Title: Poverty in rural Africa and its relationships with environmental resources and ecosystem services.

Supervisors:

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Case Partnership: International Institute for Applied Systems Analysis (IIASA)

Project Background

To monitor the 17 Sustainable Development Goals (SDGs) proposed by the United Nations requires more high quality data. Given the rapid nature of socioeconomic change new approaches are needed for high frequency data collection. Effective monitoring requires census enumeration every 10 years, household surveys every five and some form of income/consumption survey every year. The costs of such data collection would be prohibitively expensive, consuming a large amount of the global development assistance budget available for the SDGs.

The links between environmental resources, ecosystem services and human development has led to increasing interest in the use of remotely sensed (RS) satellite data for mapping rural poverty. However, understanding of the relationships between RS environmental features (land use/land cover, biophysical variables, elevation) and poverty are relatively low in part because past studies rarely use the same measure of poverty or RS features. If we can further understand the relationships between rural poverty and RS features it may be possible to develop new ways of monitoring socio-ecological conditions at fine scales. The project will examine approaches for estimating poverty from RS features by examining; (1) how different measures of poverty are related to environmental resources and RS features, and; (2) if there is an optimal way of measuring rural poverty using RS features. The outcome would be a set of guiding principles for future spatial poverty maps created from satellite data.

Key research questions

1. Is it appropriate to characterise rural wealth using asset indices, income and consumption or farm typologies when considering environmental resource use?
2. How do remotely sensed features relate to different measures of rural wealth?
3. Is there a way in which RS features can be standardised to create rural poverty maps?

Methodology

The student will identify with the supervisor team which data sets and field locations in rural Africa on which to focus. Different poverty measures will be generated which could include; the Demographic and Health Survey (DHS) index; consumption poverty and farm typologies. Survey data is already available from a variety of sources including; ACES project, Millennium Villages Project and IFAD projects. Field work in Rural Africa will help the student visualise the links between poverty and environment in specific contexts. Field work will also identify which environmental resources/ecosystem services should be estimated in RS data. The different estimates of rural wealth will be used in statistical models to examine the relationships with environmental resources derived from open source satellite data products or existing land use and land cover data from the above projects.

- Year 1: Identify focus area in Rural Africa which could be based in a region that has active projects. Identify the most commonly used measures of rural poverty in the literature. Develop an understanding of the variables required for each and identify datasets that can be used from the list of project data available.
- **Year 2:** Develop measures of rural poverty at household or village level for chosen dataset(s) and field site. Field visits to refine ideas on the links between poverty and environmental resources. Extract important environmental variables from RS data.

- **Year 3:** Examine the relationships between these poverty measures and environmental resources/remote sensed features.

**Training**

A comprehensive training programme will be provided comprising both specialist scientific training and generic transferable and professional skills. Ongoing training will be provided by the supervisors in measuring rural poverty and wellbeing, linking population data with satellite datasets and ground data collection. GW has extensive experience of remote sensing of the social aspects of landscapes. CR and his group have developed a set of methods for remote sensing in mosaic landscapes. JF compiled much of the ACES well-being data across 27 villages in Mozambique (likely to be the main dataset used in the project) and has extensive experience of research in ecosystem services and rural development. SF has extensive experience in the study of ecosystem services, remote sensing, crowdsourced land use data and crop yield estimations, he has active projects across Sub-Saharan Africa. CB has extensive experience in governance issues of natural resources in developing countries.

**Requirements**

This project would suit a student with an interest in international development and the role of ecosystems in supporting rural livelihoods. You will need to develop good numerical skills and the ability to handle spatial data; both skills are very much in demand in many research and applied contexts. You will also develop skills in communicating science to a wide range of audiences, and understanding how managers use scientific information. As such the PhD would suit students with a wide range of backgrounds, including but not limited to ecological/agricultural economics, quantitative social science, informatics, environmental science. More important than past experience or existing knowledge is the ability to work in an interdisciplinary environment and learn new methods and concepts.

**Further reading and references**


**A project summary**

Understanding how remote sensing features are related to different measures of rural poverty and the role that remote sensing can play in future socio-ecological monitoring systems.