



**POLICY BRIEF 1**  
March 2017

# **Exploring Land use and Land cover Changes under Future Climate Projections in Taita Hills, Kenya and Jimma Highlands, Ethiopia**

**aferka**

**Adaptation for Food Security and Ecosystem Resilience in Africa**

*Integrating Results, Building Capacity and Implementing Adaptation Strategies*



**UNIVERSITY of York**



## Overview

Along with population growth and agricultural development, adaptation to climate change is one of the great challenges that impact on livelihoods across Eastern Africa. Scenario approaches are useful in planning adaptation strategies as they offer the opportunity to consider multiple dimensions, such as how projected climate change impacts, socio-economic trends, and local production and governance systems interact.

As they explore multiple alternatives, scenarios can also account for uncertainty around future events and the impact of different development pathways. A participatory scenario modelling framework (Fig 1) was applied to explore potential adaptation strategies to projected climate change in the Taita Hills (Kenya) and Jimma Highlands (Ethiopia) and their consequences on the landscape.

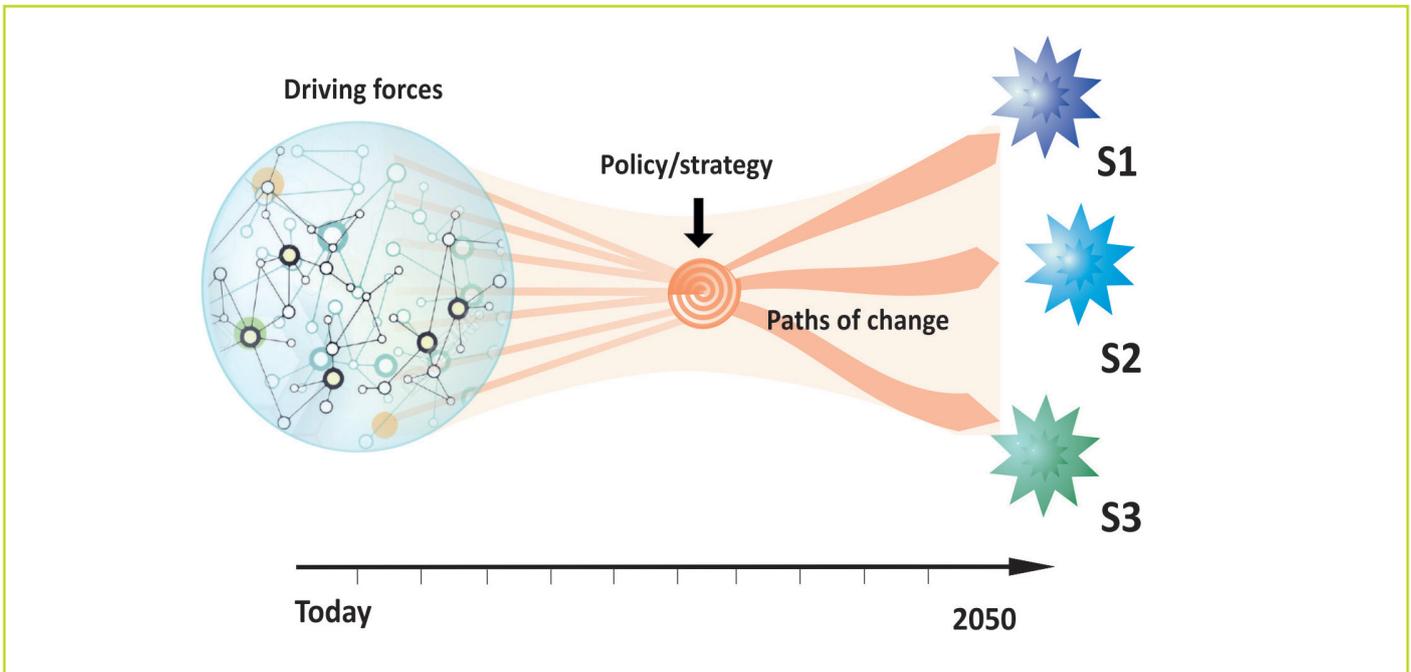


Figure 1. Schematic representation of scenarios analysis. The current system is the result of interactions amongst multiple drivers. If an external shock is applied to the system (such as a policy or a strategy), then several pathways of change may be envisaged towards future scenarios (S1, S2, S3). Scenarios are qualitative and quantitative descriptions of these potential future conditions obtained through quantitative models or a participatory process or a combination of the two approaches. In our analysis the shock is represented by the adaptation strategy applied in response to climate change observed and projected impacts.



Figure 2. The participatory scenario planning framework includes the development of socio-economic-environmental trajectories for the future (a) and mapping exercise (b). Tasks are carried out within focus groups (b,c) and then discussed in plenary sessions (a,d).

Local stakeholders that represent a cross section of the community were engaged (Figure 2) in developing scenarios representing how their landscape would look like by mid-21st century if the climate changes.

Following the AFRICLIM projections we explored two potential futures: 1) a **“no adaptation”** scenario where the

current trends and fragmented short-term coping strategies to climate related issues continue; 2) this was compared to an **“adaptation”** scenario where an integrated adaptation strategy is implemented. Scenario maps were created by using a mixed approach that integrates local knowledge and expectation with quantitative and spatial data in particular AFRICLIM climate projections (Figure 3).

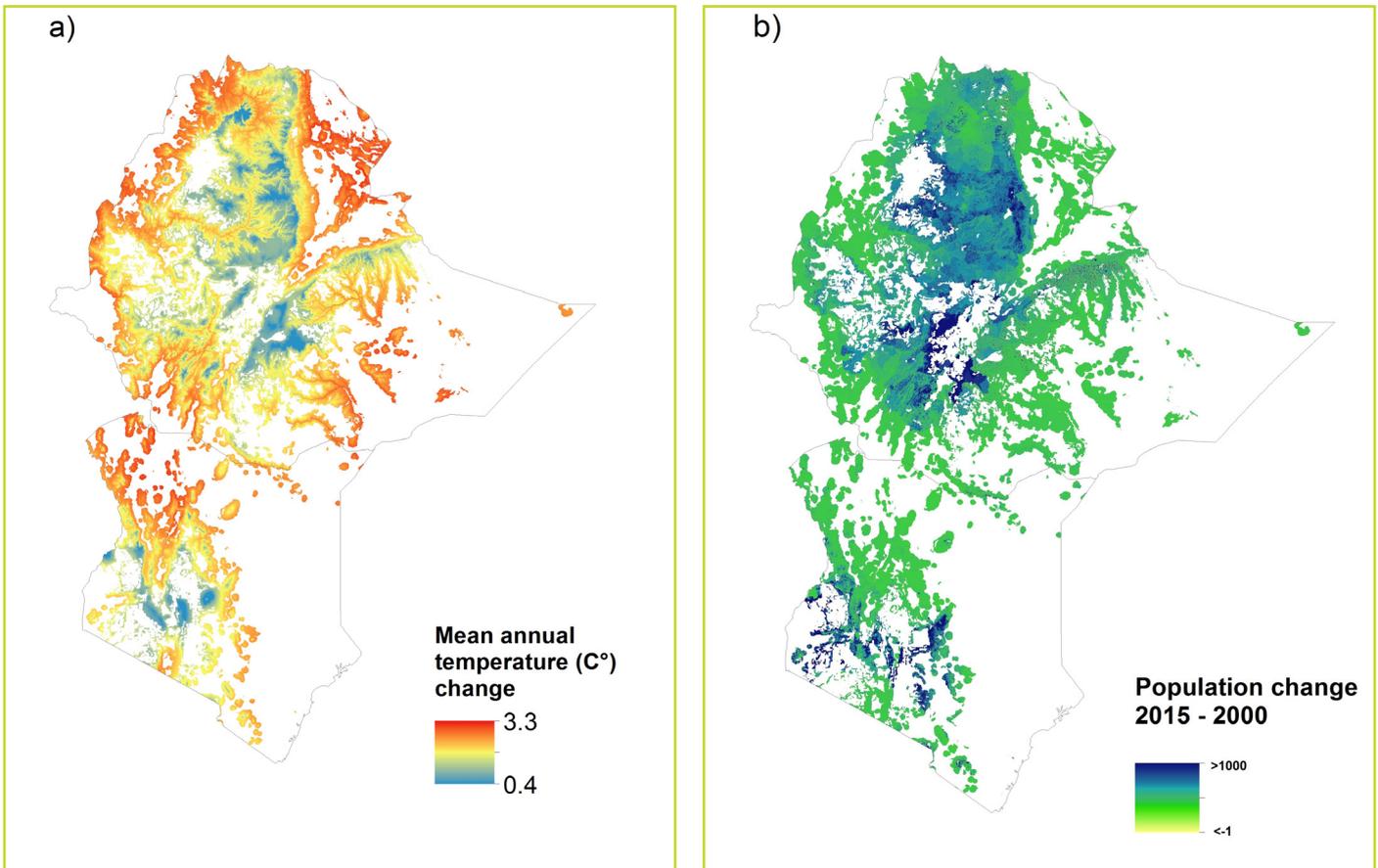


Figure 3. Scenario maps were modelled using spatial datasets for climate, population and land cover change trends. Here we show for the highlands of Ethiopia and Kenya: a) The projected mean annual temperature change between mid-21st century and the model baseline (Source; AFRICLIM); b) Population change between 2015 and 2000 (Source: Worldpop); c) The 2009-baseline land use and land cover map (Source: MODIS).

**Participatory scenario planning is a demanding activity, but it provides additional benefits to change the traditional modelling approach by:**

- Enhancing ownership of the process and output by local stakeholders and its legitimacy and relevance
- Building consensus on the desired targets and the roadmap to achieve them
- Incorporating indigenous knowledge on the interactions between ecological systems and communities
- Integrating different perspectives from the different stakeholder groups and cultures (such as farmers versus pastoralists)
- Assessing the power dynamics amongst community members in relation to gender or status in the community

## Insights from the Participatory scenario development process in both Taita Hills and Jimma Highlands

Results show that local communities have responded to climate related pressures over time, and have perceived changes in climatic conditions (such as higher frequency of extreme or unpredictable weather events) during the past decade, particularly in the Taita Hills.

Under projected climate conditions, and without a proper adaptation strategy, greater impacts are expected, from increased variability of rainfall patterns on the main livelihood systems (agriculture and livestock) as well as on services (infrastructure, tourism, education and health).

This implies increased land degradation and deforestation, and the **reduction of landscape diversity and capacity to provide multiple services** (food production, water and climate regulation, biodiversity support, young generations learning and capacity building) and therefore a **reduction of community resilience**.

An integrated adaptation strategy is expected to **enhance the capacity to adapt to the increasingly unpredictable climatic conditions and reduce dependence** on the environment, by improving and diversifying land and water management, production systems, access to the market and social services. The resulting landscape maintains and improves **multiple functions for both the human and wildlife communities** and **enhances community resilience to change** (Figure. 4).

In the Taita Hills, (Figure 4a) forest restoration, particularly by indigenous species is envisaged by stakeholders as adaptation strategies, along with support to agroforestry system. Whereas in the Jimma Highlands, (Figure 4b) policies and interventions supporting semi-managed coffee growing are preferred adaptation strategies to heavily managed coffee plantations.

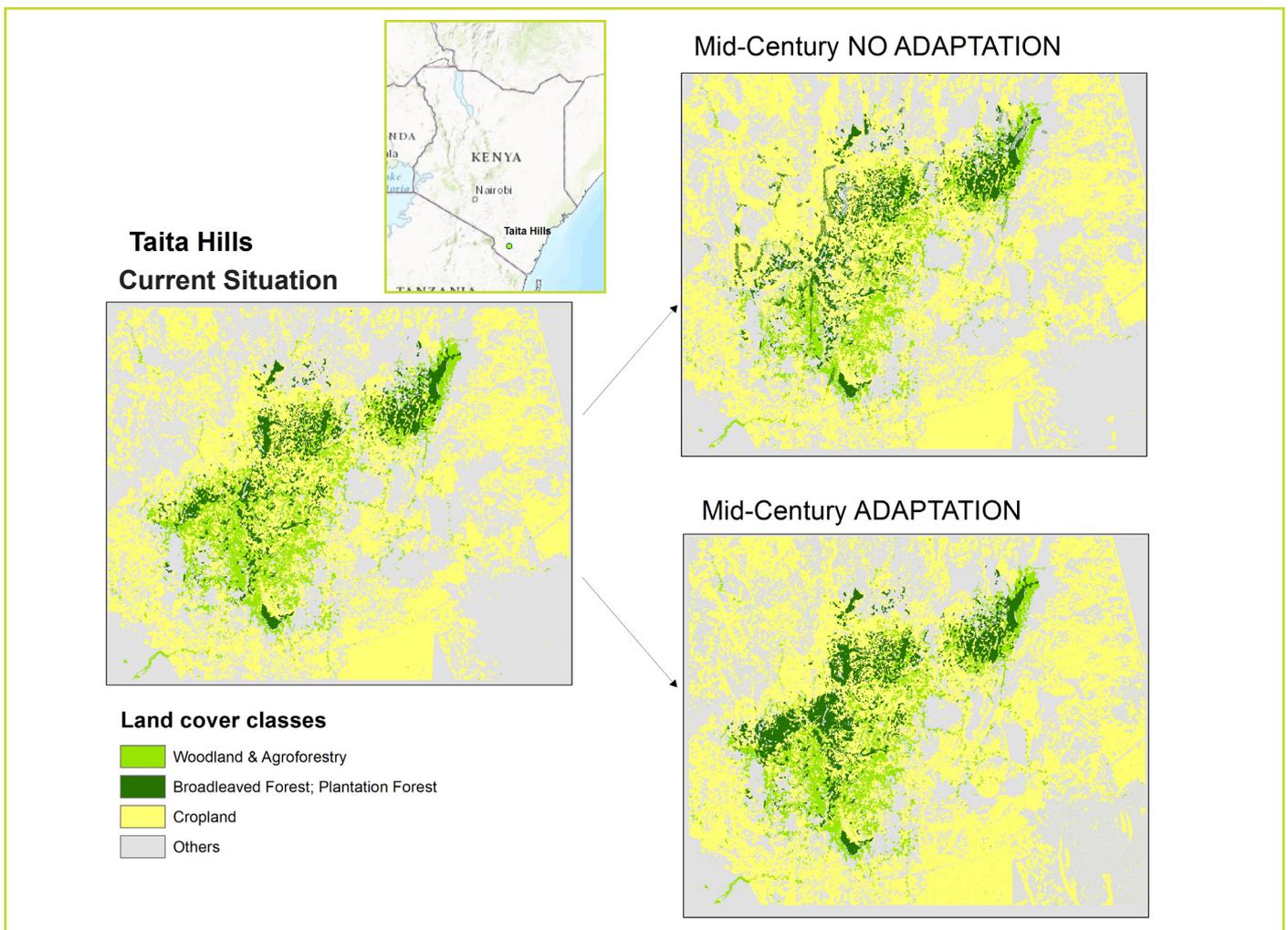


Figure 4a. Land use and land cover change scenario maps under projected climate conditions by mid-21st century for the Taita Hills. Maps show in particular the changes in indigenous forest, woodland and agroforestry (green) against croplands (yellow) surfaces in either “no adaptation” or “adaptation” scenarios. Source: Capitani et al. in preparation

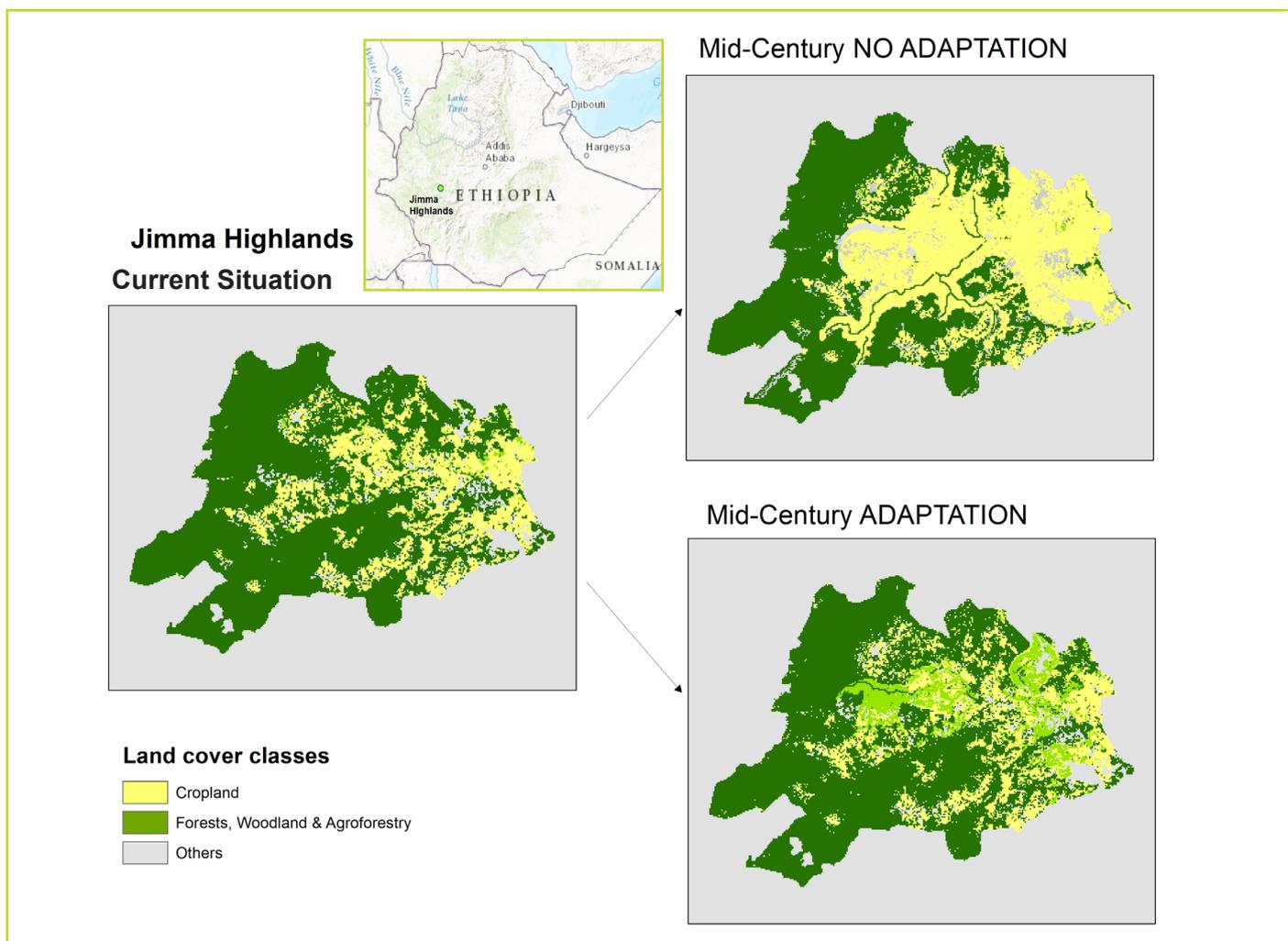


Figure 4b. Land use and land cover change scenario maps under projected climate conditions by mid-21st century for the Jimma Highlands. Maps show in particular the changes in indigenous forest, woodland and agroforestry (green) against croplands (yellow) surfaces in either “no adaptation” or “adaptation” scenarios. Source: Capitani et al. in preparation

## Opportunities and Challenges

This scenario development process presented both opportunities and challenges for:

- A) Enhancing the capacity for **long-term** decision-making and planning;
- B) **Raising awareness on possible future challenges** and ways of overcoming them;
- C) Improving the **representativeness** of community members, such as women and disabled people, who may be overlooked in usual decision-making processes (Figure. 2 c-d);
- D) Highlighting **trade-offs** between different goals and expectations;
- E) Facilitating **social learning** and knowledge exchange across the community members (Figure. 2a).

## Recommendations for policy makers

1. The participatory scenario planning outputs can be used by policy/decision makers to develop short- and long-term climate change adaptation strategies, keeping in mind that other global processes (population growth, globalisation) are occurring at different speeds.

2. The scenarios can be validated and redefined by the community objectives over time as these may change. Participatory planning approaches can consider and target the multiple stressors that contribute to vulnerability of mountain communities to climate change impacts such as population fluxes, land use changes, poverty, management practices, access to technology and markets, the provision of services (extension services, health centres), remoteness and weak lobbying power (for example on the global market for coffee, on trading route development).
3. To promote sustainable land management, particularly water management systems, scenarios can be used to support the development and maintenance of agroforestry systems and mosaic agricultural landscapes, investigate how high-quality mountain agricultural products, like coffee, can preserve landscape multi-functionality and enhance community resilience to the changing climate. Well-planned infrastructure development can improve business capacity, encourage alternative living strategies (eco-tourism) and enhance capacity building of young generations and adults.

### REFERENCE

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

<http://dx.doi.org/10.5751/ES-08565-210304>

## About AFERIA

The Adaptation for Ecosystem Resilience in Africa (AFERIA) is a two-year project to disseminate and communicate research results, insights and interactions of climate change and food security developed from a previous research and development project (CHIESA-Climate Change Impacts on Ecosystem Services and Food Security in Eastern Africa).

The project is funded by the Ministry for Foreign Affairs of Finland and coordinated by the International Centre for Insect Physiology and Ecology (*icipe*) in Nairobi, Kenya.

The AFERIA project disseminates research findings on climate change impacts and implement adaptation technologies such as drip irrigation, roof rain water harvesting, conservation agriculture, farm forestry and insect pest management to the partner organisations and beneficiary communities in different agro-ecological zones in the highlands.

The project cooperates closely with national and local organizations in Ethiopia, Kenya and Tanzania to reach out to the smallholder farmers, especially women and special needs groups.

In addition, through communication and advocacy, AFERIA supports policy decision-makers in making rational and evidence based decisions on climate change adaptation to enhance food security and ecosystem resilience in the target areas.

**Objective:** Improved food, nutrition security, and livelihoods of small-scale farmers in Eastern Africa.



For more information about the AFERIA project ,Please contact:

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