Agricultural development and biodiversity
A case study on the Great Lakes of Africa

This study aims to identify current and potential future priorities to inform activities of stakeholders, in relation to impacts of agricultural commodity markets on biodiversity in the Great Lakes of Africa

Introduction

Land conversion and intensification of agricultural systems seem unavoidable and likely to lead to a loss of biodiversity and ecosystem functions. There is an urgent need to understand trade-offs between land uses, and provide such information to stakeholders.

This study uses an analytical framework at national and regional (multi-country) scales and combines future scenarios with land use modelling, to evaluate priorities for conservation or other actions, in order to balance demands on land.

Method

- The framework consists of a combination of spatially explicit datasets and newly developed, as well as established, methods of linking these.
- Current and future land cover (Figure 2) based on LandSHIFT land use change model (Schaldach et al., 2011).
- Biodiversity importance index (Figure

3) based on IUCN species ranges, habitat affiliations and modelled land cover (IUCN, 2014).
- Commodities importance index (Figure 4) based on landscape functions approach (Kienast et al., 2009) and modelled land cover data.
- Analysis carried out at watershed scale within MacArthur regions.
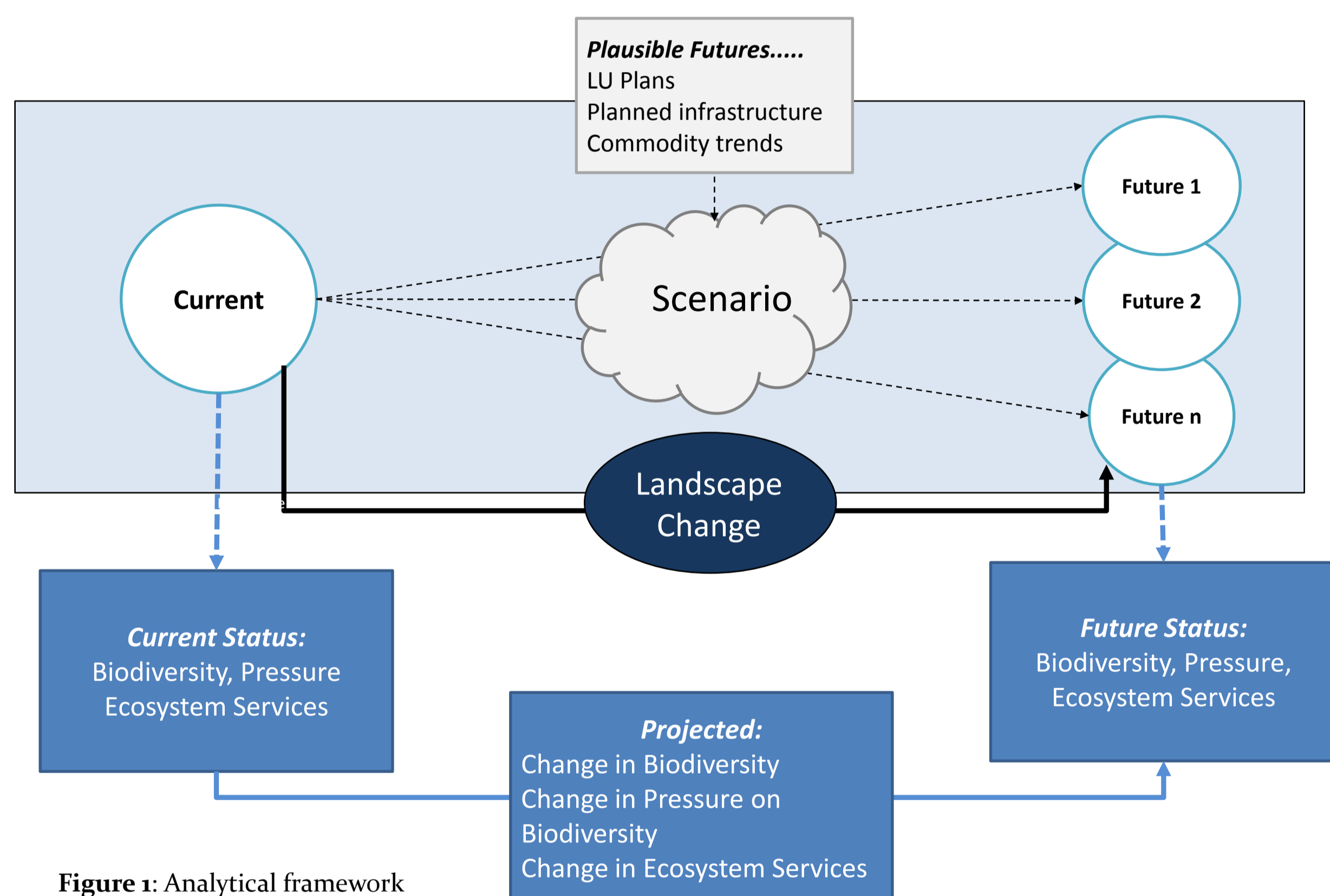- Time frame: 2000 – 2050.

Analytical Framework

Figure 1: Analytical framework
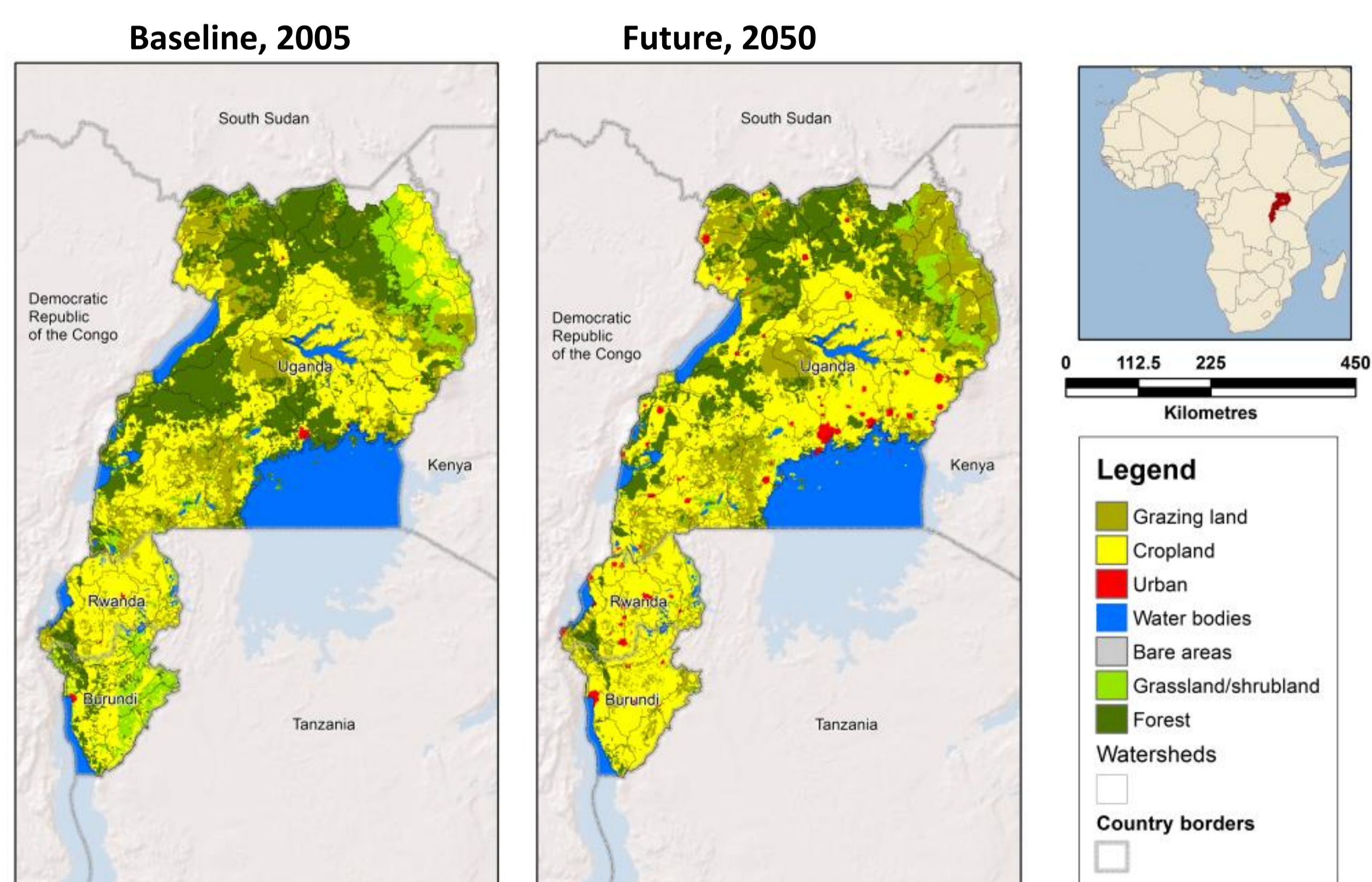
Modelled land use change

Figure 2. Modelled baseline land use (left) and under Industrious Ants scenario (Vervoort et al., 2013) for 2050 (right) based on LandSHIFT model results for Uganda, Rwanda and Burundi

Results

Case study results are based on:
- Comprehensively assessed IUCN species groups: birds, amphibians and mammals.
- A regionally developed scenario.
- LandSHIFT land use change data with LCCS classification (Di Gregorio and Jansen, 2000), at 1 km spatial resolution.
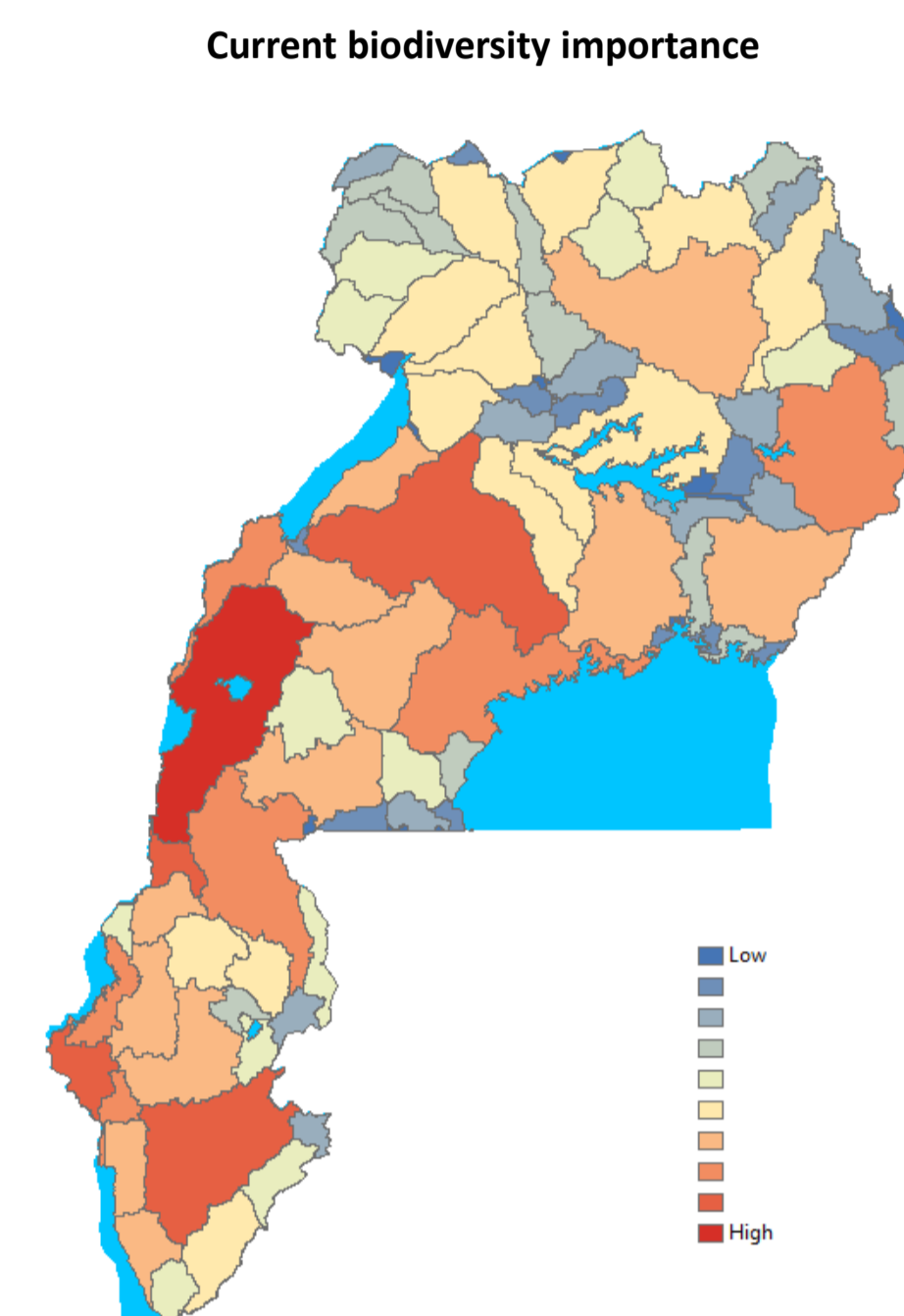

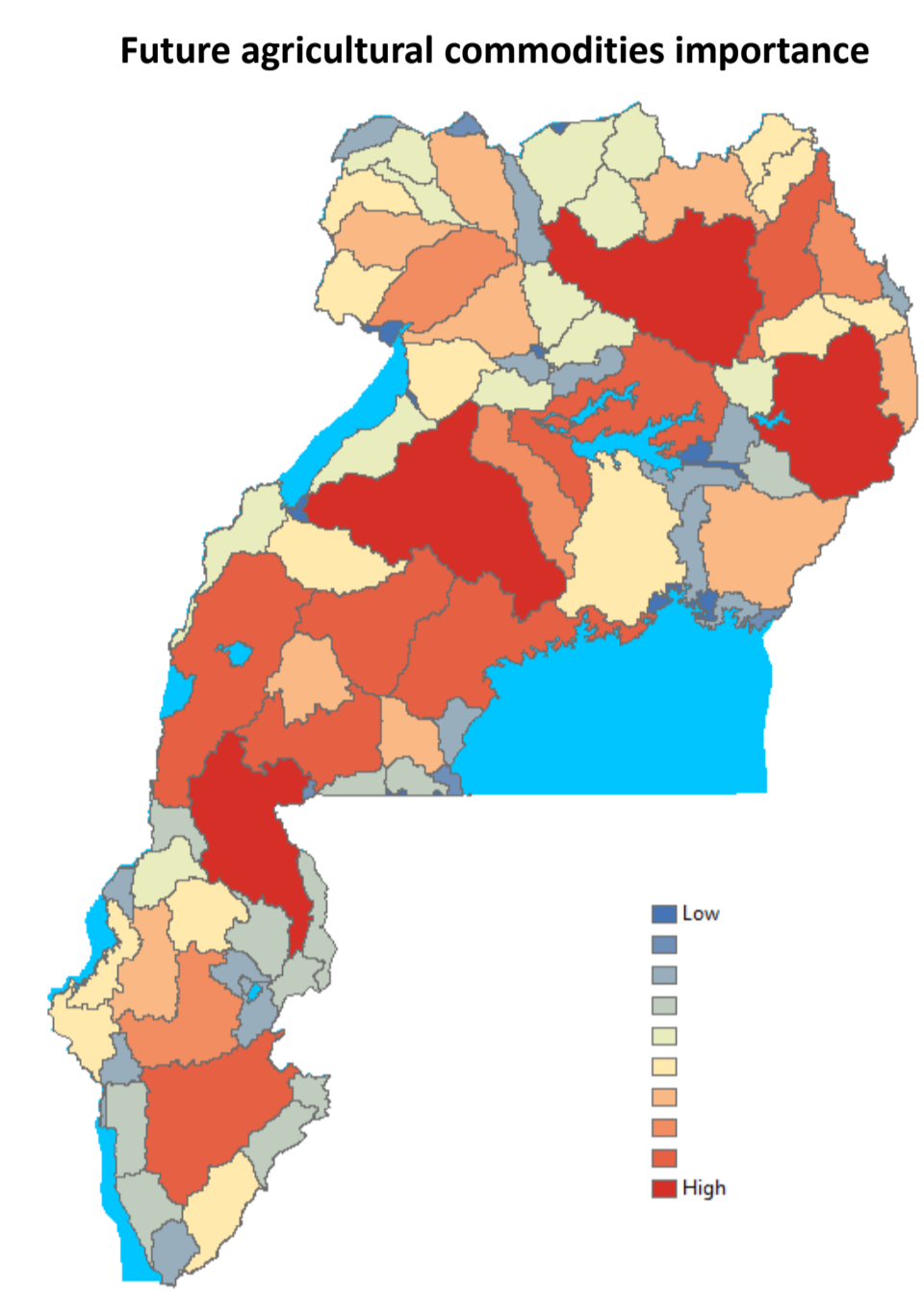Figure 3: Current biodiversity importance of watersheds in the Great Lakes Region.

High biodiversity importance is characterised by:
- Diversity of land cover/use types
- Mix of species
- High number of endemic or restricted range species

Figure 4: Future commodities importance of watersheds in the Great Lakes Region.

High importance is characterised by:
- A high proportion of the absolute area of agricultural land (arable and grazing) in the watershed, relative to the region.
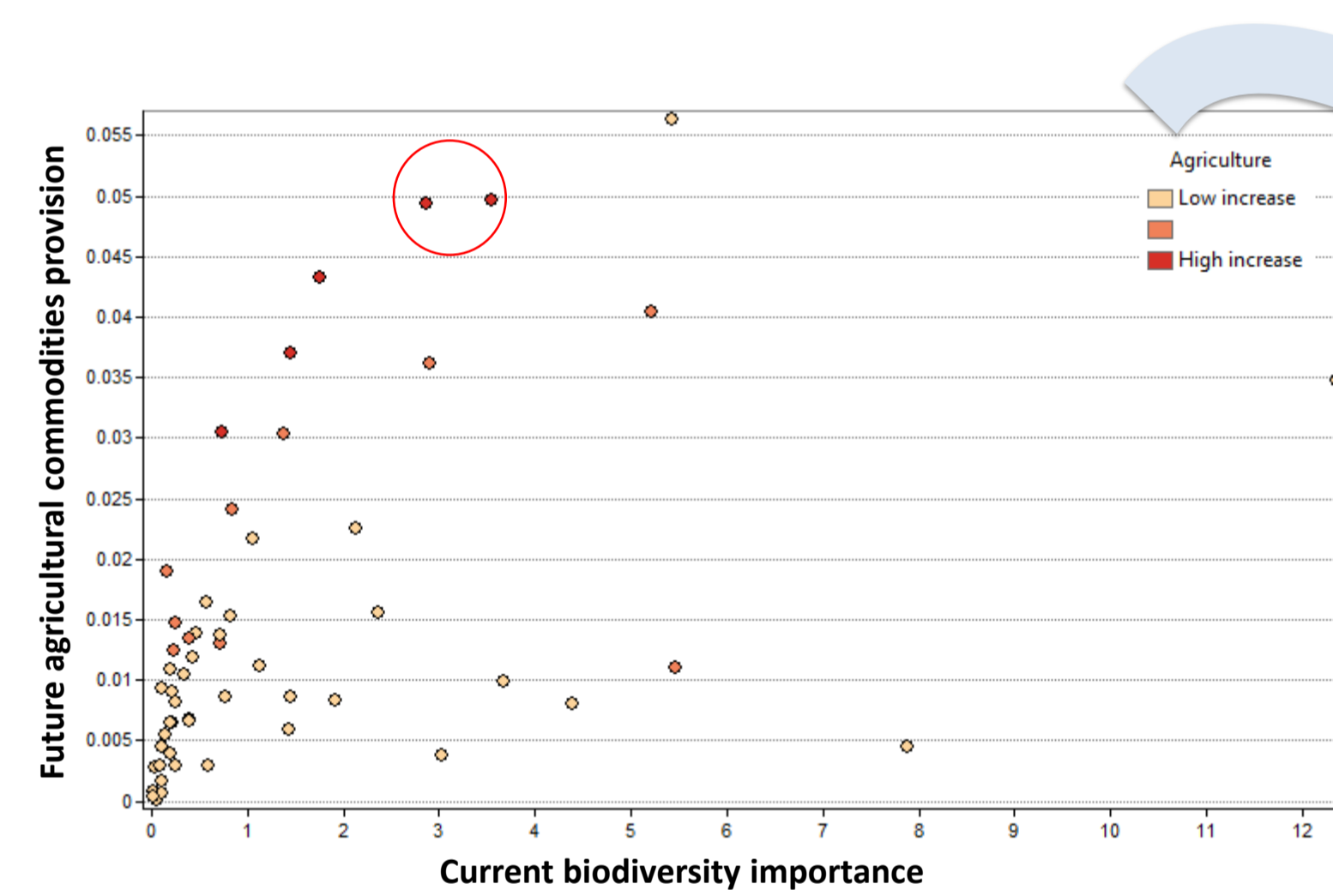- Does not include yield or livestock density

Figure 5: Ranked current biodiversity importance and ranked future commodity provision for watersheds in the Great Lakes Region.
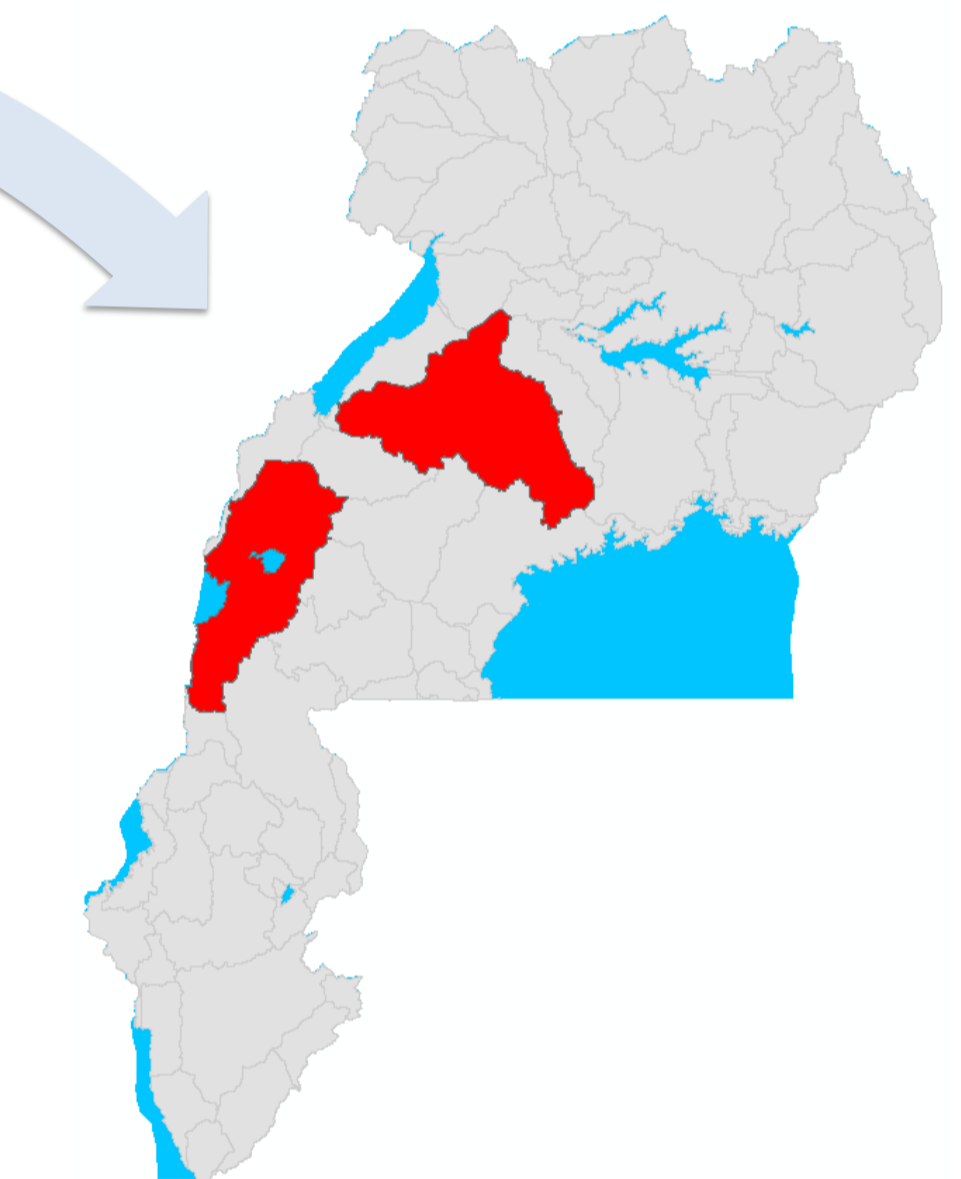
Figure 6: watersheds of high current biodiversity importance and future commodities provision importance

Web-based tool
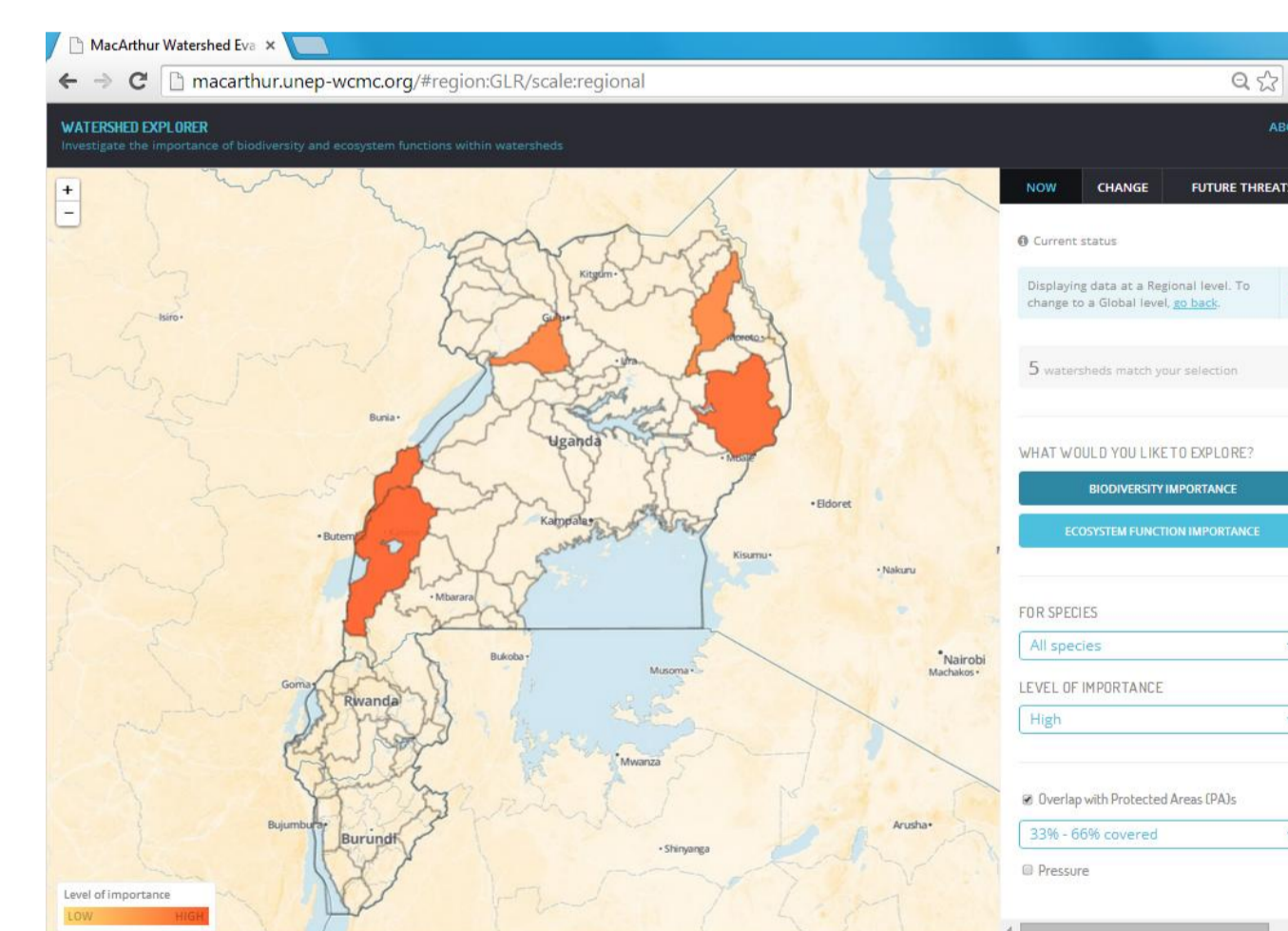- A web-based tool was developed to visualise results for different scenarios. See: http://macarthur.unep-wcmc.org

Figure 7: screenshot of web based visualisation tool.

Conclusion

This study presents a novel approach to assess trade-offs between agricultural development and biodiversity under a scenario of change. It uses a high-resolution land use change model driven by a regionally developed scenario and spatially explicit information on multiple values of biodiversity. This framework is capable of highlighting areas of interest that can be used by donors and other stakeholders to inform conservation or other activities.

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