UNIVERSITY OF CAMBRIDGE

VALUING THE ARC

# Valuation of ecosystem services in Tanzania: incorporating spatial and temporal dynamics of change.

**Ruth Swetnam**

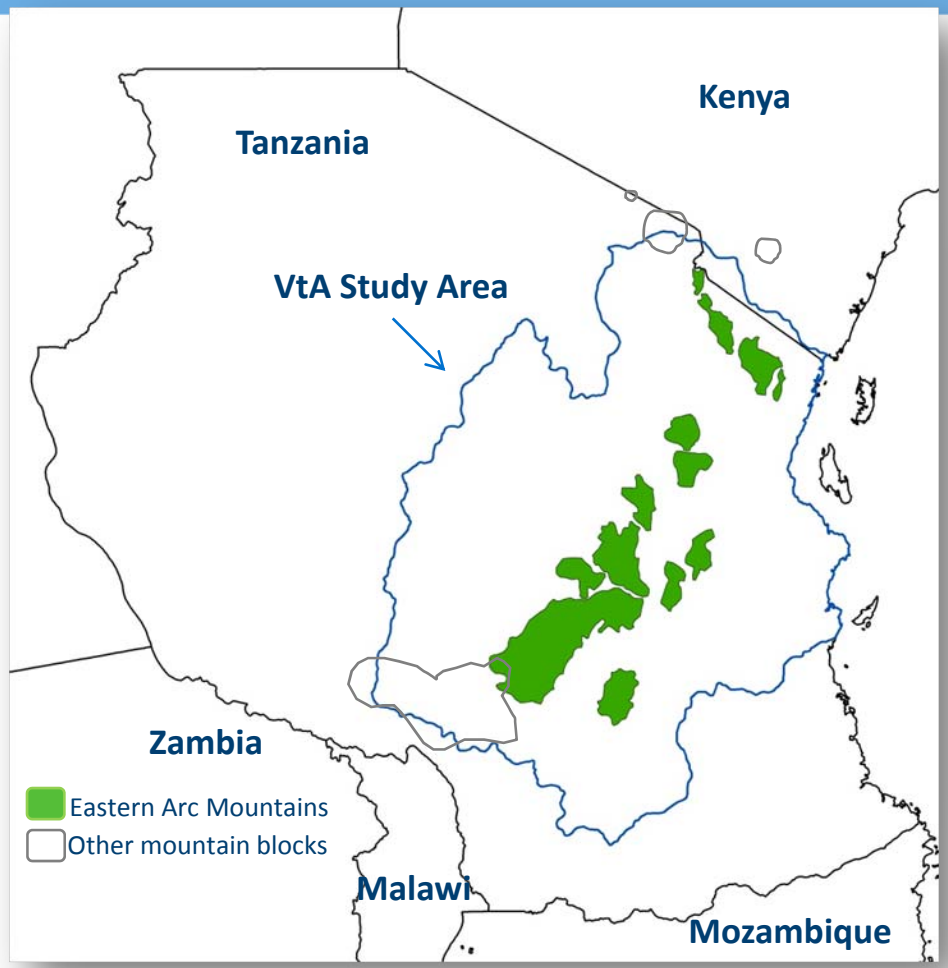

ESRC Seminar, York: Jan 2009

# Ecosystem services - definition

- “Ecosystem services are the aspects of ecosystems utilized (actively or passively) to produce human wellbeing.”

(Fisher & Turner 2008)

# The Eastern Arc Mountains – a biodiversity hotspot

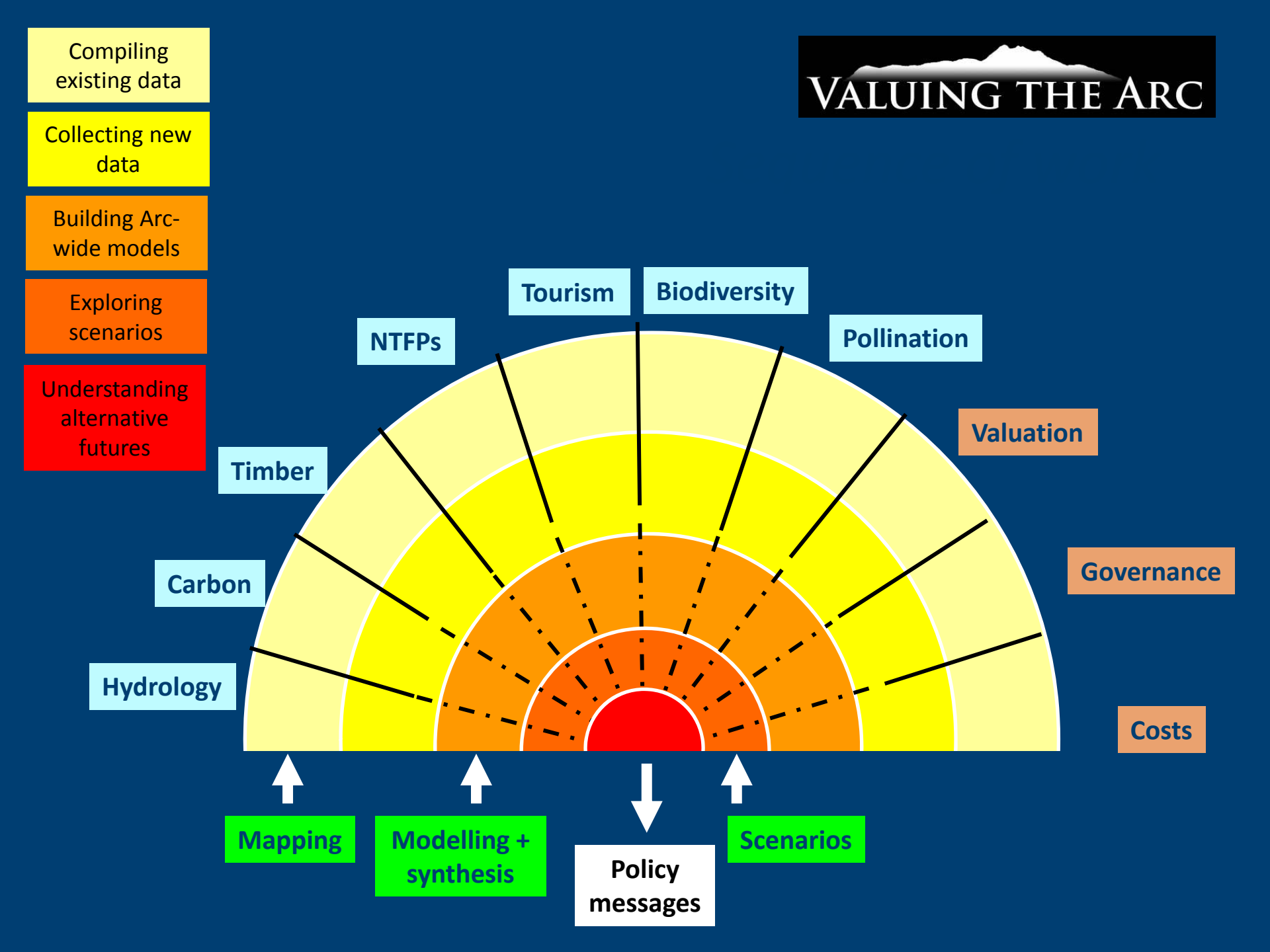


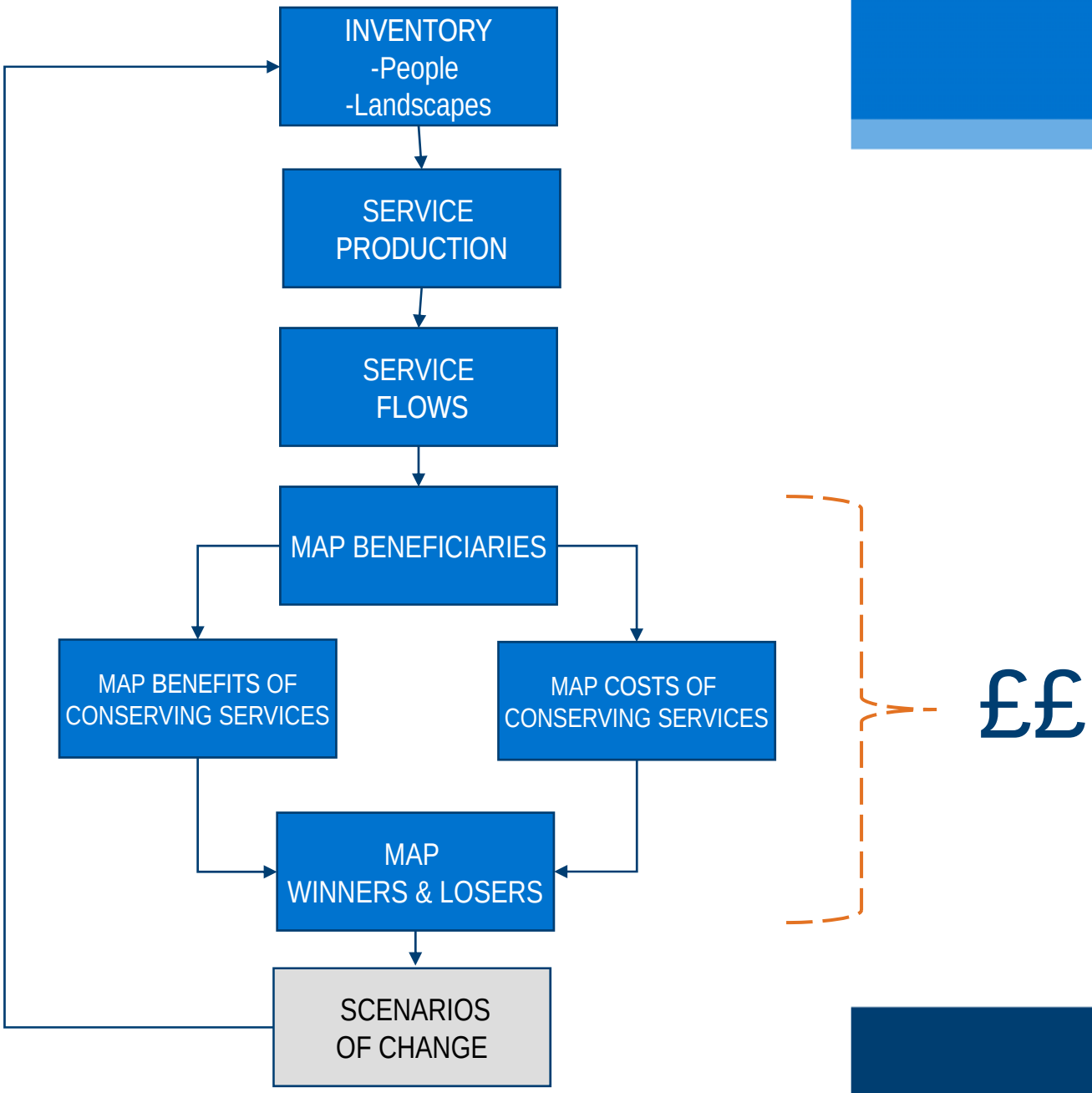

➢800 endemic plants



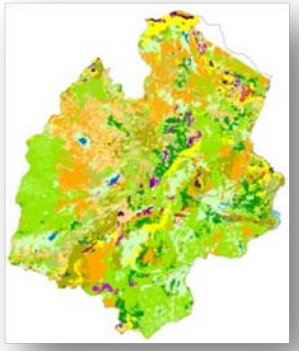
➢100 endemic vertebrates

➢100s species threatened with extinction

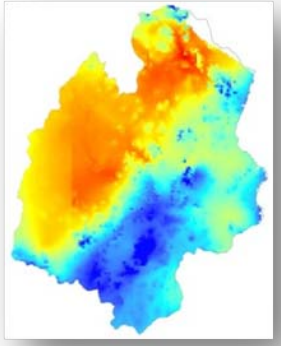

Compiling existing data
Collecting new data
Building Arc-wide models
Exploring scenarios
Understanding alternative futures
VALUING THE ARC
Tourism
Biodiversity
NTFPs
Pollination
Valuation
Timber
Carbon
Governance
Hydrology
Costs
Mapping
Modelling + synthesis
Policy messages
Scenarios


INVENTORY
-People
-Landscapes
SERVICE PRODUCTION
SERVICE FLOWS
MAP BENEFICIARIES
MAP BENEFITS OF CONSERVING SERVICES
MAP COSTS OF CONSERVING SERVICES
MAP WINNERS & LOSERS
SCENARIOS OF CHANGE
££

# Inventory – biophysical & socioeconomic datasets



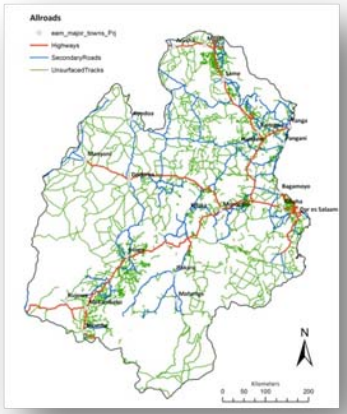
LandCover

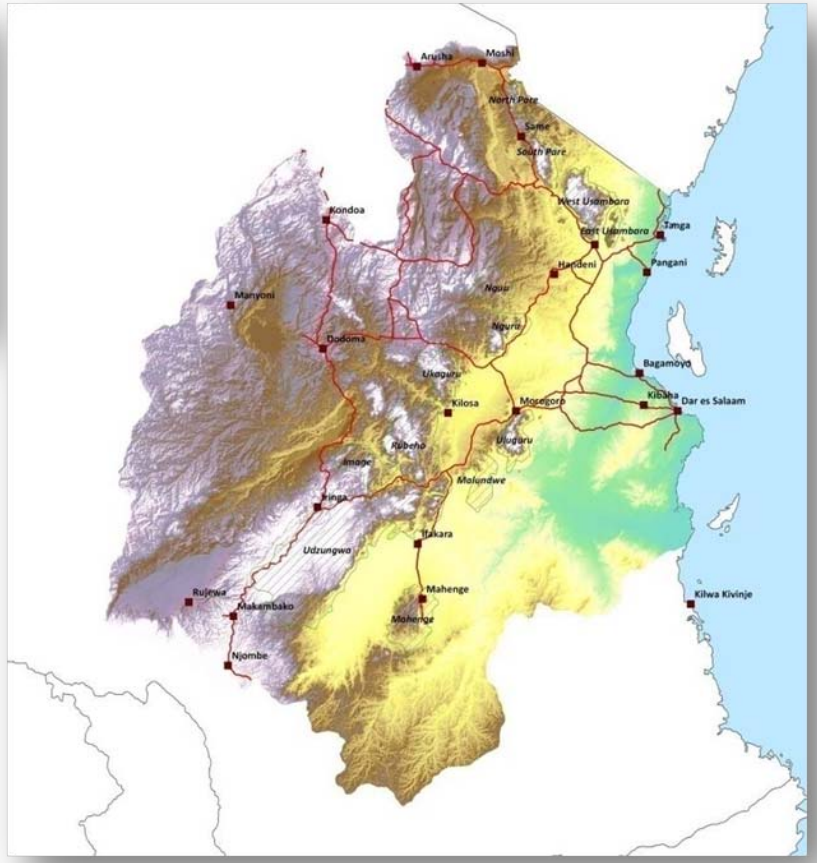


Annual Precipitation

Soils Map

Protected Areas




Elevation, Transport infrastructure, settlements

# Inventory: GIS database

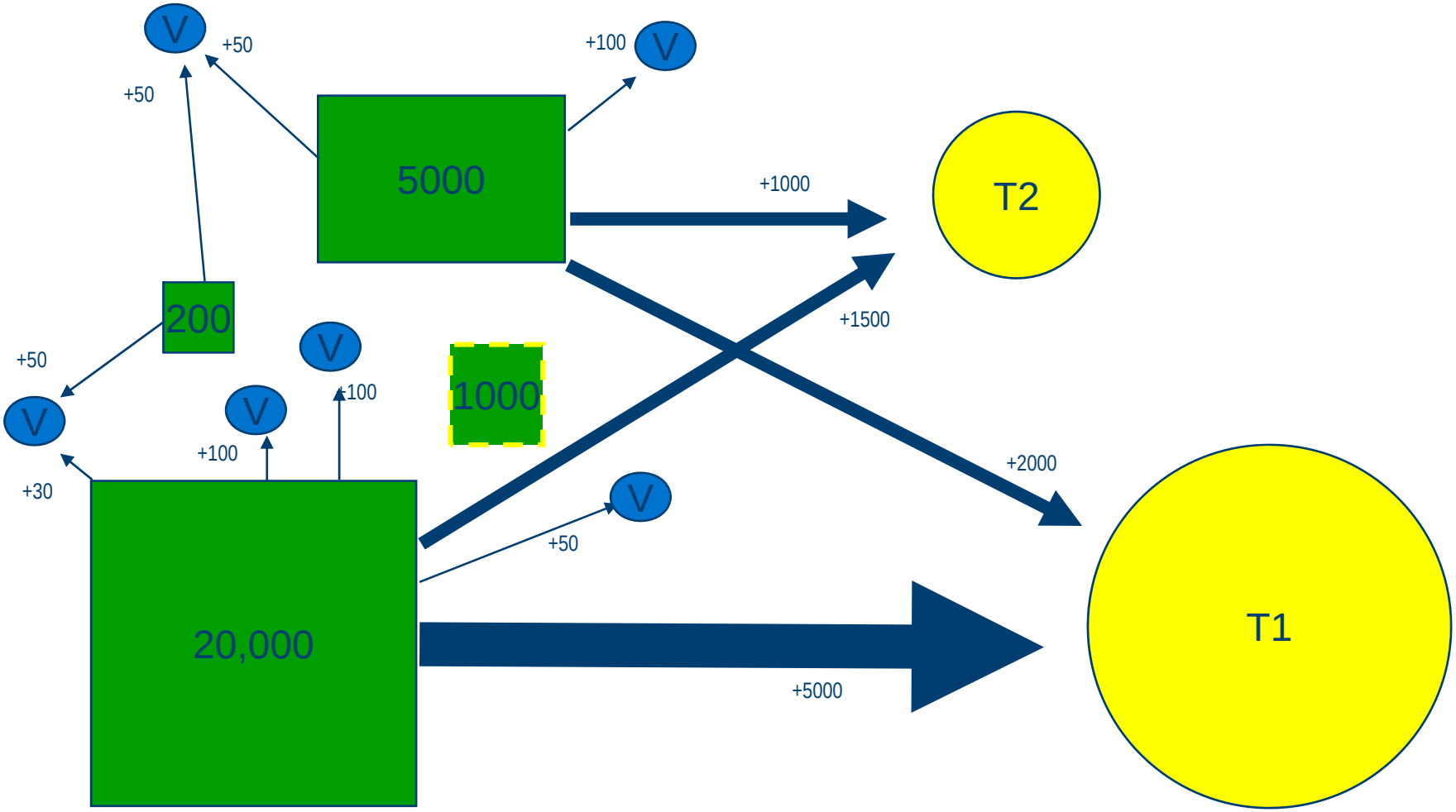
**BIOGEOGRAPHIC**
Elevation (slope / aspect)
Drainage
Land Cover
Soils
Climate
Fire occurrence
Carbon Plots
Vegetation Plots
Flora & Fauna (limited)

**INFRASTRUCTURE**
Main roads
Railways
Towns
Detailed settlement maps (EAM)
Tracks / paths (EAM)

**SOCIO-ECONOMIC**
Administration
Protected Areas
Population
Census data
TSED values

**DERIVED / MODELLED**
Population density
Fire density
Species maps (trees)
Bird distributions
Development indices
Accessibility

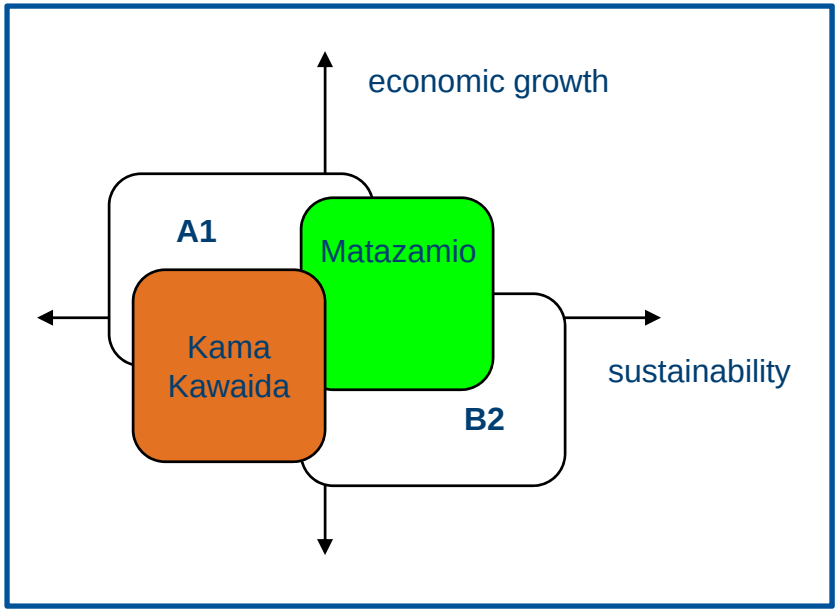
# Service Flows



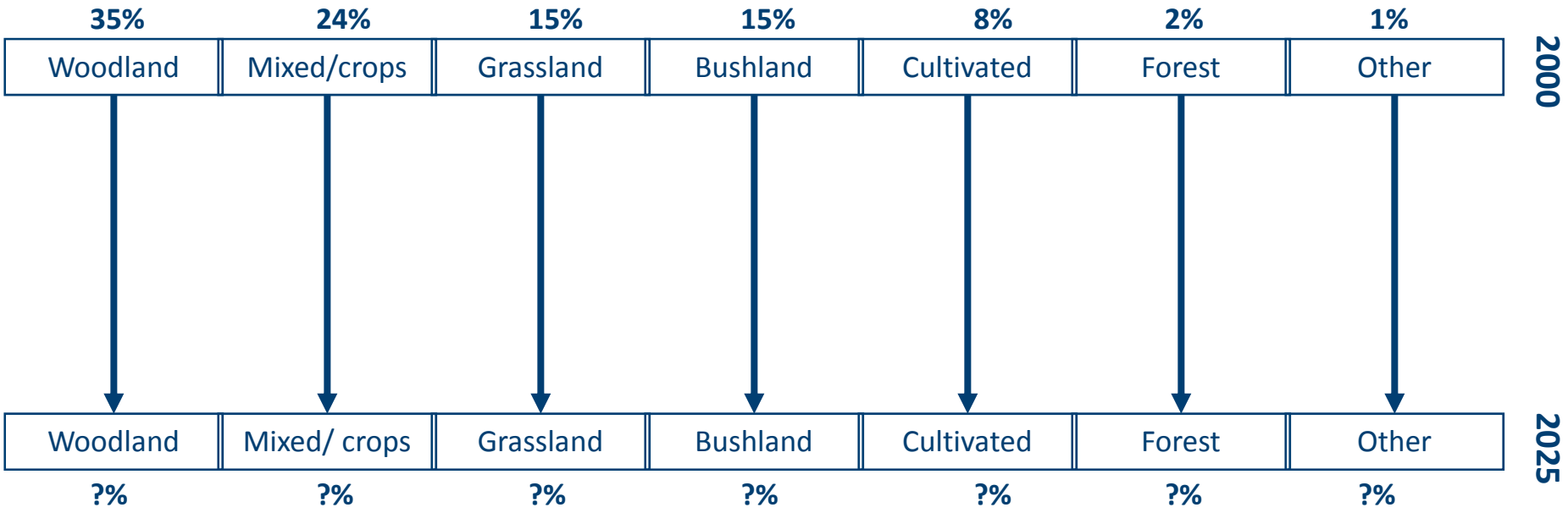
# Socioeconomic scenarios

Scenarios used to help define marginal changes

- Participatory scenario building
- Storylines>possible impacts on Tz landscape>service flows
  - E.g. continued extraction of NTFP and timber and agricultural encroachment>woodland area declines by 3%
- Comparing outputs under different scenarios & policy packages



# Implementing scenarios of change

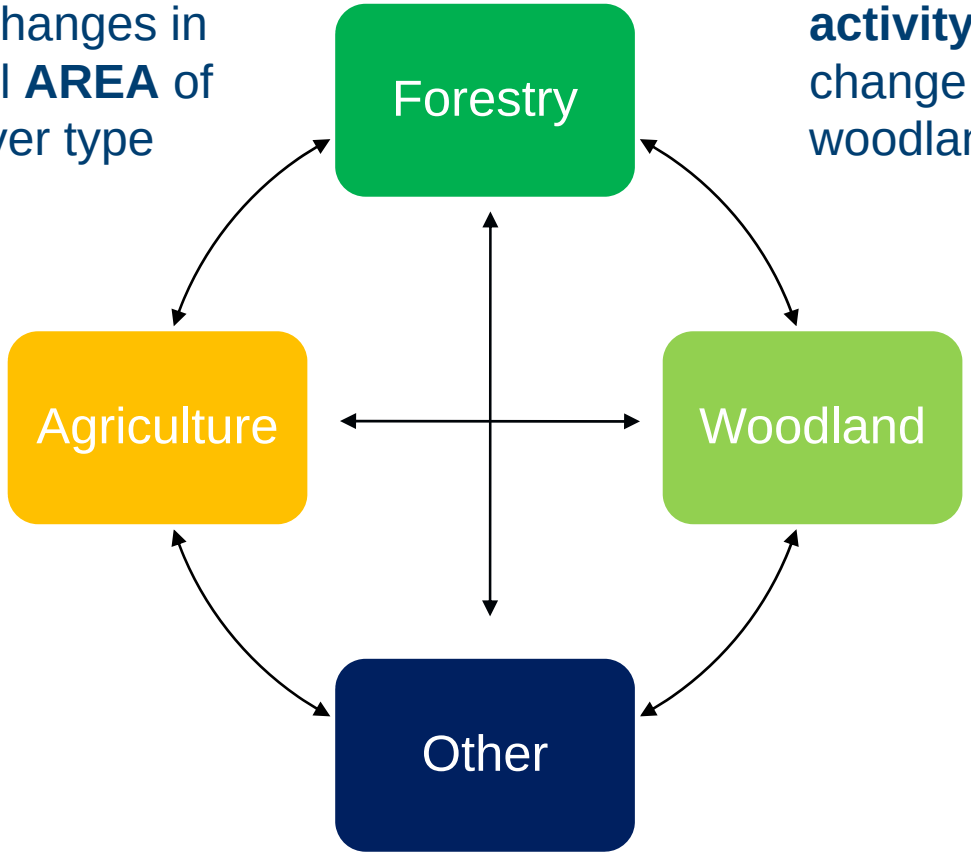


# Qualitative ➡ Quantitative

- From General statements ...
  - “Agriculture will increase”
- To specific statements ...
  - “Where soils are suitable”
  - “Where there is some rain between Jan & April”
  - “Where there is access to a road”
- To the expression of rules
  - “Where soils are of type x, y or z”
  - “Where 650mm <= annual precipitation <=1800mm AND precipitation in Jan Feb and Mar exceeds 300mm”
  - “Within 20km of an all-weather road”

# Area versus activities

Some of the rules relate to changes in the overall **AREA** of a land cover type

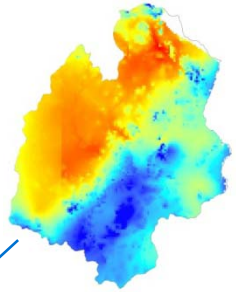



Others actually relate to changes in an **activity** which is then expressed as a change in the overall AREA of woodland.

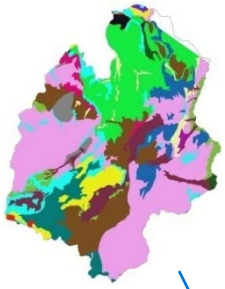
- NTFP
- Charcoal
- Poles
- Hunting

# Implementation of change – agriculture example

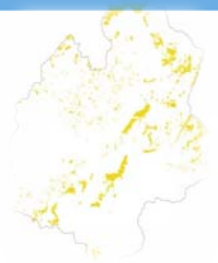
LandCover



Annual Precipitation



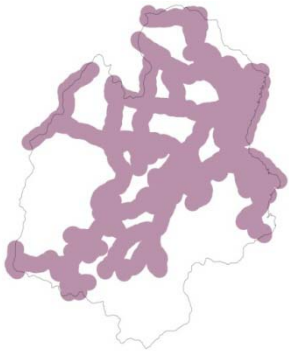
Soils Map



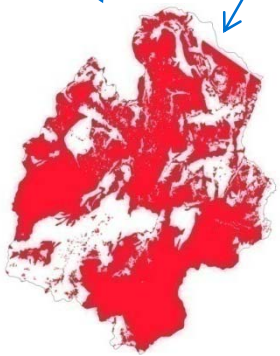
Current Agricultural Area

Suitable landcovers
NOT (urban, water, rock, cultivation, ice/snow, ocean, plantation forest, plantation agriculture, swamp)

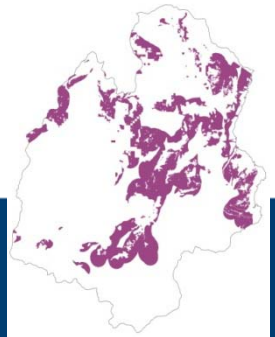
Suitable climate
(600<= annpt <= 1800mm)

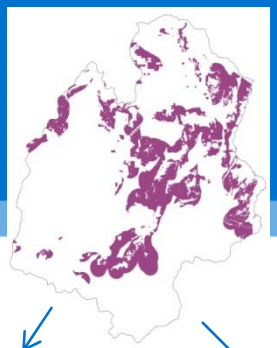


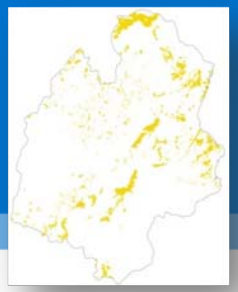
Within 20km of navigable road
(highways & secondary)



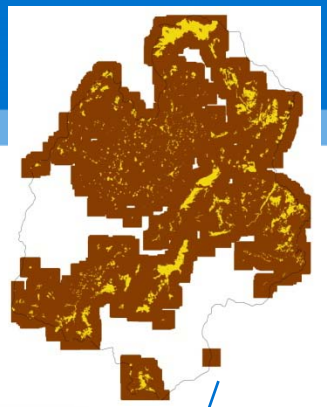
Soils suitable for agriculture



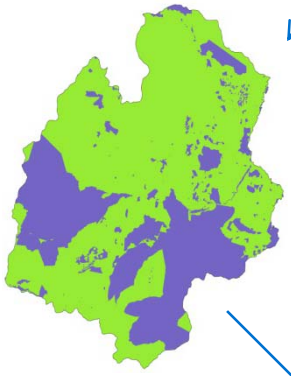




Current Agricultural Area

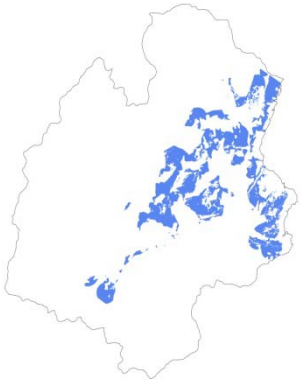


Within 20km of current agric

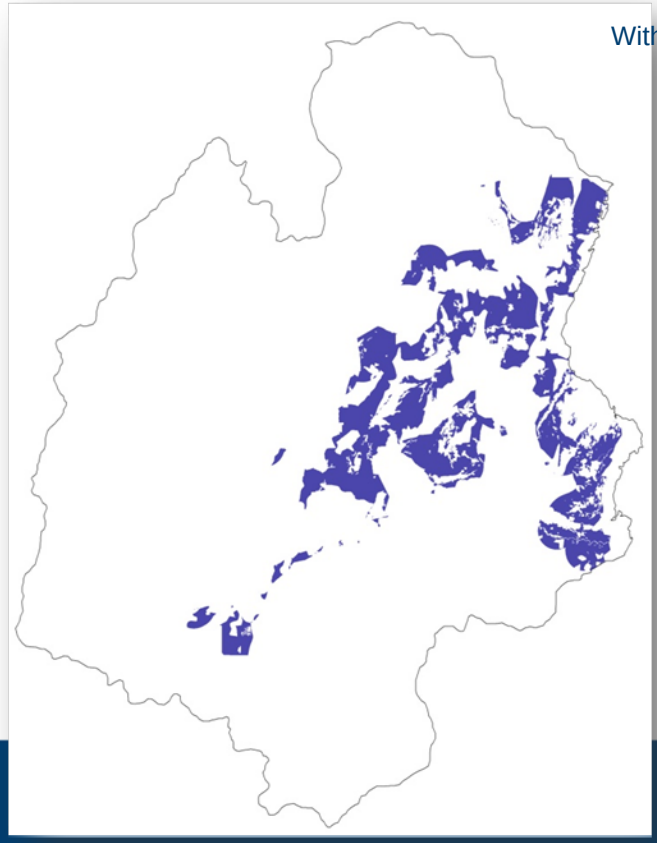


Protected Areas

Target certain districts



Outside PA, target certain districts



Essentially binary
Decision making

# Implications for conservation in TZ

- Policy relevance for Tanzania
  - Where to target resources for maximum benefit
  - How different economic futures may have +ve / -ve impacts on TZ
- Directly feeds into negotiations for REDD*
- Payments for Ecosystem Services - water
- Money potentially available to feed directly back into conserving the habitats
- Equitable treatment to those people maintaining these services.



* = Reduced Emissions from Deforestation & Degradation

# Collaborators & Funding

VALUING THE ARC

- Funded by The Leverhulme Trust
- In collaboration with:

- Andrew Balmford, Neil Burgess, Rhys Green, Jon Green (Cambridge UK).
- Brendan Fisher, Chris Kirby ,Sian Morse-Jones, Kerry Turner , Doug Yu, (UEA, UK)
- Simon Lewis & Juoni Paavola (Leeds, UK)
- Celina Smith & Sue White (Cranfield, UK)
- Antje Ahrends, Rob Marchant, Andrew Marshall, Phil Platts (York, UK)
- G. Kajembe, S. Madoffe, R. Malimbwi, B. Mbilinyi, P. Munishi, (Sokoine University, TZ)
- K. Howell, G. Jambiya, K. Kulindwa, F. Mtalo, S. Mwansasu, P. Valimba, (Univ. of Dar Es Salaam, TZ)
- S. Mwakalila (WWF Tanzania)
- Nasser Olwero & Taylor Ricketts, (WWF US)

UNIVERSITY OF LEEDS

Cranfield UNIVERSITY

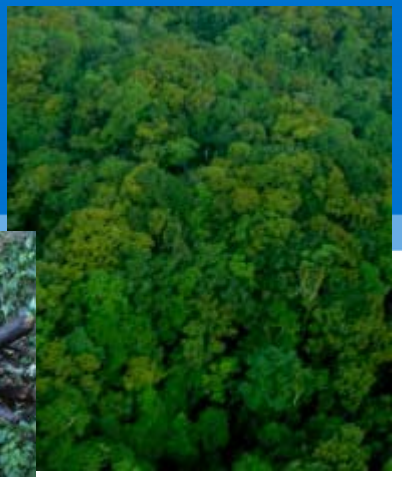
natural capital PROJECT

UEA NORWICH

THE UNIVERSITY of York

www.panda.org Tanzania

# Thankyou for your attention



For further information please contact:
**Ruth Swetnam**
Conservation Science Group
Zoology Dept
Cambridge University

**rds40@cam.ac.uk**

See www.valuingthearc.org