

KESHO: a participatory scenario modelling tool

What is KESHO?

KESHO is a **scenario framework** named from the Swahili word for “tomorrow” or “later”. Scenario frameworks are used in planning future adaptation strategies; increasingly needed under a future characterized by changing demographic, environment and development pathways. Scenario tools offer the opportunity to consider multiple dimensions (e.g. socio-economic and environmental), to explore multiple alternatives and account for uncertainty around the future events and the impact of different future pathways (Fig. 1). To address challenges of social-ecological systems in face of global to local pressures, we developed a participatory framework to model land use and land cover change (LULCC) scenarios at local, regional and national scales.

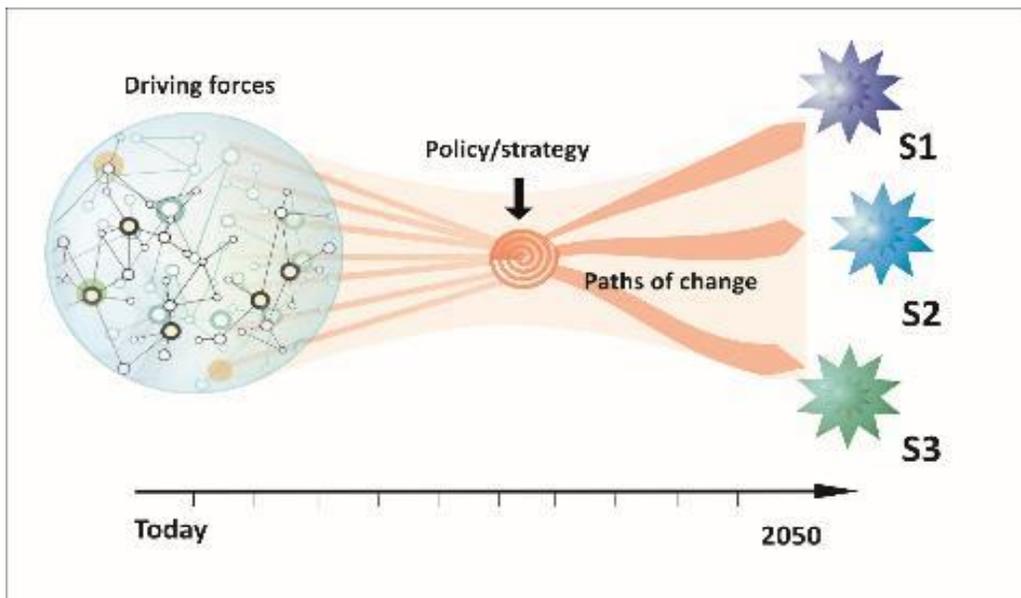


Figure 1. Scenarios. The current system results from interactions amongst multiple drivers. Decisions taken or targets set at present produce alternative pathways of change (e.g. S1, S2, S3) that can be explored through scenario analysis.

KESHO was developed and first applied in East Africa in 2014 in the York Institute for Tropical Ecosystems¹ (Capitani et al. 2016², 2019³). The regional and national scale applications in Tanzania were followed by a local scale study in two mountain sites of Kenya and Ethiopia overlapping the Eastern Afromontane Biodiversity Hotspot⁴ (Capitani et al. 2019⁵). KESHO is a flexible scenario tool currently being applied across different projects investigating:

- Pastoral – Conservation – Agricultural interactions across the wider Serengeti landscape
- Impacts of Gold mining on biodiversity in Western Tanzania
- Interactions between coastal developments and climate change across Zanzibar
- The interactions between large Chinese foreign direct investments in Development Corridors on land use transitions in Kenya and Tanzania
- The interactions between agricultural and pastoral communities on mountains

Why KESHO? The KESHO framework offers opportunities for:

- Enhancing the capacity for **long-term decision-making and planning**;
- Bringing together **stakeholders with divergent views of land use change and desired futures**;
- Highlighting **trade-offs** between different goals and expectations;
- Investigating the **impact of policy intervention** or ‘what if?’ scenarios; and
- Building **consensus for future development pathways**.

How does KESHO enhance participation? Building on previous studies, the KESHO framework enhances the role of local stakeholders in co-producing scenarios by:

- 1) Integrating local knowledge on potential future changes into scenario storylines (both qualitative and quantitative) ;
- 2) Strengthening the link between socio-economic trajectories and LULCC;
- 3) Determining the divergent futures and timeframes – usually a ‘Green Economy’ and a ‘Business as Usual’ scenario towards 2030 and 2063; and
- 4) Disentangling the complexity of socio-economic and biophysical drivers of change and their causal relations with spatial patterns of LULCC.



Figure 2. Some moments from KESHO implementation: clockwise, quantifying socio-economic/environmental trajectories discussion, analyzing spatial patterns of LULCC, focus group and plenary discussions.

The participatory approach adopted in the KESHO framework (Fig.2):

- increases scenario plausibility and legitimacy via a sense of process ownership by stakeholders,
- improves representativeness of communities’ behaviors, particularly in subsistence economy or in society with strong traditional values or cultural identity, and of community members that may be overlooked in usual decision-making processes
- provides capacity building and facilitate knowledge transfer to decision-makers,
- captures and reconcile sub-national perspectives at wider (e.g. landscape to national) scale.

The KESHO methodology

KESHO provides a structured approach allowing participation and output comparability across regions and scales. KESHO comprises four main steps involving experts (facilitators and modelers) and stakeholders (those affected by or can effect land use dynamics).

The **first step** concerns the definition of scenarios objectives and boundary conditions, by either the experts or the stakeholders or both. Participants in the process develop locally tailored scenario storylines. The **second step** engages stakeholders to envisage future socio-economic and environmental trajectories and trade-offs in relation to specific livelihood activities. Specific causal relations between the trajectories, land use and cover changes are identified. In **step three**, experts organize, synthesize and validate the consistency and plausibility of the scenarios provided by stakeholders, and translate this through a modelling process into quantitative (i.e. numeric) and spatially-explicit (i.e. maps) scenarios. **Step four** is a feedback process where results are presented back to stakeholders, discussed and validated. Feedback received from stakeholders can amend the modelling so agreed final outputs are produced.

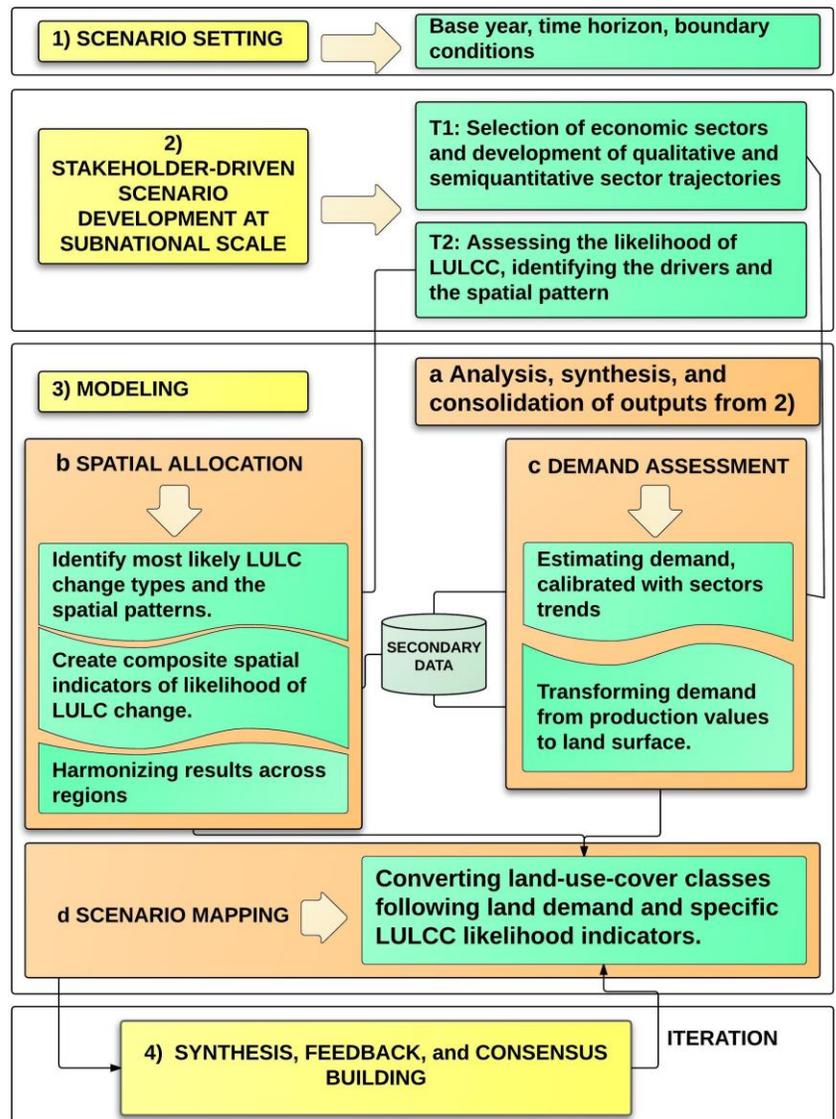


Figure 3. The four steps of KESHO framework includes participatory scenarios development, quantitative and spatial modelling, scenario simulation and participatory validation.

Scenario outputs can be used to estimate potential future impacts on biodiversity and ecosystem services (e.g. carbon regulation, Fig. 4), and analyze potential trade-offs (e.g. Capitani et al. 2019³).

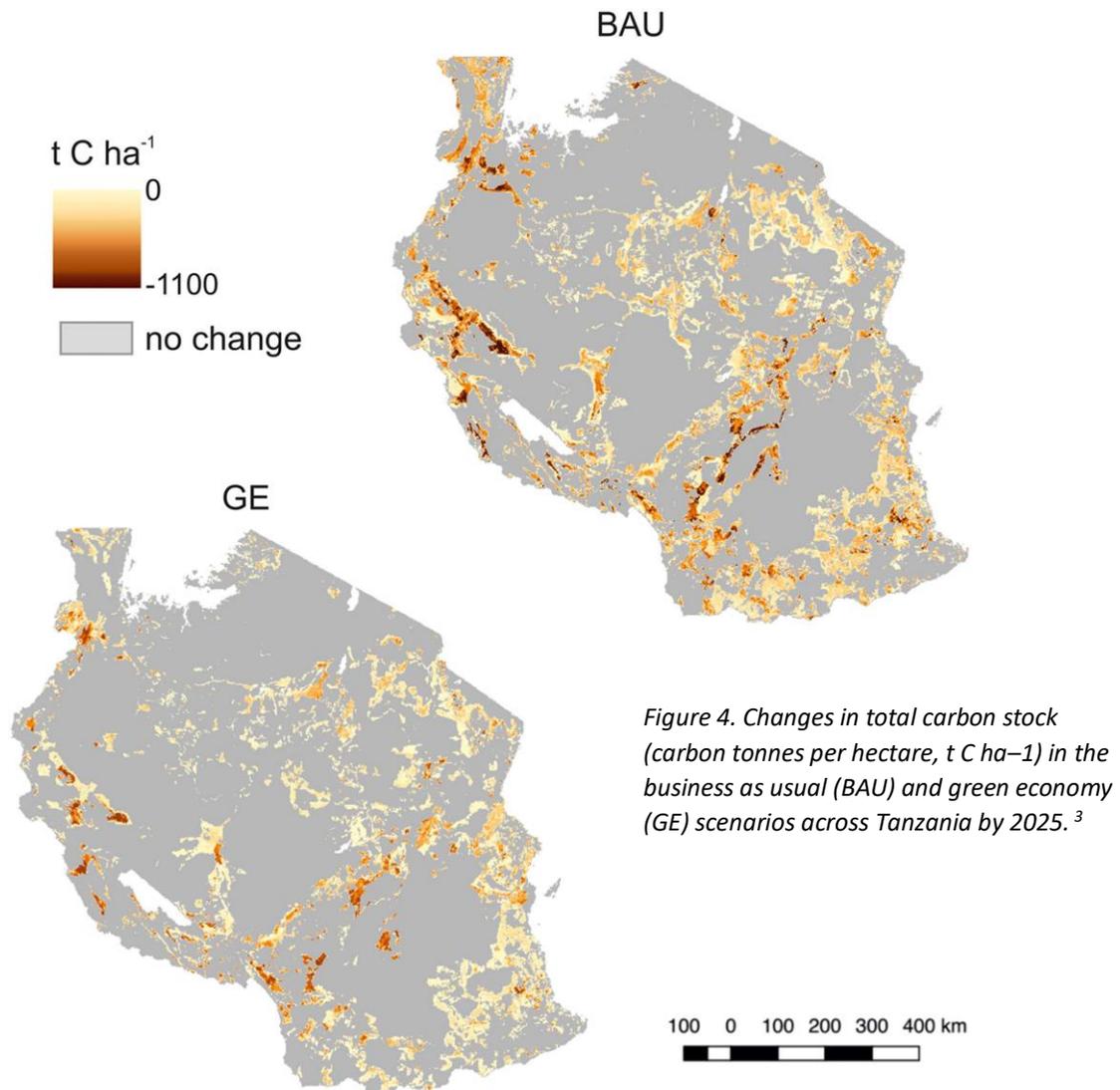


Figure 4. Changes in total carbon stock (carbon tonnes per hectare, t C ha⁻¹) in the business as usual (BAU) and green economy (GE) scenarios across Tanzania by 2025.³

For further information please contact:

Dr. Claudia Capitani Claudia.capitani@ext.ec.europa.eu or
Prof. Rob Marchant robert.marchant@york.ac.uk

¹ The York Institute for Tropical Ecosystems was partner in the REDD+ readiness pilot project with WWF Tanzania, Sokoine University of Agriculture, IUCN, UNEP-WCMC. <https://www.york.ac.uk/environment/research/kite/>

² Capitani C., K. Mukama, B. Mbilinyi, P. Munishi, N. Burgess, P.J. Platts, S. Sallu, and R. Marchant. 2016. From local scenarios to national maps: a participatory framework for envisioning the future applied to Tanzania. *Ecology and Society* 21(3):4.

³ Capitani et al. 2019. Scenarios of Land Use and Land Cover Change and Their Multiple Impacts on Natural Capital in Tanzania. *Environmental Conservation*, 46(1), 17-24. doi:10.1017/S0376892918000255

⁴ The CHIESA and AFERIA projects were carried on by University of Helsinki, York Institute for Tropical Ecosystems, University of Dar es Salaam, Sokoine University of Agriculture and coordinated by ICIPE.

⁵ Capitani et al. 2019. Views from two mountains: exploring climate change impacts on traditional farming communities of Eastern Africa highlands through participatory scenarios. *Sustainability Science* 14: 191.