PhD position proposal (3 years)

Landscape changes and natural resource management in the semi-arid region of Amboseli (Kenya): participatory approaches, spatial modelling, future scenarios

Contract length: 3 years from autumn 2018

University and Research group: Université Lumière Lyon 2, Unité Mixte de Recherche 5600 Environnement, Ville, Société

Location: Lyon, France

Supervising committee: Yanni Gunnell (UMR EVS, Univ. Lyon 2), Christophe Le Page (UMR Green, CIRAD), Hervé Fritz (UMR LBBE, CNRS), François Mialhe (UMR EVS, Univ. Lyon 2)

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Keywords: natural resource management, remote sensing, GIS, participatory approaches, modelling, future-proofing scenarios

Scope of the research

The PhD scholarship opportunity is part of the ANR JCJC (Agence National de la Recherche, Jeunes Chercheurs, Jeunes Chercheuses - France) research project MaGnuM. This project, which started in 2017, focuses on the Greater Amboseli Ecosystem (GAE), i.e. the Amboseli National Park (ANP) and the agro-pastoral belt surrounding it at the northern base of Mount Kilimanjaro. The research aims to understand the causes and consequences of landscape transformation over the last 60 years, particularly by seeking to reveal how ecological and socioeconomic processes have interacted, and to conceive for the future some alternative management approaches to those currently in place. This challenge is considerable because (i) of the complex dynamics of savanna environments at nested time scales, (ii) of the constant interplay between socioeconomic and ecological factors, and (iii) of persistent uncertainties regarding the long-term trajectories of these rangeland socio-ecosystems. Through the co-production of future land and livelihood scenarios with the participation of local stakeholders, the project seeks to construct a range of options relating to issues such as the persistence of viable wildlife populations, the sustainable management of natural resources, and to prospects for maintaining agricultural and pastoral activities. To meet these challenges, the project is

rooted in interdisciplinarity, with collaboration, participatory modelling, and landscape analysis as key approaches.

The study area is a semi-arid savanna in Loitokitok District (Kajiado County), at the heart of historical Maasailand. Large herds of large wild mammal species move through the landscape between the dry-season refuge zone provided by the ANP wetlands (which provide food, water, and nutrient sources); and the wet-season dispersal areas of the surrounding rangelands. Semi-nomadic pastoralism was for a long time the only activity adapted to the semi-arid conditions of much of Kenya. For some decades, however, agriculture and human infrastructure have expanded around Amboseli because of the unique presence of perennial vauclusian (supplied by Mt. Kilimanjaro) and artesian springs that have promoted the development of irrigated agriculture. As a result, the pastoral landscape is fragmenting because of land reclamation for agriculture, fencing, and urbanization. This fragmentation introduces historically unprecedented constraints on the movement of wildlife and livestock, and it also modifies routine access strategies to certain key resources (e.g., water, natural forage, etc.). The high animal mortality recorded during recent droughts (in 2009, 2017) raises questions about the Greater Amboseli socio-ecological system's ability to cope with such events.

Because of its collaborative purpose and interdisciplinary character, the research is intended to be shared as much as possible with the local stakeholders. The project seeks to reframe issues relating to natural resources by adopting an inclusive approach to the plurality of viewpoints, and to spawn alternative natural resource management methods to those advocated by single-issue agencies and organisations. Enabling this requires (i) marshalling several disciplinary skills, and (ii) collaboration between academics, conservation practitioners, and land users. As shown in other settings, cross-learning and consensus-building can be promoted in this way and lead to the implementation of new management frameworks and policies.

The doctoral research programme will address the following questions, leading to recommendations on best practices for the future:

1. Which modes of water resource management can stakeholders seek to promote given the multiplicity of uses and increasing pressure on water resources?
2. How can population growth, land dynamics and the demand for modern infrastructure be reconciled while limiting land fragmentation and restraining human impacts on the environment?
3. How can changes in Maasai pastoralist livelihood strategies, widening socio-economic inequalities, and ongoing institutional evolution among communities be reconciled with sustainable biomass management in an ecosystem where livestock and wildlife coexist?

Question (1) is of great importance because recent problems over access to water herald the likelihood of escalating conflict in the near future. Access to groundwater is highly unequal among potential users, and the longer-term availability of this resource is geologically not well understood. The main short-term issues therefore mainly concern the sharing of spring water and surface runoff. From hydrological time series and satellite images, spatial analysis will be carried out in order to strengthen our understanding of the causes of hydrological variation and their impacts on the regional environment. This will be the prelude to the construction of a participatory modelling approach (e.g. through role-playing games) aimed at sharing knowledge with and among local stakeholders, and at developing management scenarios along a key focus area (section of watershed extending between the city of Kimana and the natural depression of El Chalai).

Question (2) focuses on infrastructure development, and aims to build upon the conclusions of a 2018 Master's dissertation that deals with urban planning, population growth and land tenure

dynamics in the study area. The questions of demographics, land cultivation, urbanization, and land speculation are often eluded in existing natural-resources management plans. However, they are nonetheless crucial for understanding trends and spatial patterns in resource harvesting (water, biomass, etc.), their geographical consequences, and their connection with new economic opportunities. It will therefore be important to finely document the range of socio-ecological changes currently threatening the GAE through interviews, surveys, and focus groups, and then to develop scenarios with local stakeholders about the possible or desirable future evolution of built-up and farmed areas from a perspective of ecosystem services.

The focus of question (3) is the future of pastoralism, which is the historically dominant form of livelihood in much of Kenya's drylands. The physical and social fragmentation of the Amboseli environment have been caused by a proliferation of exclusive conservation areas (private and public), the development of grazing plans and new ranching practices, an evolution of public policies on rangeland and wildlife management, and numerous societal changes relating to globalisation. As a result, semi-nomadic pastoralism has entered a period of transition in which many of its long-term pillars (cultural institutions, livestock mobility, land access rules, traditional ecological knowledge, etc.) are being challenged. Question (3) considers the primary threats and opportunities as expressed by pastoralists themselves. It explores future options for facilitating the co-existence of pastoralism with the growing appetite for other land uses of the savanna.

The research work will build on primary and secondary data, some already collected and some in the process of collection through an ongoing monitoring process implemented during the first phase of the project (e.g. hydrological data, socioeconomic data concerning the agricultural systems, land tenure information, livestock movement patterns acquired from GPS collar data, vegetation and climate dynamics inferred from satellite imagery, and traditional ecological knowledge collected among pastoralists by another PhD student). Scenario building based on these and other data will be accomplished step by step, in close collaboration with MaGnuM members.

Provisional work schedule

Year 1: production of a literature review on participatory methods in the field of natural resource management, punctuated by fieldwork during the month of November, and production of a work plan during the first six months. This will be followed by approximately three months of field work to initiate the participatory approaches in three field settings: (i) the Kimana-El Chalai section of the Kimana river watershed (Question 1), (ii) the Kimana and Isineti townships (Question 2), and (iii) the Olgulului-Eselenki-Mbirikani area (Question 3) during the remaining six months.

Year 2: work on spatial analysis, participatory modelling, with additional field work (3 months).

Year 3: field work (3 months) and writing of scientific articles and the PhD manuscript.

Expected profile of applicants

Disciplinary skills: remote-sensing and GIS, familiarity with agent-based modelling, quantitative and participatory methods in the social sciences, and an interest in savanna ecology.

Training: undergraduate degree in geography or ecology as minimum requirement.

Human qualities and personal interests: autonomy, dynamism, capacity to generate work through collaboration and networking, sharp interest for socio-ecological issues.

Language skills: high fluency in English; basic Swahili will be appreciated.

Capacity for fieldwork: a cumulative total of ~9 months will be spent in the field in Kenya. Prior experience in the Tropics will be an asset (throughout the project, the student will benefit from the support and diverse backgrounds of all the project members).

Salary: ~1500 euros net / month

Contact

Send a comprehensive Curriculum Vitae and a cover letter to Yanni.Gunnell@univ-lyon2.fr and Francois.Mialhe@univ-lyon2.fr