AGRICULTURAL DEVELOPMENT, BIODIVERSITY AND ECOSYSTEM SERVICES IN THE LAKE VICTORIA BASIN

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Introduction

Context

- Lake Victoria Basin (LVB) covers parts of five countries
- LVB declared "area of common economic interest" and "regional economic growth zone" by the EAC
- Agriculture main economic sector in the region
- 25% of Key Biodiversity Areas and ecosystem services under threat from deforestation, overexploitation and poor land use practices
Conceptual framework

Plausible Futures.....
LU Plans
Planned infrastructure
Commodity trends

Current Status:
Biodiversity, Pressure
Ecosystem Function

Projected:
Change in Biodiversity
Change in Pressure on Biodiversity
Change in Ecosystem Function

Future Status:
Biodiversity, Pressure
Ecosystem Function

Current

Scenario

Future 1
Future 2
Future n

Landscape
Change
Scenarios and modelling change

Method and data

- Current and future land cover simulated using LandSHIFT land use change model (Schaldach et al., 2006)
- Initial land cover based on GLC2000 (Bartholome and Belward, 2005)
- Regionally developed scenarios, quantified by IMPACT model (Rosegrant et al., 2011)
- Biodiversity importance based on IUCN species ranges, habitat affiliation (IUCN, 2015) and modelled land cover
- Ecosystem services importance based on landscape functions approach (Kienast et al., 2009)
- Analysis carried out at watershed scale

Analysis flow chart

1. Regional scenarios to 2050
2. IMPACT model
3. LandSHIFT land use change model at ~ 1 km resolution
4. Changes in biodiversity and ES importance in watershed
Socio-economic scenarios

- 4 regional stakeholder developed scenarios
- Developed in collaboration with CGIAR-CCAFS

Participants of the East African Scenarios workshop 2013. Image: CCAFS
Quantifying the scenarios

Population changes

- Population for all countries set to nearly double by 2050
- Only Burundi showing slowing trend towards end of scenario period
- Large differences between scenarios
Quantifying the scenarios

**Dietary changes**

- Projected nearly doubling of meat production in some countries will require increase in grazing land
Quantifying the scenarios

Crop production

- Different scenarios have different trajectories for crop production
- Scenarios include a large drought event around ca 2020
- For some crops projection range not larger than recent inter-annual variability
- Climate change in some cases increases crop production
Results

Projected land use changes

Baseline (2005)  
Projected 2050 Sleeping Lions scenario
Results

Projected forest loss

Baseline forest cover

No protection

PAs protected

KBAs and PAs protected
Results

Impacts on biodiversity

Baseline biodiversity importance

No protection

PAs protected

KBAs and PAs protected
Results

Impacts on ecosystem services

- Commodity provision, wild provision and regulating services.
- Forest loss has greatest impact on wild provision and regulating services.

No protection

PAs protected

KBAs and PAs protected
Results

Impacts on ecosystem services

- Trade-offs in ecosystem services
- Commodity provision unaffected or increases but regulating and wild provision decreases

Commodity provision

Regulating provision

Wild provision
Conclusions

- Novel framework that can be implemented at different scales and for different regions that can help in prioritising conservation or other actions.
- Different socio-economic scenarios result in only small differences in agricultural development and thus impacts on biodiversity and ES at the watershed scale.
- Protecting areas can lead to more forest loss as more forest is lost outside their boundaries if LU change drivers remain the same.
- Without protection, biodiversity losses are higher. Increasing protection (e.g. KBAs) results in even lower losses.
- Without protection, the bundle of ecosystem services (wild, regulating and provisioning) loses more than with protection.
- Spatial assessment of different ecosystem services allows for analysis of trade-offs.