Hydrological analysis of catchments in S. Tanzania

SNAPP Water subgroup
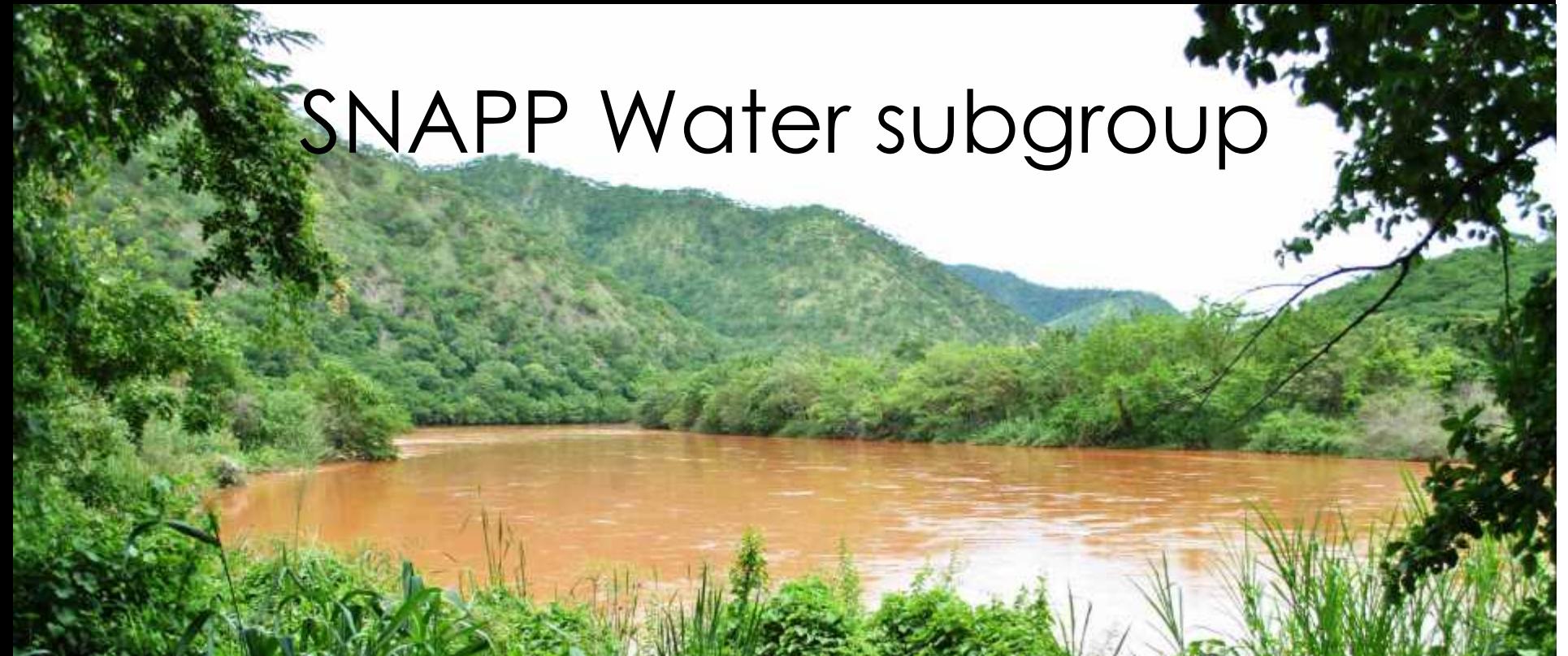
Goals

- Characterize base-line conditions of water resources in the Southern Highlands of Tanzania

- Identify interactions among land-use change, climate change and water resource management
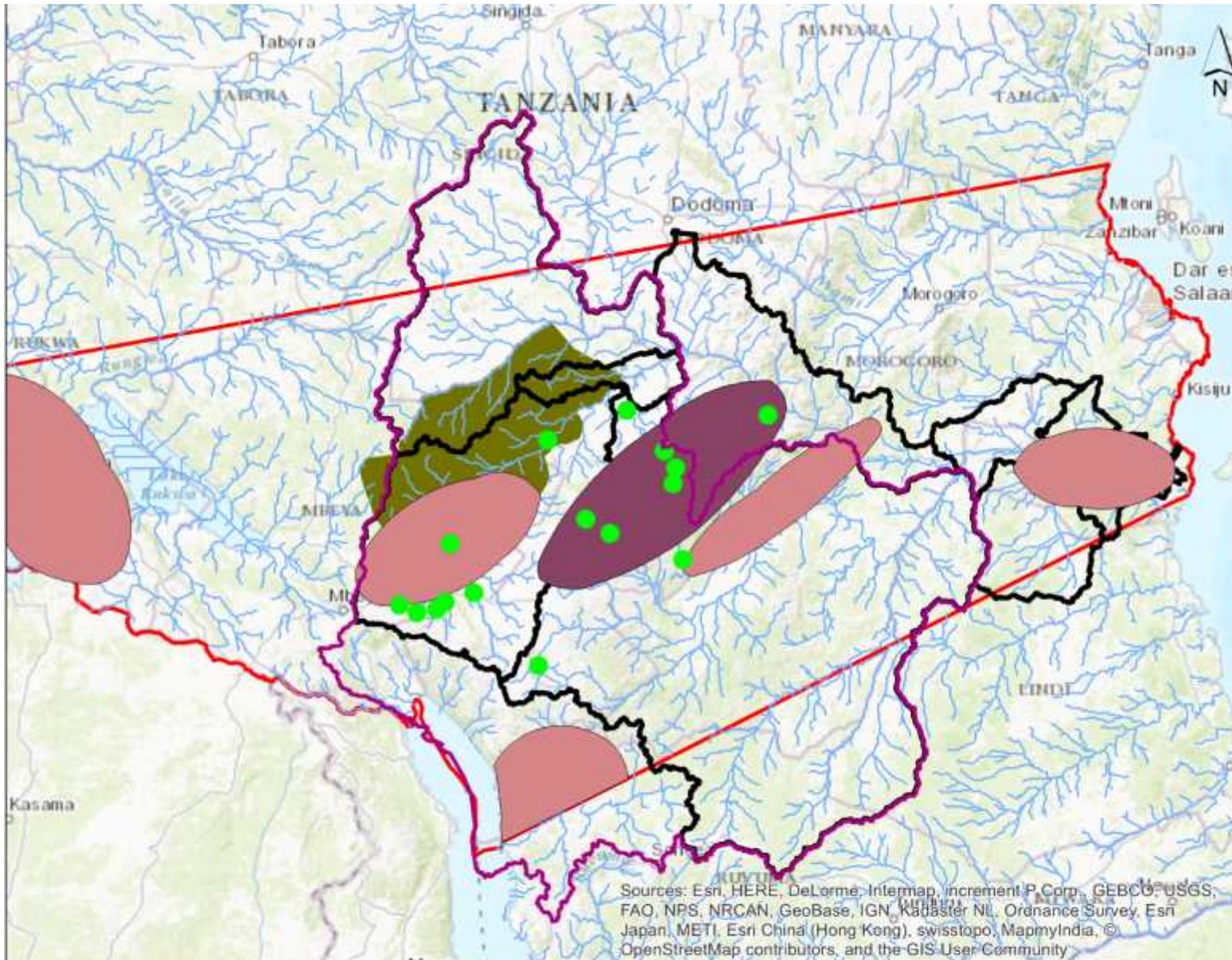
Legend

▢ Study_Extent_outline	▬ Development_Clusters	— rivers_Stream network
● Monitoring_stations	▢ Rufiji basin & subbasins	▬ RuahaNP
▬ Ihemi_Cluster		▢ Sagcot Outline

Approach

| Land use mapping	Predicting land-use	Hydrologic Modelling	Climate	Sediment modelling
1980				
1990		1981 - 2014	Historical temperature & rainfall	
2000				
2010				
2014				
2020		2015 - 2030	Projected temperature & rainfall	
2025				
2030				

Land-use change   River-flow estimates   Erosion/Sediment estimates
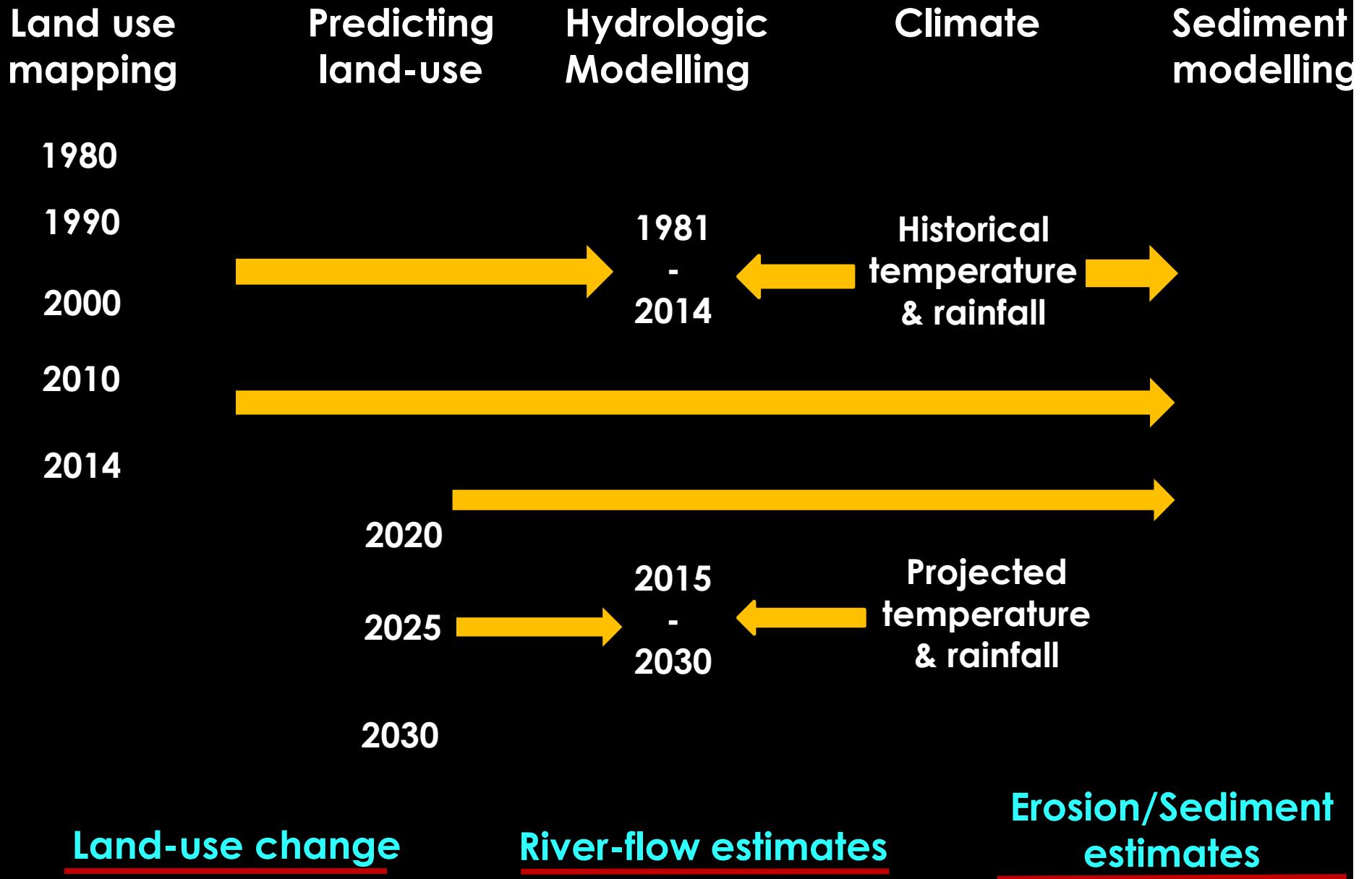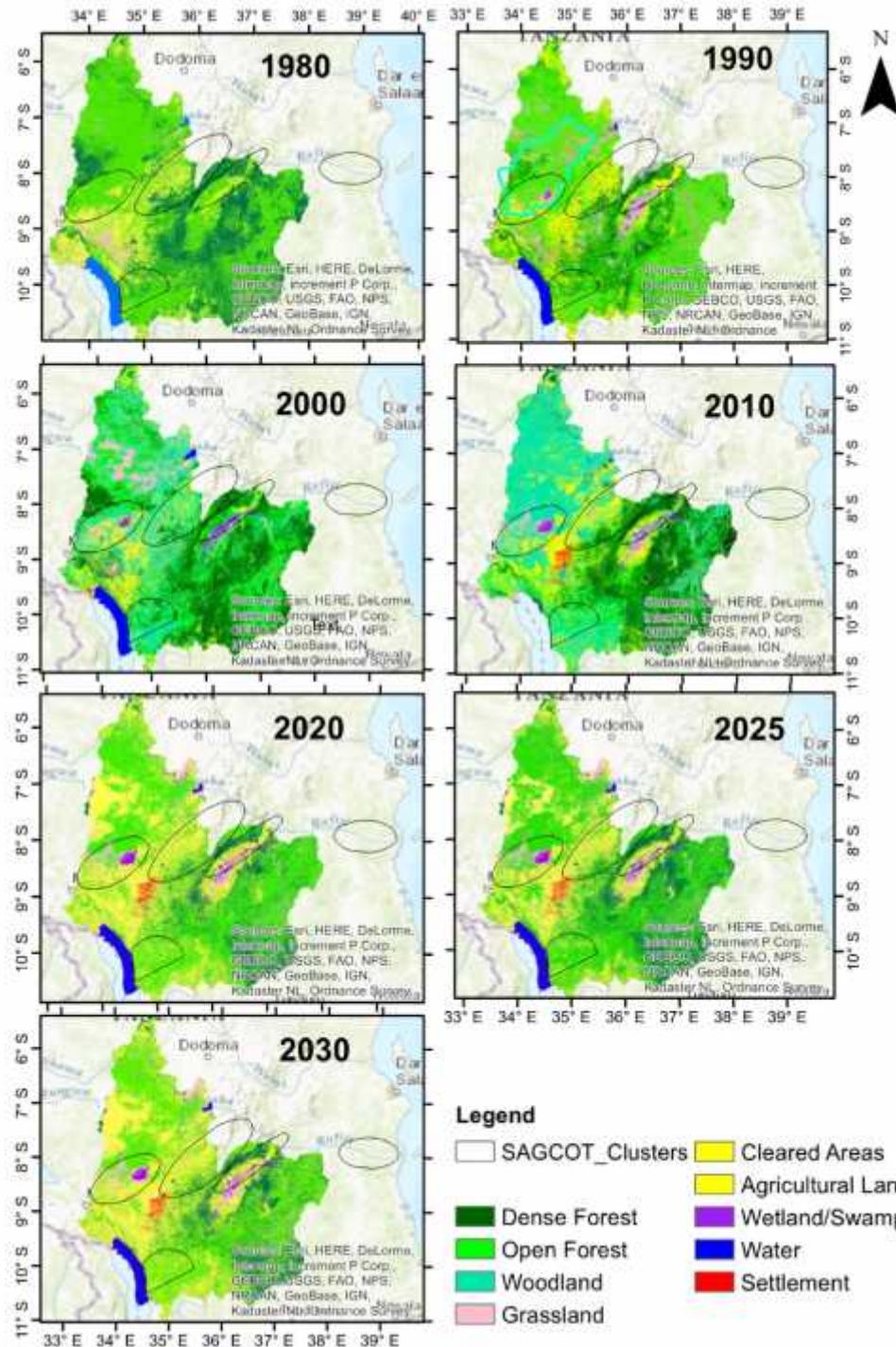
- Land clearing for agriculture increased

- Dense forests declined

- Same trends expected in the future

Agric. increased from 10-15%

projected to increase to ~25%
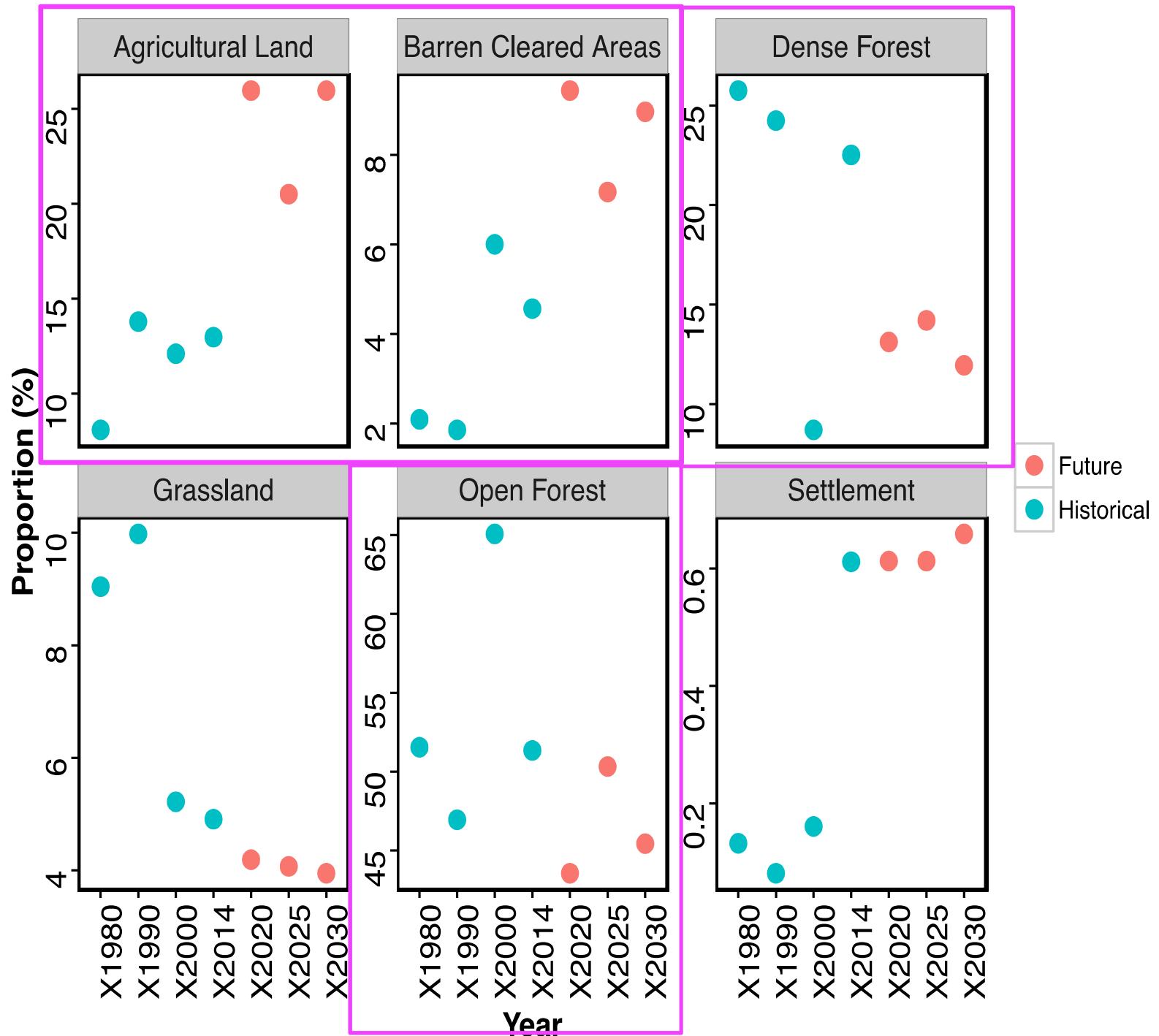
Hydrological model to simulate river flow

- Daily simulations: 1981- 2014; 2015-2030
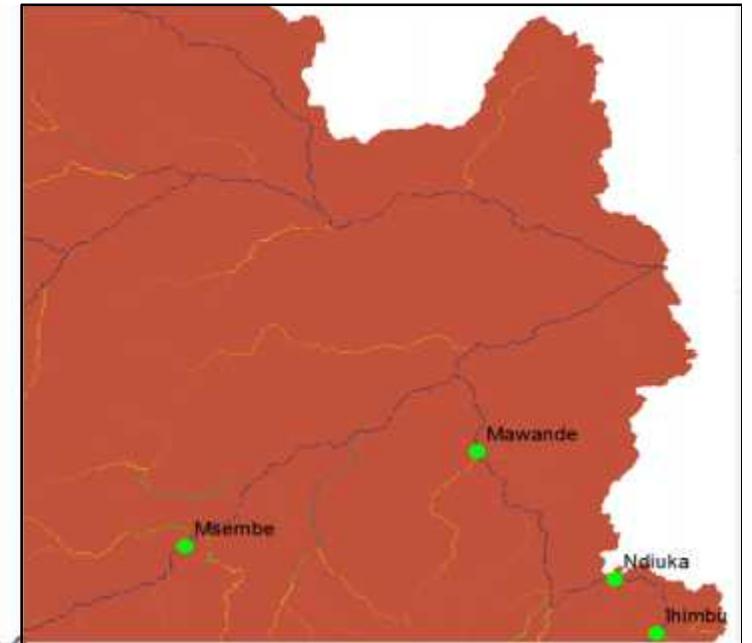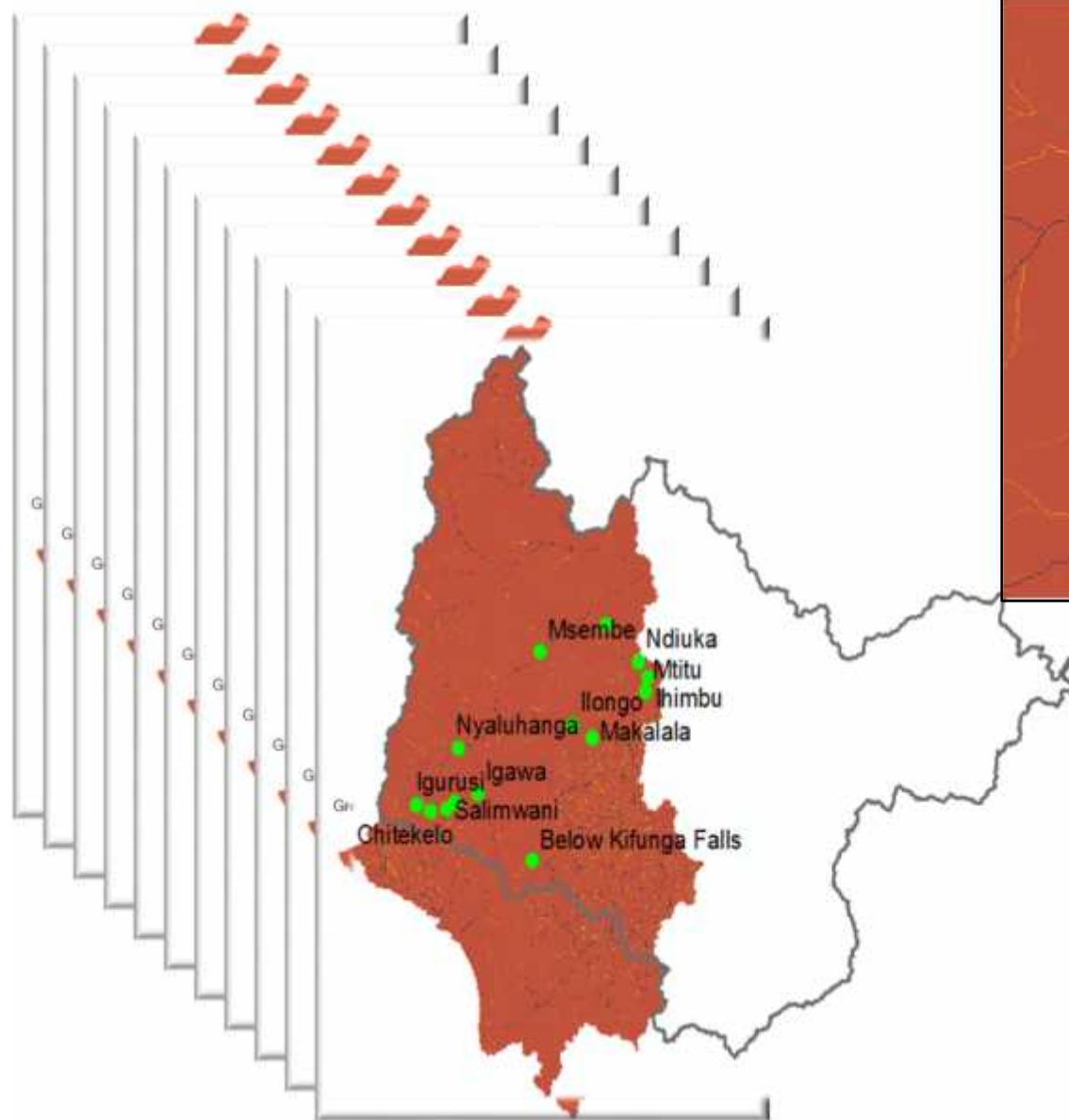
✓ Historical and future estimates of daily river flow from 1981-2030 for every point in the study area

Application example: continuous data

- Daily simulations: 1981- 2014; 2015-2030
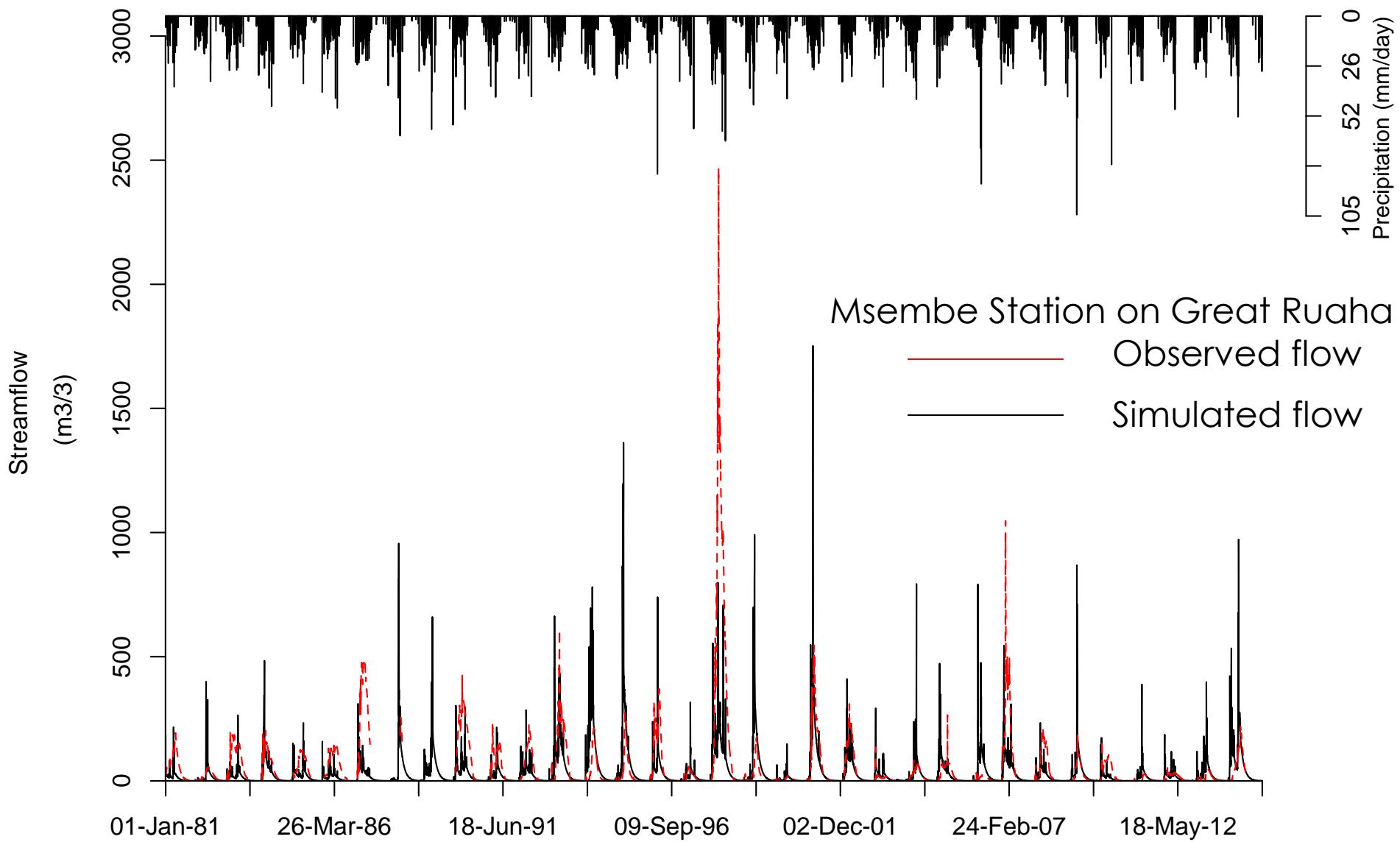
Application example: continuous data

- The frequency of spell events (no. per year)

- Average Recurrence Interval of events in years

- Average duration of spell events

- Average spell peak

- Minimum duration of spell events

- Average duration of spell events

Comparing historical (1981-2014) monthly Raifall and river flow to projected (2015-2030)
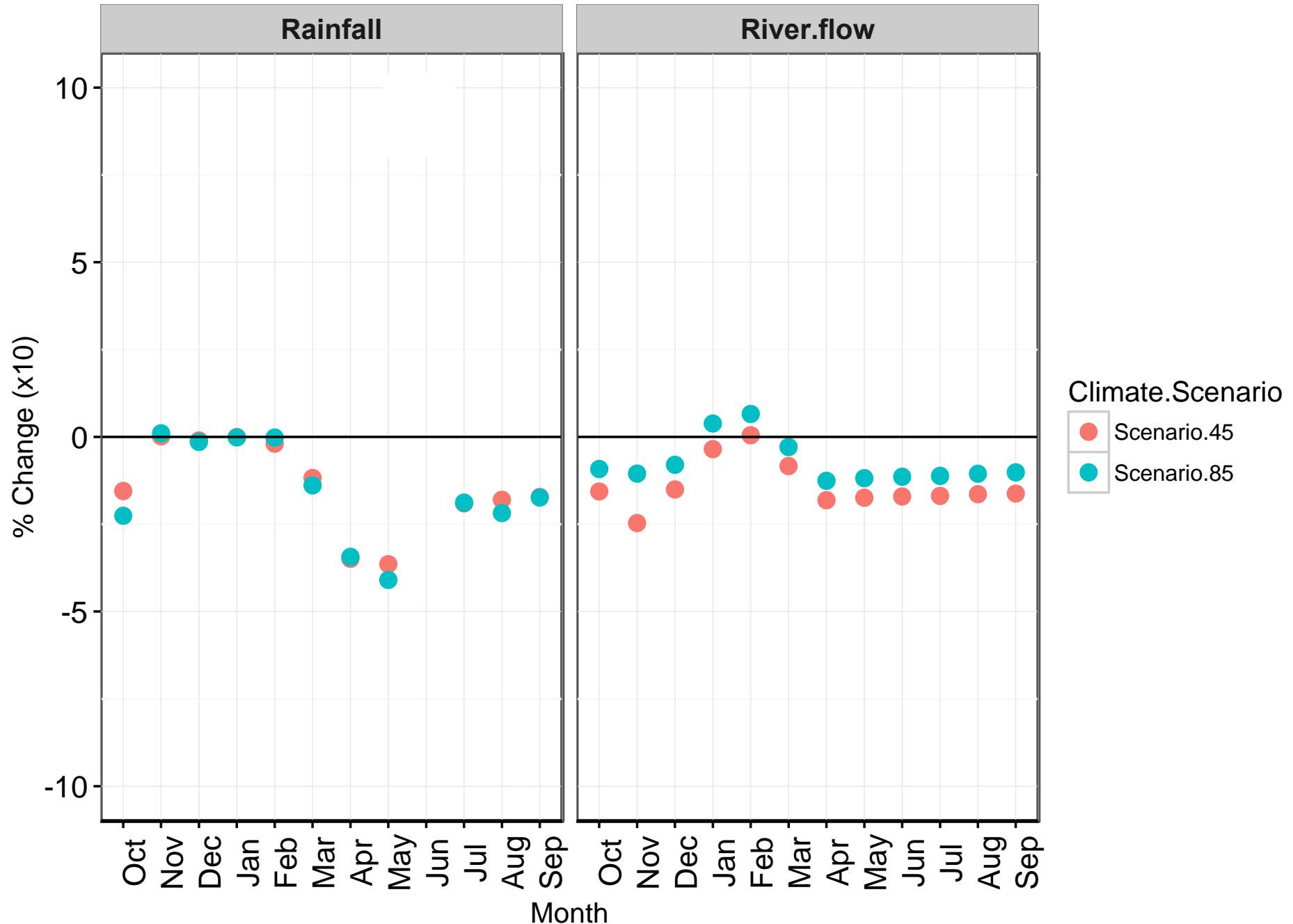
Base flow
amount relative
to mean daily
flow

30% of the
stream
comprised of
base flow base
flow

Mean daily flow (MDF) & mean baseflow (mean.bf)
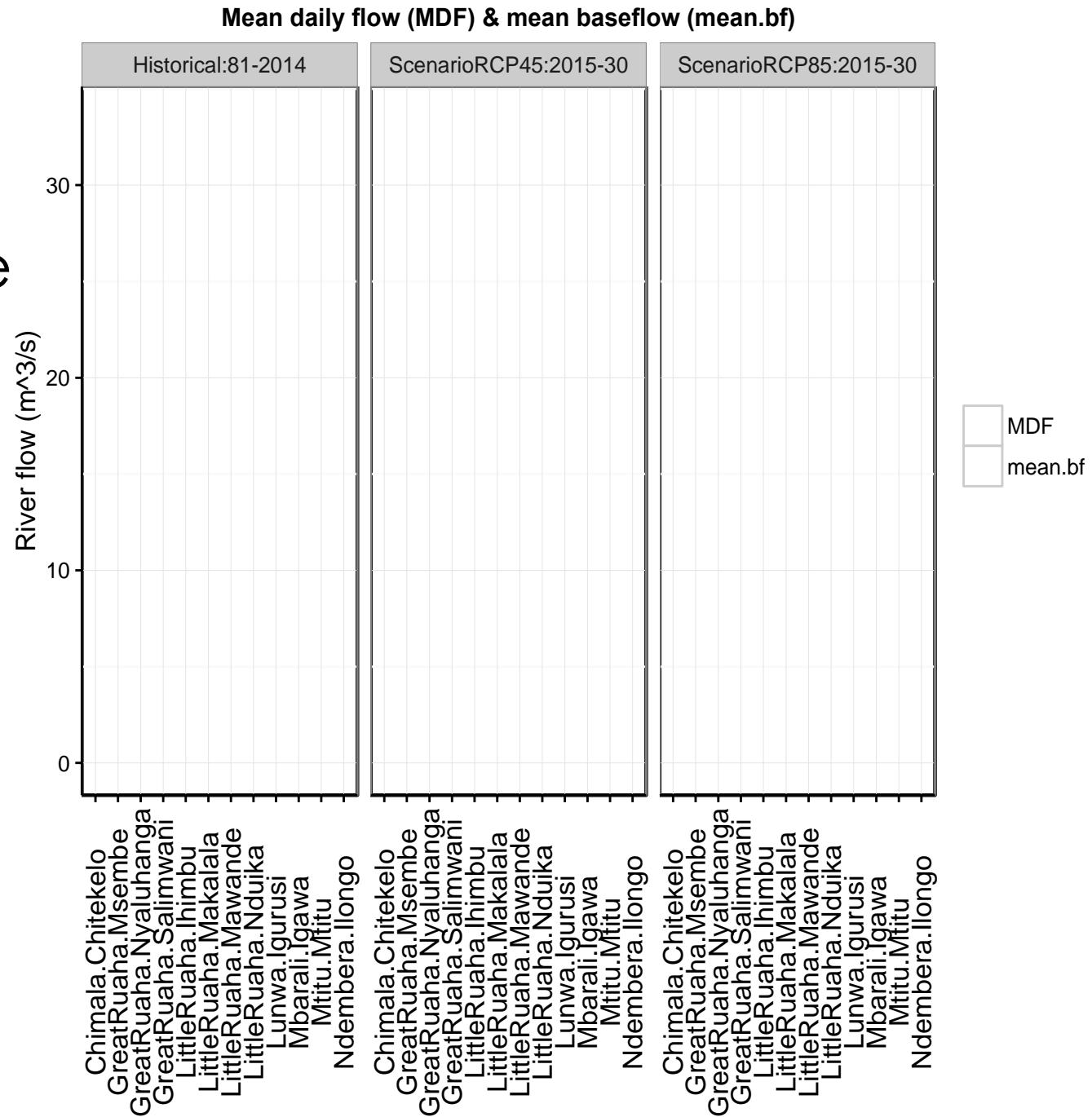
Sediment export – Tones/Ha

Legend

|	
Development_Clusters	3.0 - 9.2
Rufiji basin & subbasins	9.2 - 21.05
1.4	21.1 - 27.02
1.41 - 3.0	27.02 - 78.9

Total potential soil loss

Catchment retention

Sediment export
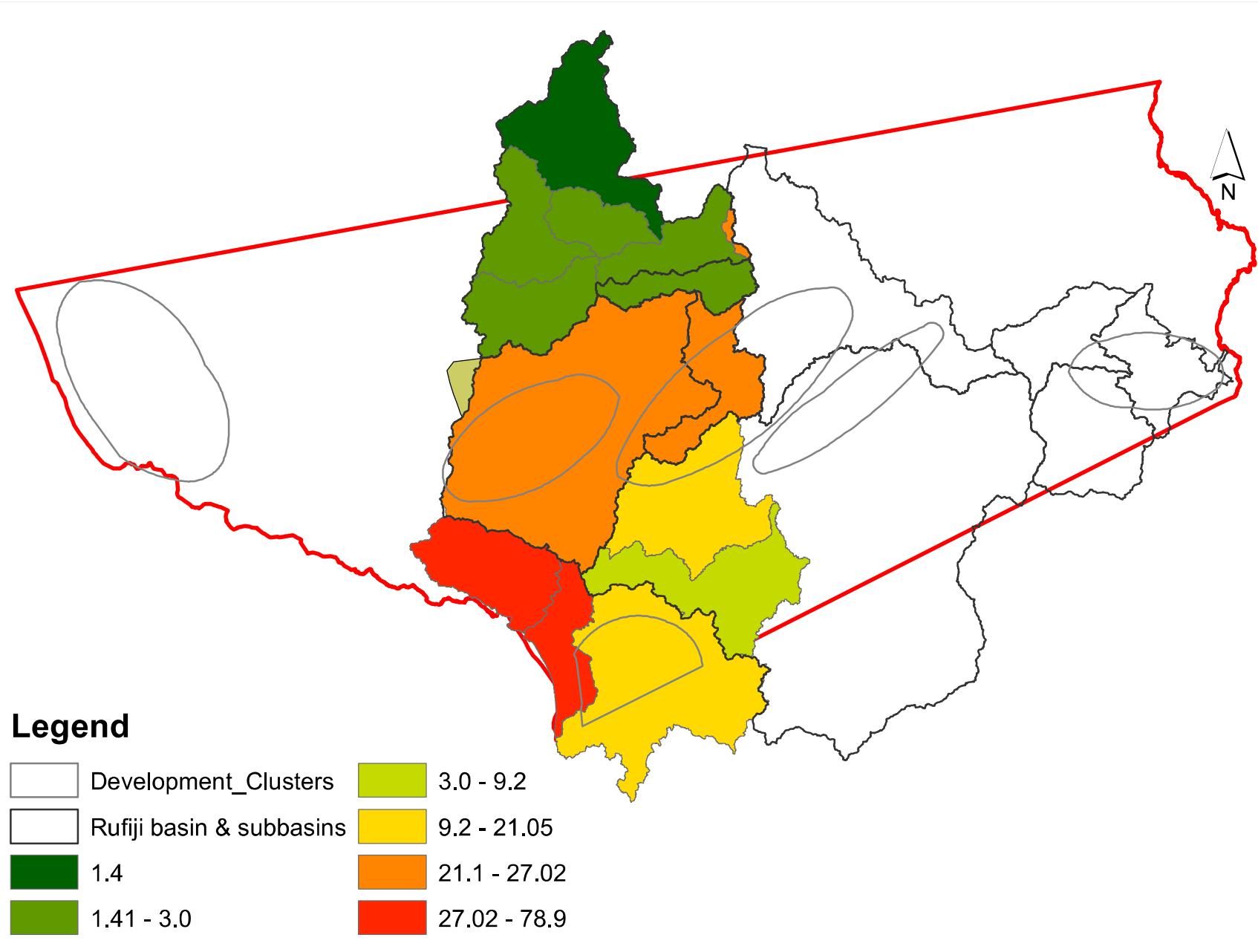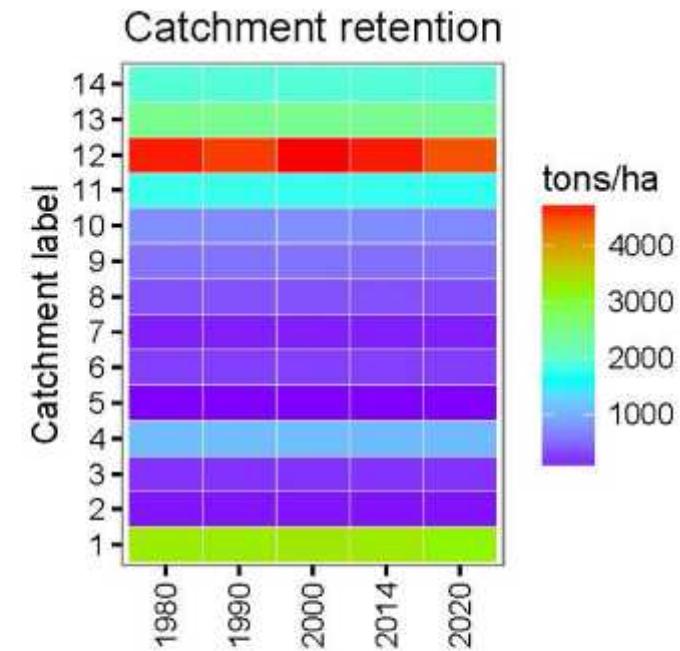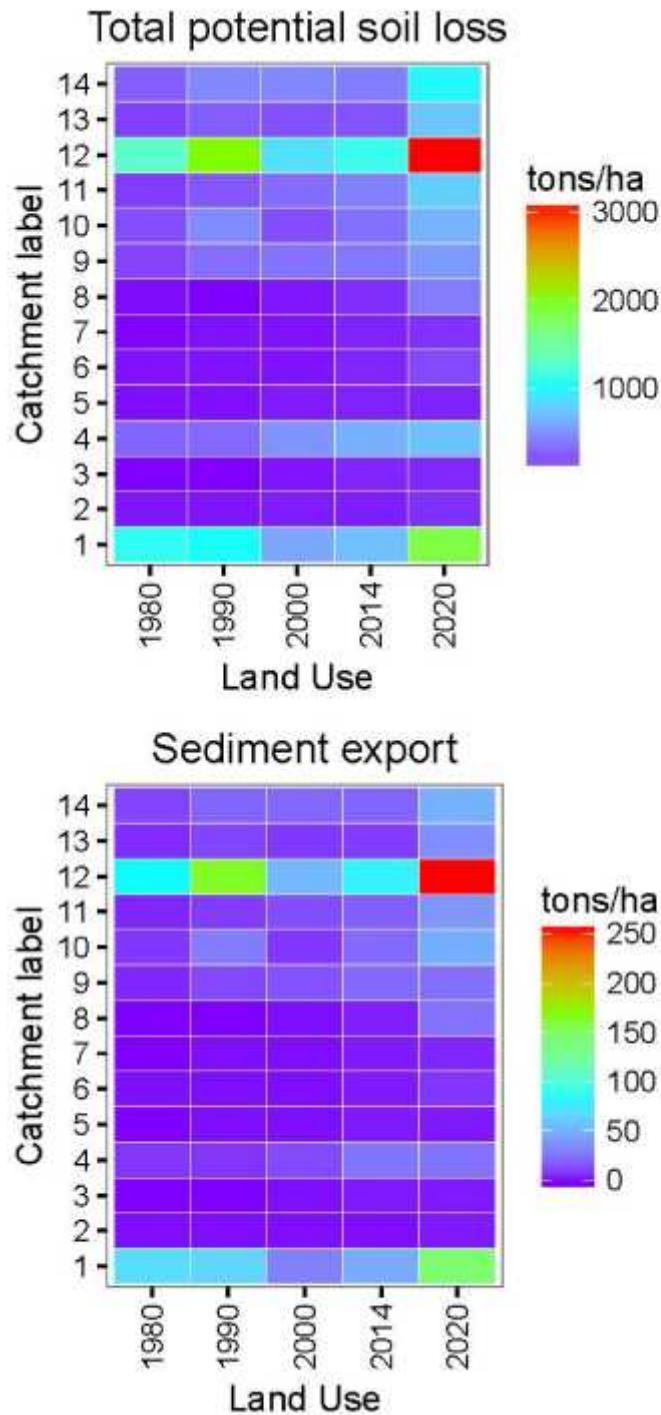
Catchment Labels: 1-14
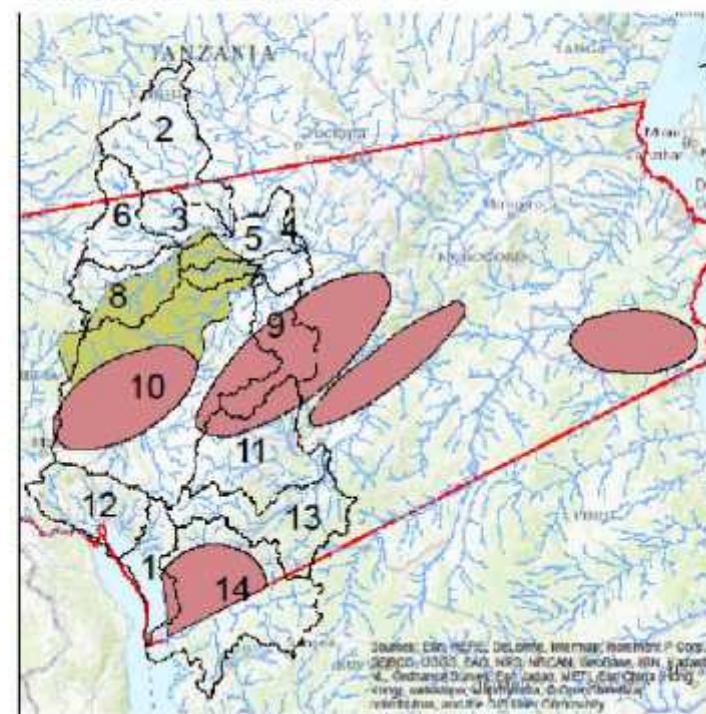
Select Applications

- Model can be the basis for water allocation modelling
- Supporting water resource management during the dry season
- Predicting water stress at any point in the study area for any day up to 2030
- Sustainable land use management priority setting for water resources in the Southern Highlands

Summary

- Model provides the baseline water balance (1981-2014) and future predictions (2015-2030)

- Future flow will slightly increase over the next 30 years during wet seasons

- Dry seasons are predicted to become drier, with a net decline in river flow and precipitation

Summary

Next steps

- User-Friendly tool: online interphase to access model outputs

- Capacity building

- Scenario building

- Data analyses for other locations of interest