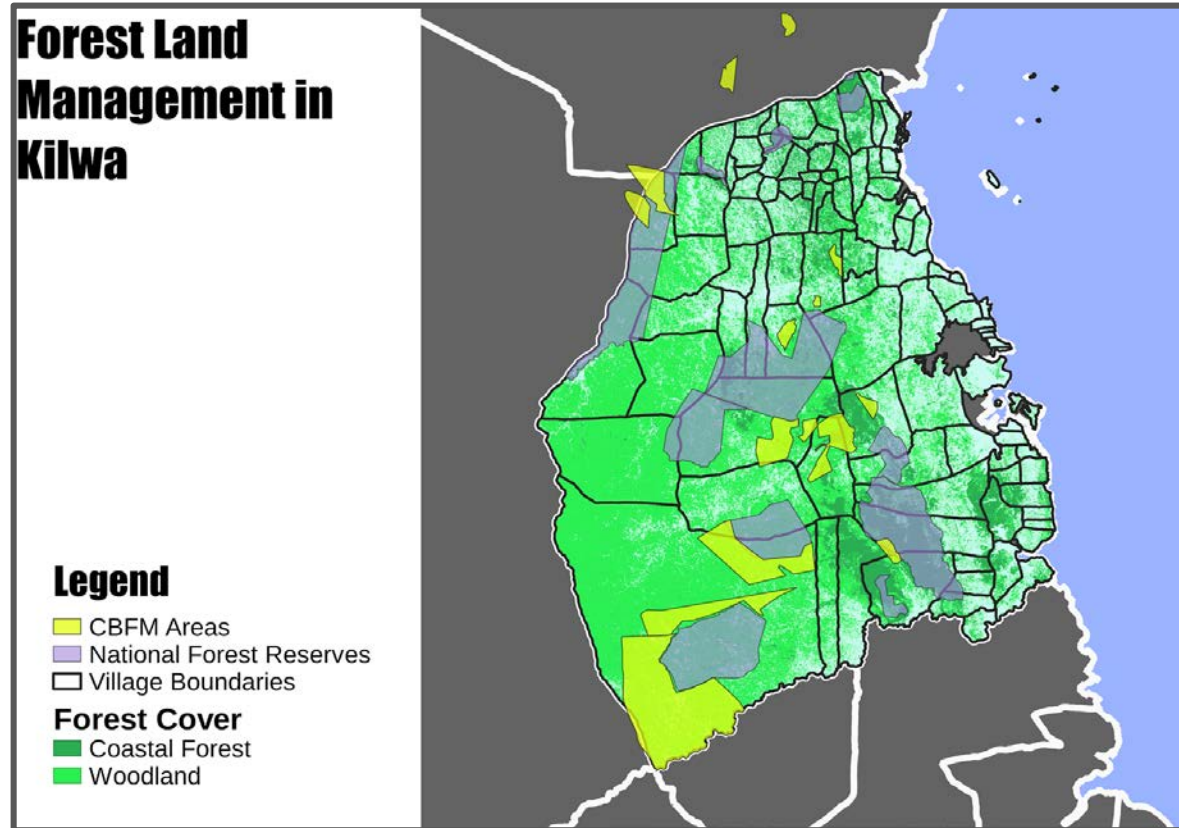
- ❑ Critique of state-driven conservation approaches for being too top-down, not taking into account communities reliance on local resources for livelihoods
  - ❑ We assess whether novel non-state conservation approaches outperform more traditional state-based approaches: state forest reserves vs. participatory forest management (involving community-ownership)
  - ❑ Non-state conservation approaches often involve organisationally heterogenous networks of actors that set, monitor and enforce rules of conservation/ressource management
  - ❑ We assess whether the social network of conservation bodies and of the communities taking on their governance standards matter for deforestation

# Hypotheses

- ❑ Forest areas governed under sustainability management principles are more likely to be conserved than forest areas that are not.
- ❑ Forest areas governed under community-based/participatory forest management are more likely to be conserved than forest areas under government management.
- ❑ Forests areas governed by sustainable forest management bodies that are more tightly and centrally embedded in the organizational network surrounding them are more likely to be conserved than areas governed under less central and tightly embedded bodies.
- ❑ Forest areas owned by communities that are more centrally and tightly embedded in the organizational network surrounding them are more likely to be conserved than areas governed under less central and tightly embedded communities.

# Research setting: Kilwa district in Southeast Tanzania

- ☐ Comparing Community-Based Forest Management (CBFM) with National Forest Reserves
- ☐ Eight villages samples:
  - 4 has CBFM
  - 6 have National Forest Reserves
  - 2 have no CBFM or National Forest Reserves
- ☐ We observe forest land pixels (10\*10m) in 2000 to establish baseline
- ☐ We follow these pixels in 2004, 2009, 2014 and 2018 to identify deforestation and...
- ☐ ...observe their conservation status
- ☐ ...and social networks...





...aids rural village communities to:



## Community forest rights

We support rural communities to own and sustainably manage their forests



Effective land use and forest rights



Forest patrols / natural resource assessments



Governance Support



## Sustainable timber production

We train communities to harvest responsible timber that is certified by the Forest Stewardship Council™



## Linking with buyers

We link communities with buyers, helping them to sell their timber locally, regionally and internationally



Partnerships



Products include: furniture and musical instruments



## Community benefits

Communities decide how to use the income from timber to address their local development needs



Building Schools



Water Wells



Health Care



## Locally-driven forest conservation

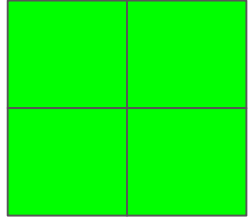
When people see the benefits that come from healthy forests, they act to conserve them



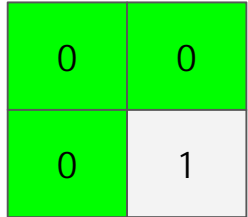
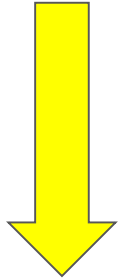
The Tanzanian Government defines PFM as:

*“The arrangements for management that are negotiated by multiple stakeholders and are based on set of rights and privileges recognized by the government and widely accepted by resource users; and the process for sharing power among stakeholders to make decisions and exercise control over resource use.”*

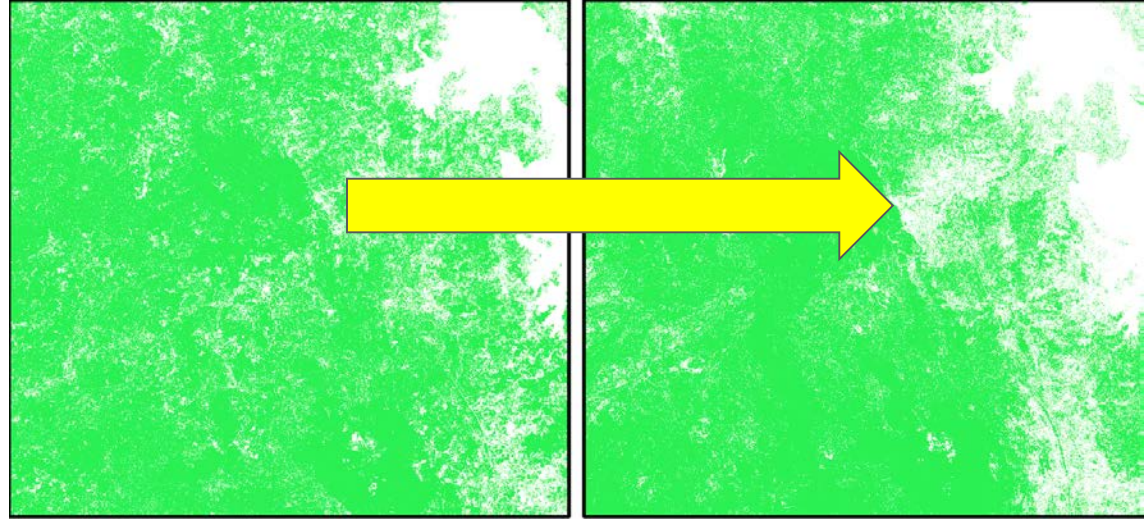
# Dependent Variable: Deforestation



2000

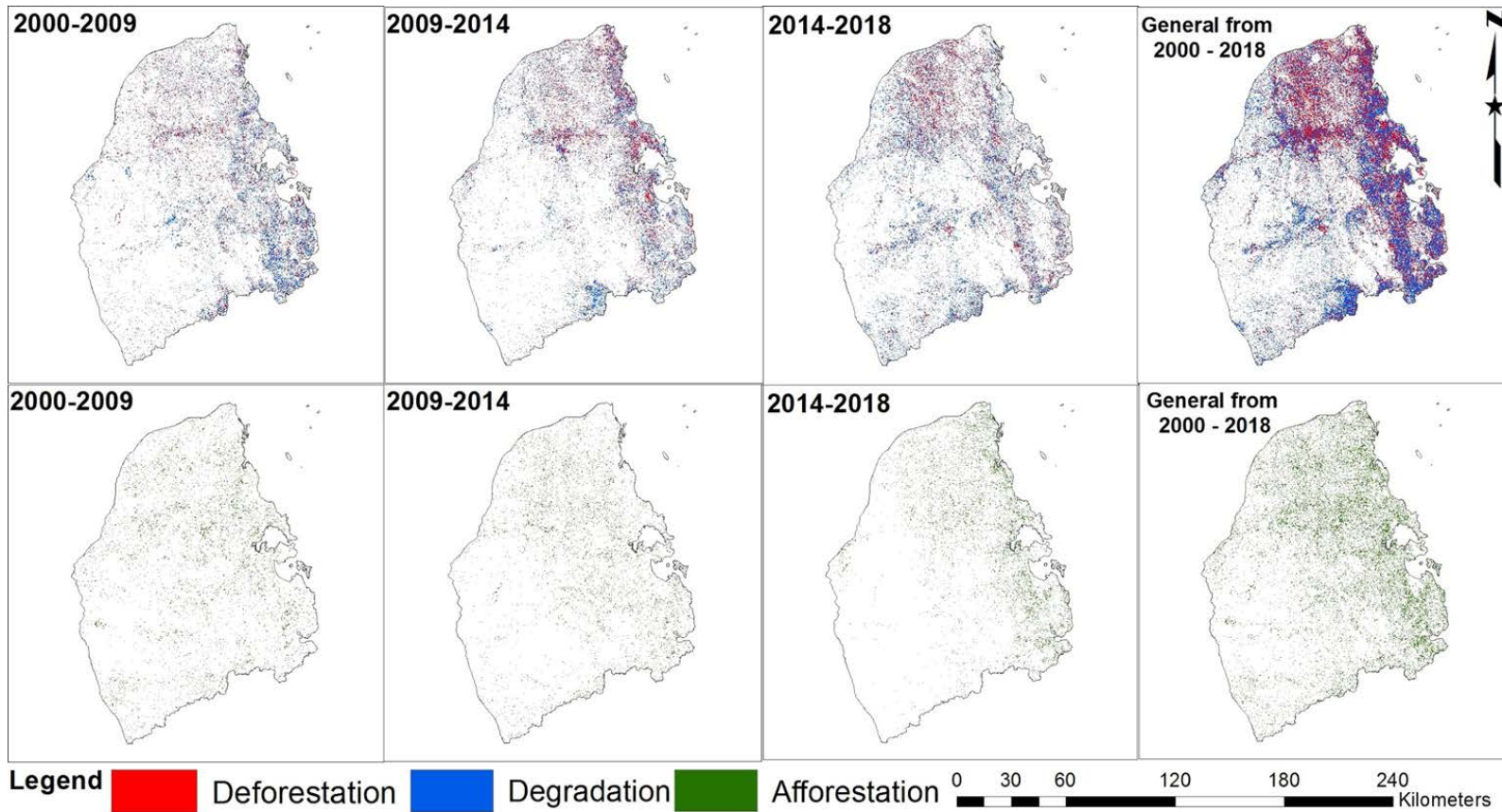


2014



**2000**

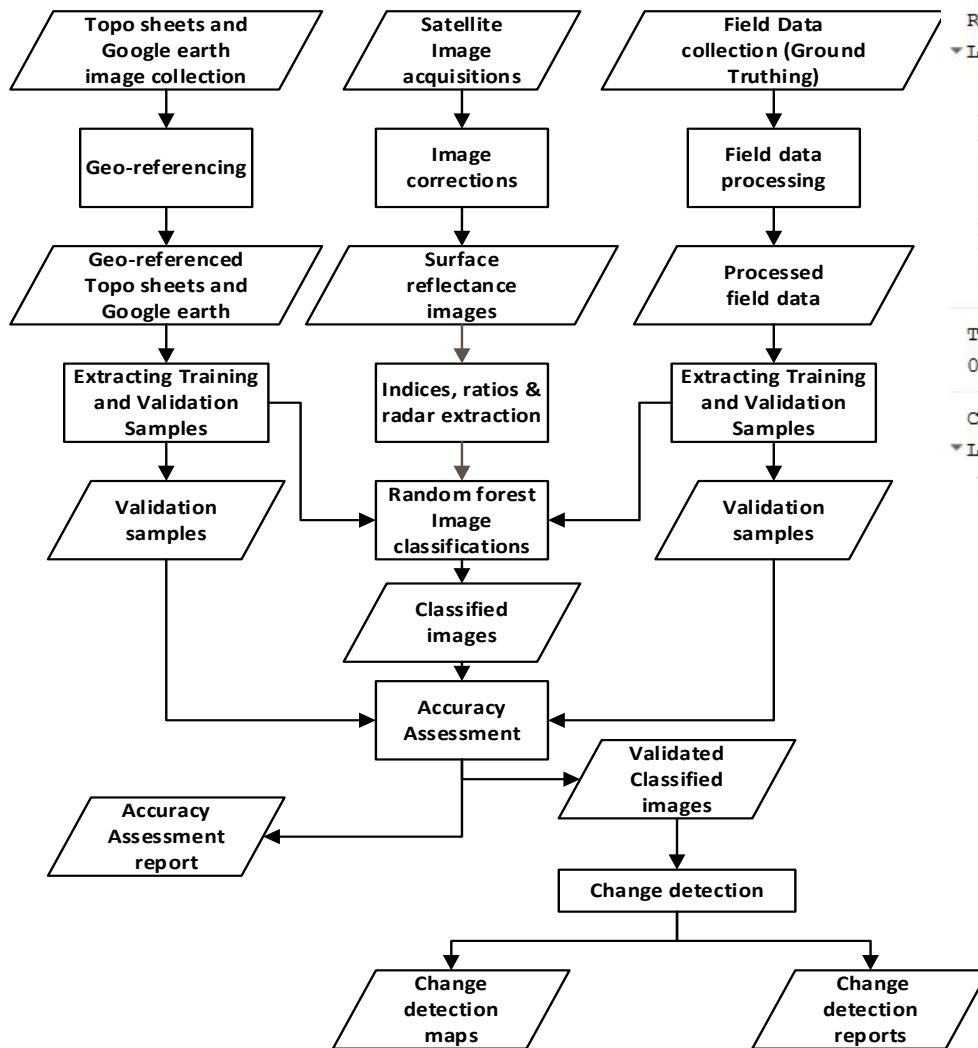
**2014**





# Remote sensing with ground truth





Resubstitution error matrix:

▼List (8 elements)

- 0: [0,0,0,0,0,0,0,0]
- 1: [0,395,0,0,0,0,3,1]
- 2: [0,0,50,0,0,0,0,0]
- 3: [0,0,0,223,0,1,1,14]
- 4: [0,0,0,0,497,0,0,3]
- 5: [0,0,0,2,2,324,0,21]
- 6: [0,4,0,0,0,0,495,1]
- 7: [0,1,0,2,7,4,0,986]

Producers Accuracy

▼List (8 elements)

- 0: [0]
- 1: [0.9899749373433584]
- 2: [1]
- 3: [0.9330543933054394]
- 4: [0.994]
- 5: [0.9283667621776505]
- 6: [0.99]
- 7: [0.986]

Training overall accuracy:  
0.977938755350675

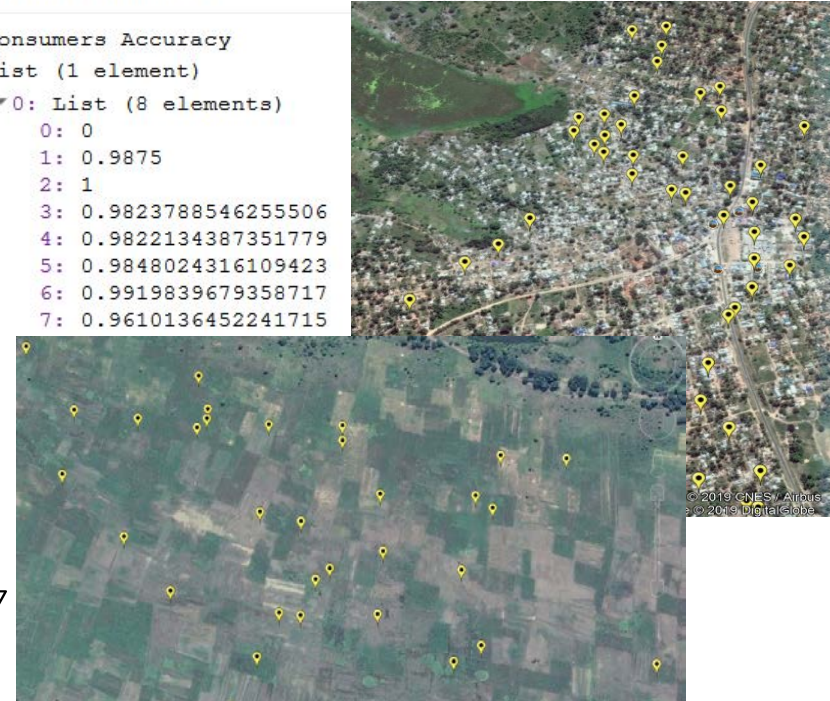
Kappa  
0.9723672694211262

Consumers Accuracy

▼List (1 element)

►0: List (8 elements)

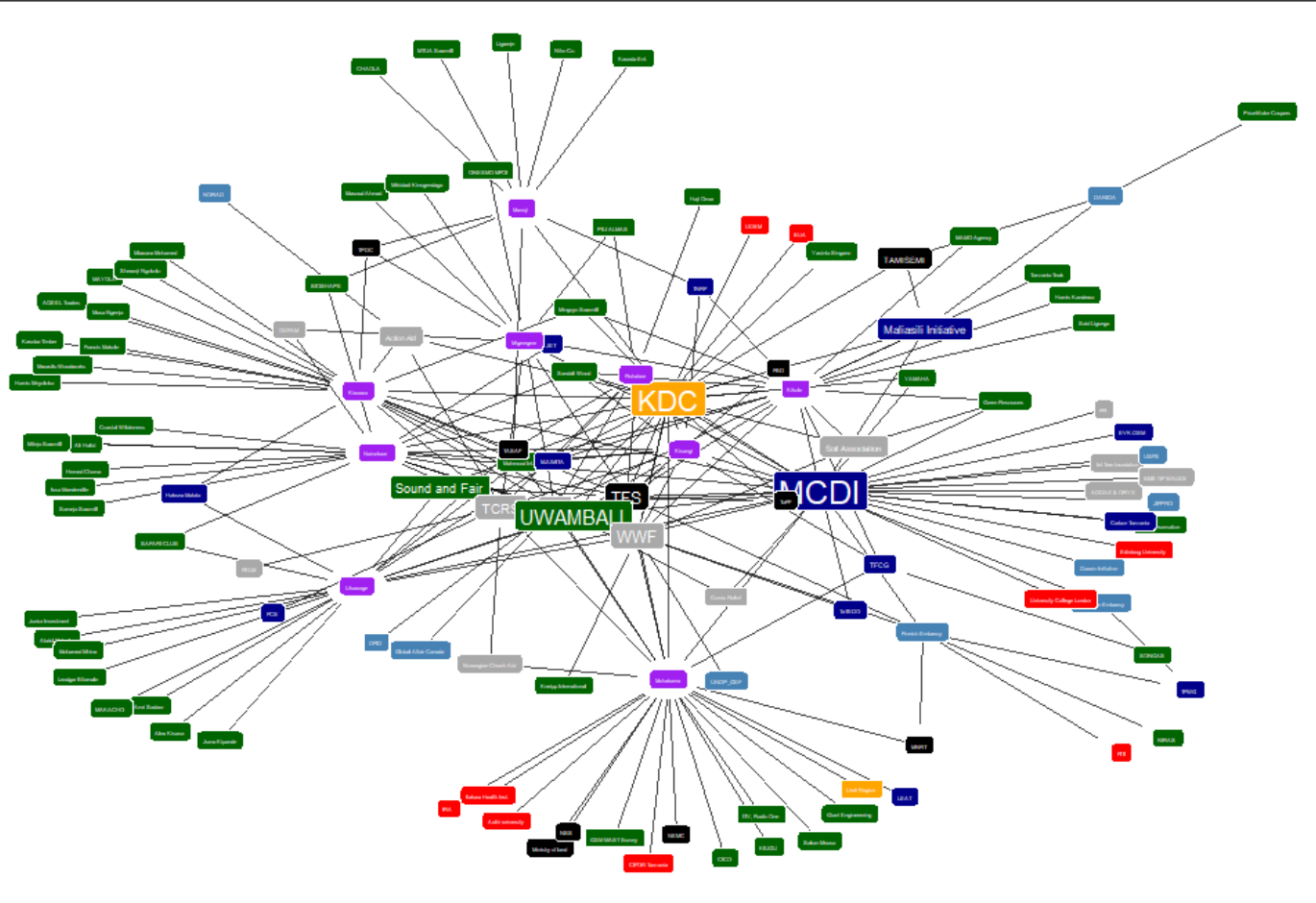
- 0: 0
- 1: 0.9875
- 2: 1
- 3: 0.9823788546255506
- 4: 0.9822134387351779
- 5: 0.9848024316109423
- 6: 0.9919839679358717
- 7: 0.9610136452241715





# Independent Variable: Network Connectivity

- Conservation initiatives:
  - Overall degree centrality
- Village:
  - Government degree
  - NGO degree
  - Private sector degree



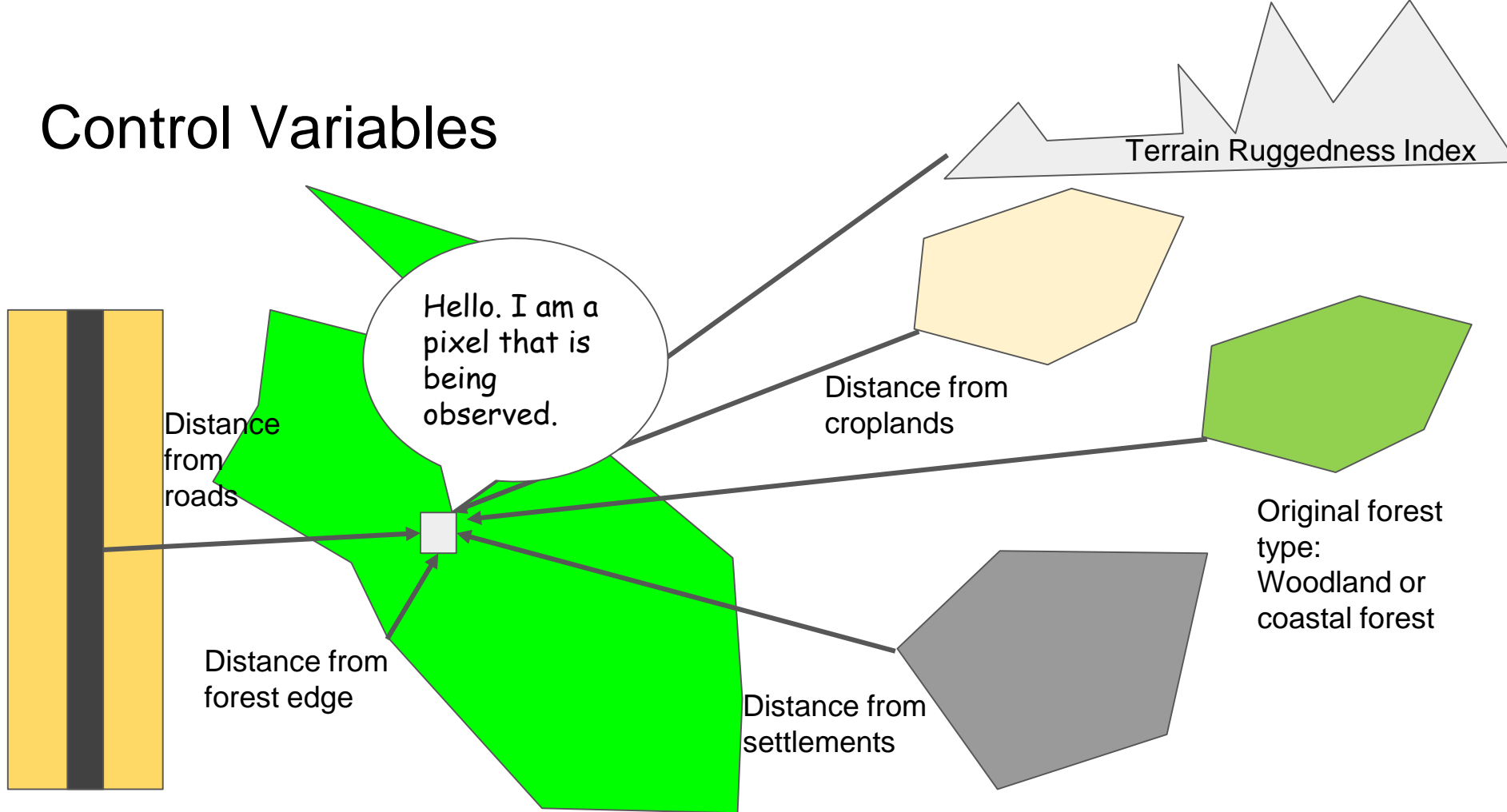
Type	a	a	a	a
	Central Government	CSO: Local	Local Government	Research Institution
	CSO: International	Donor	Private Sector	Villages/Local community

# Network data collection

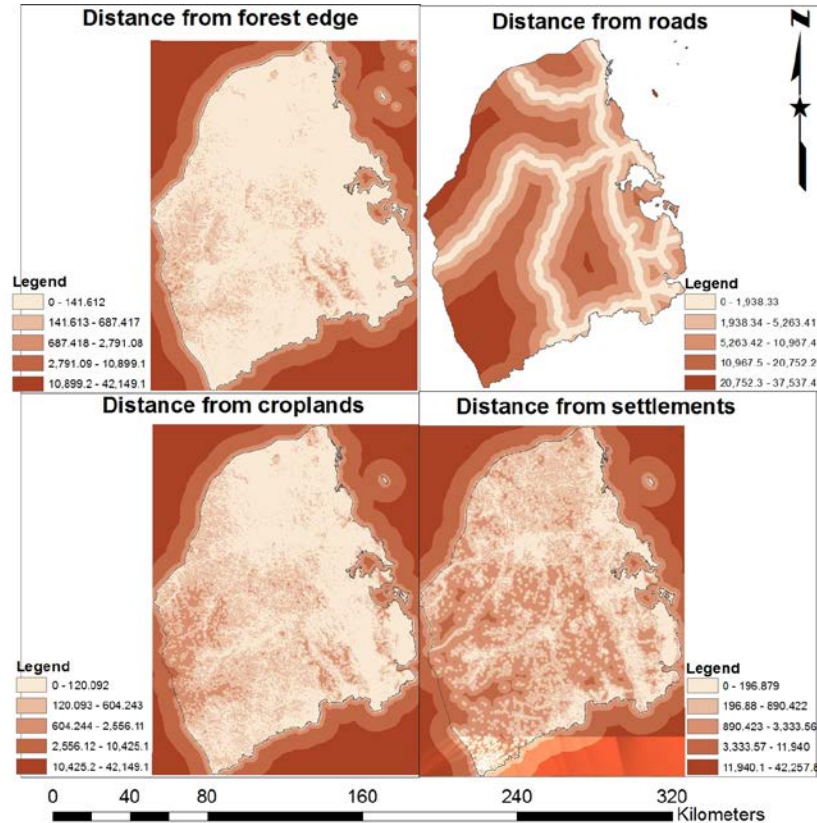
- ❑ Documents and village guestbooks
- ❑ 58 Key Informant Interviews
- ❑ Village Survey
- ❑ Coding actor types and edge types



# Control Variables

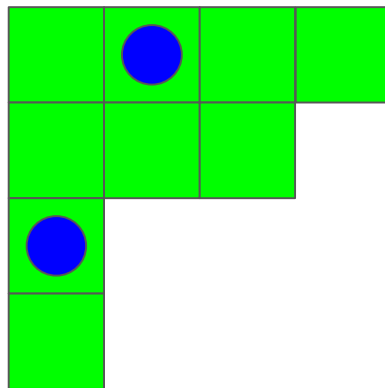


# Controls

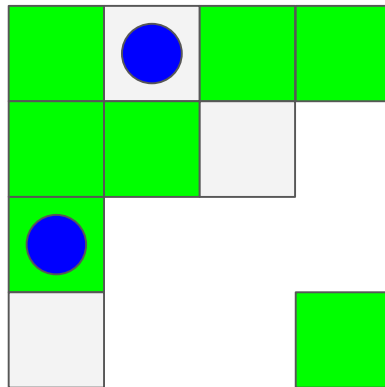


# Sampling Approach

- Select all forested pixels as of 2000
- Convert to points
- Randomly select ca. 6 million points to track over time

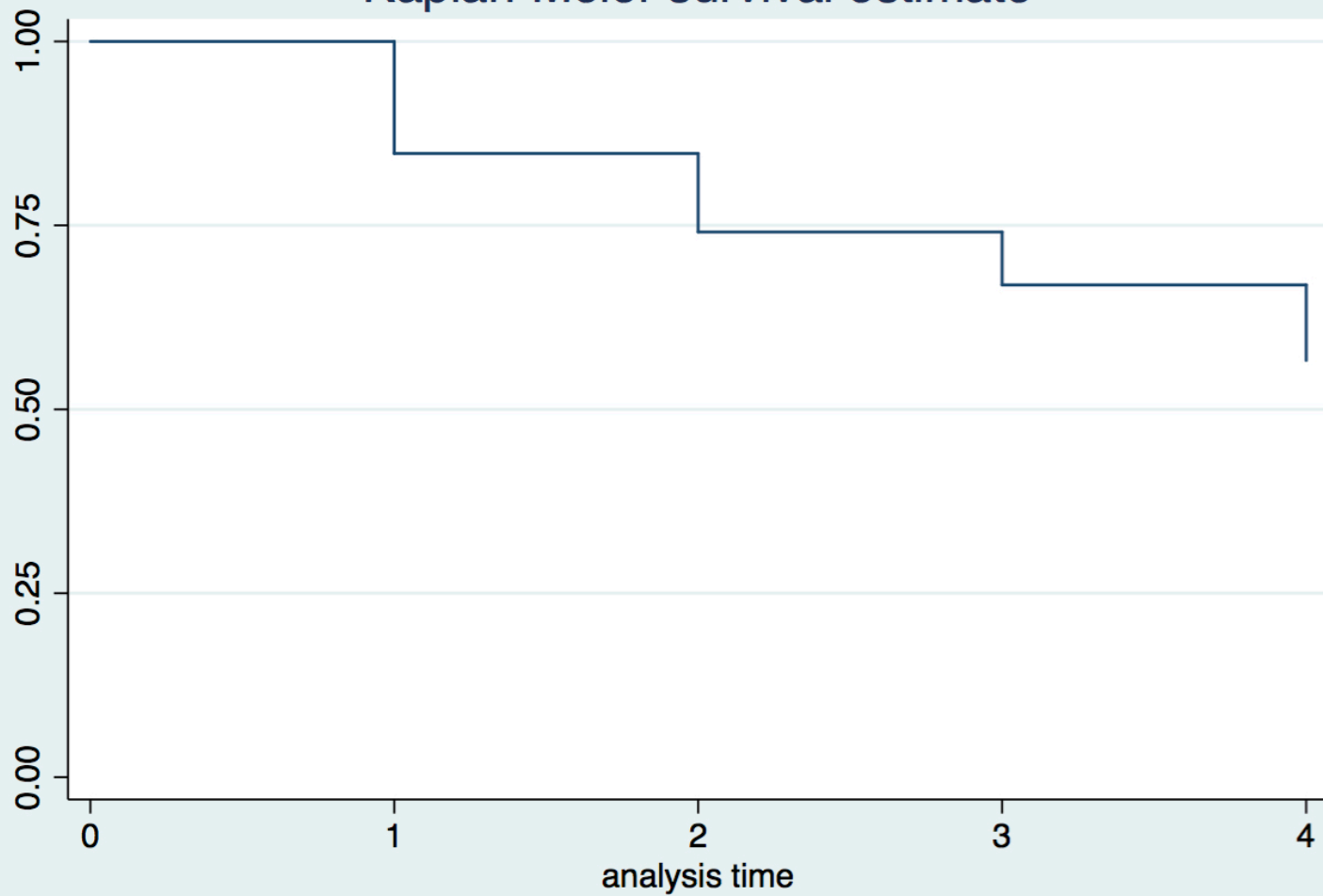


2000

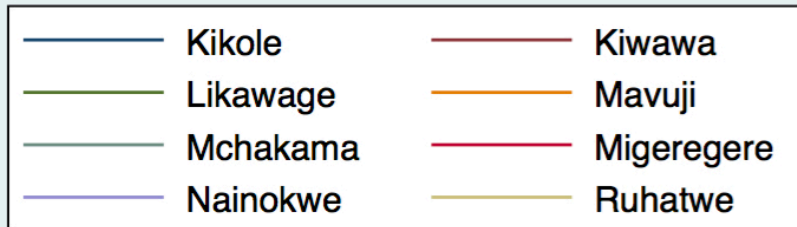
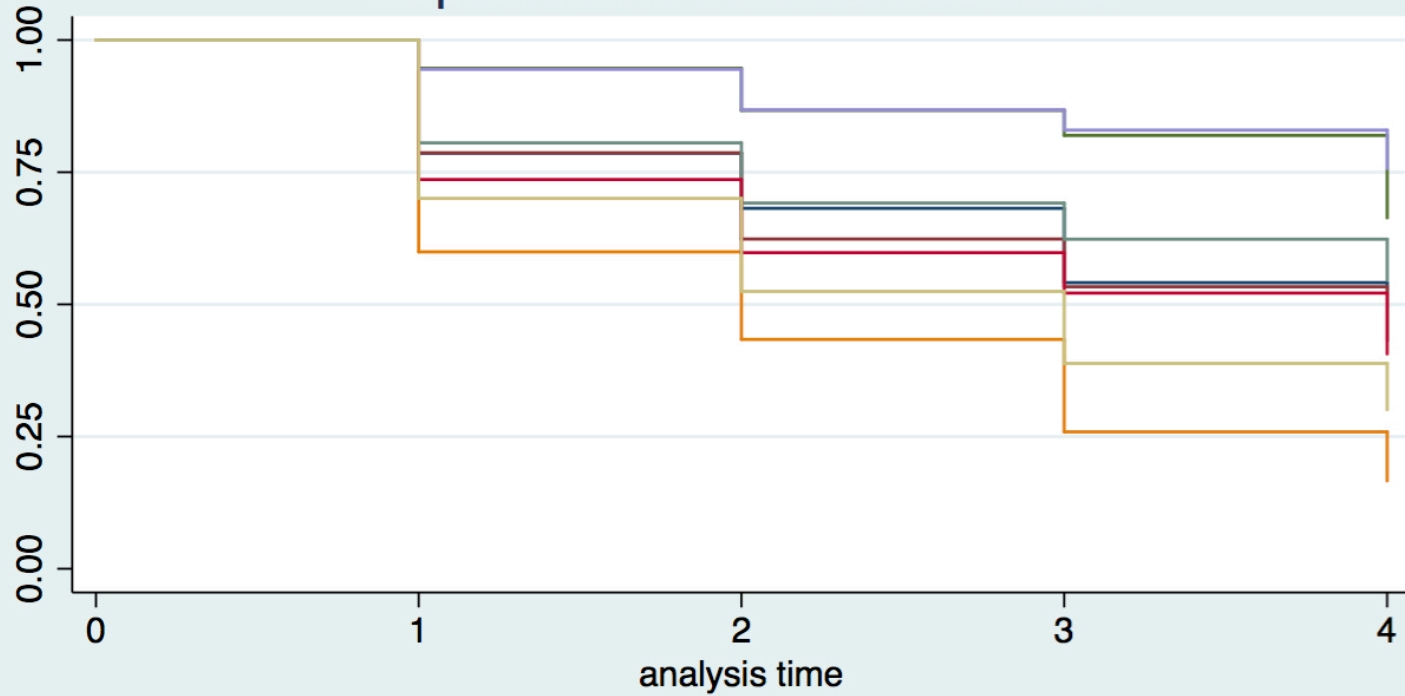


2009

Kaplan-Meier survival estimate



## Kaplan-Meier survival estimates



	(1)	(2)	(3)	(4)	(5)
	Haz. Ratio	Haz. Ratio	Haz. Ratio	Haz. Ratio	Haz. Ratio
<i>Cons. Initiative (ref=open area)</i>					
National Forest Reserve	.537***	.683***	.685***	.741***	.736***
CBFM	.563***	.659***	.684***	.930***	.925***
Village gov. Degree			.986***		.983***
Village NGO degree			.986***		.989***
Village private sector degree			1.02***		1.02***
Conservation initiative degree				.983***	.985***
Village fixed effects	No	Yes	Yes	Yes	Yes
Forest controls	Yes	Yes	Yes	Yes	Yes
N. of villages	8	8	8	8	8
N. of time periods	4	4	4	4	4
N. observations	9,001,107	9,001,107	9,001,107	9,001,107	9,001,107

# Findings

- In the context of Kilwa, conservation initiatives matter
- Both management types are subject to similar village heterogeneity
- CBFM effect however affected by network heterogeneity considerably more than National Forest Reserves
- More effective CBFMs have more NGO ties and relatively fewer government and private sector ties
- Accounting for village het. CBFM is more effective, yet cons. init. network evolution differentiate effective CBFMs from ineffective

# Going forward

- ❑ Further qualitative inspection CBFM network evolution
- ❑ Using the village survey data – asking villagers about connections to Village Environmental Committees (governing the village forest land) and broader conservation networks
- ❑ Two step model: (1) Sampling land use data from all of Kilwa (100 villages) to assess general impact of management practices; (2) then assessing role of networks on the smaller sample
- ❑ Looking at more complex socio-ecological processes of shifting cultivation, de- and afforestation processes.