

Introduction

- Intact ecosystems maintain stable biodiversity and processes that support the production of a range of ecosystem services
- Agricultural intensification and other land use changes e.g. urbanization cause habitat fragmentation, pollution and alteration of biodiversity leading to a reduction in regulatory and supporting services at the expense of provisioning services (Millennium Assessment study [MA] 2005). Climate change accelerates these changes by altering vegetation communities, biome boundaries and animal habitats (IPCC 2007).
- As a result, the incidence and impacts of infectious diseases such as Rift Valley fever, Chikungunya fever, malaria, etc. would increase if sufficient preventative measures are not implemented.
- This study uses multidisciplinary approaches to identify the impacts of irrigation in the dry lands (as an intervention to increase food production) on human health and wellbeing based on the framework given in Figure 1. Rift Valley fever (RVF) is being used as a case study disease and sites that have been identified for the study are Ijara and Tana River Districts in Kenya (Figure 2)
 - Expected outcome:** Greater awareness established on linkages between environmental change and public health. In addition, findings generated will be used to develop policies and incentives on sustainable land use

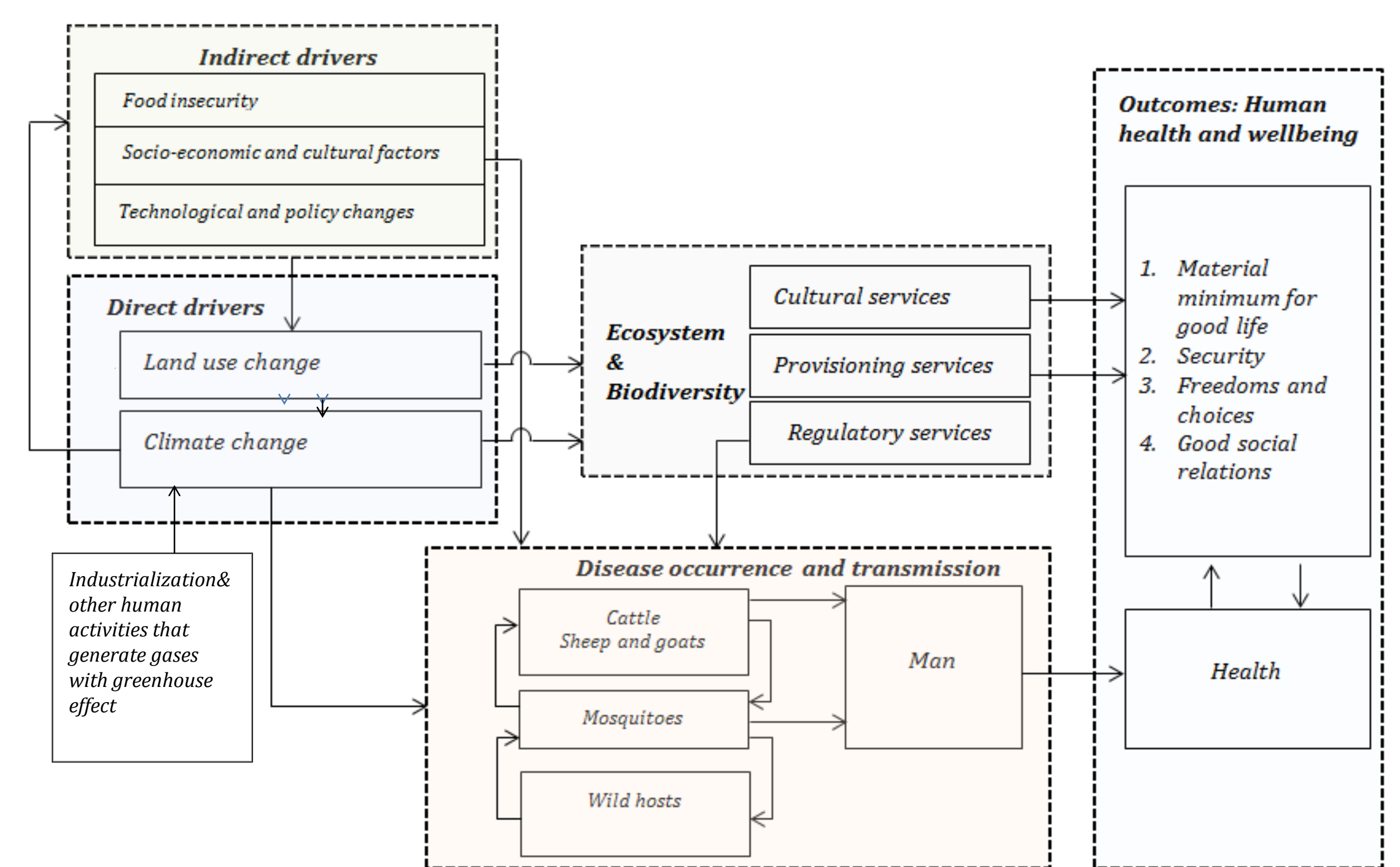


Figure 1. Conceptual framework illustrating key linkages between land use and climate change, biodiversity and human health and wellbeing

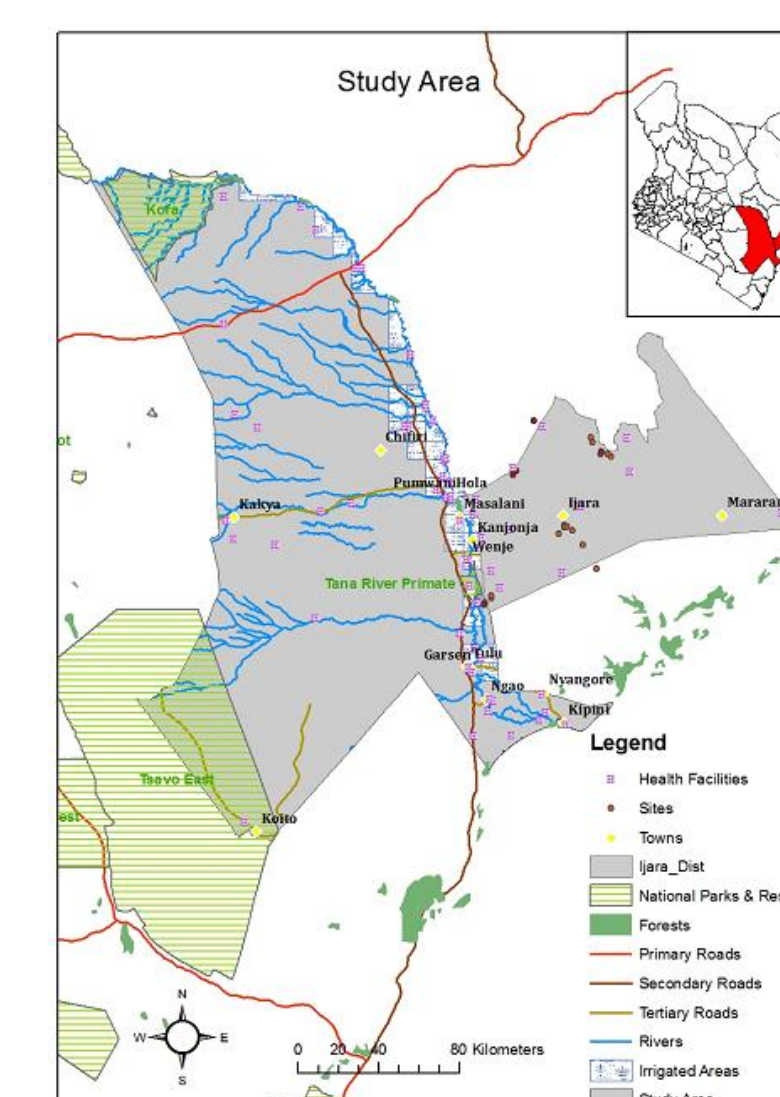


Figure 2. Map of the study area

Two sites will be used for the study:

- Ijara District, Kenya** is an area where pastoralism is the main livelihood activity. It represents a site that has slow or minimal land use changes
- Tana River County**, has two of the main irrigation schemes in Kenya (HOLA and BURA). It represents a site with substantial land use changes

Trans-disciplinary research themes

Local system contexts and interactions

- Utilizes participatory and social science methods to assess local peoples' interactions with their ecosystems and landscape and their understanding on the linkages between ecosystem change and the disease
- Builds on the work that has been done using participatory epidemiological methods (maps [e.g. Figure 3], timelines, seasonal calendars etc.) to illustrate how livelihood practices influence exposure to disease

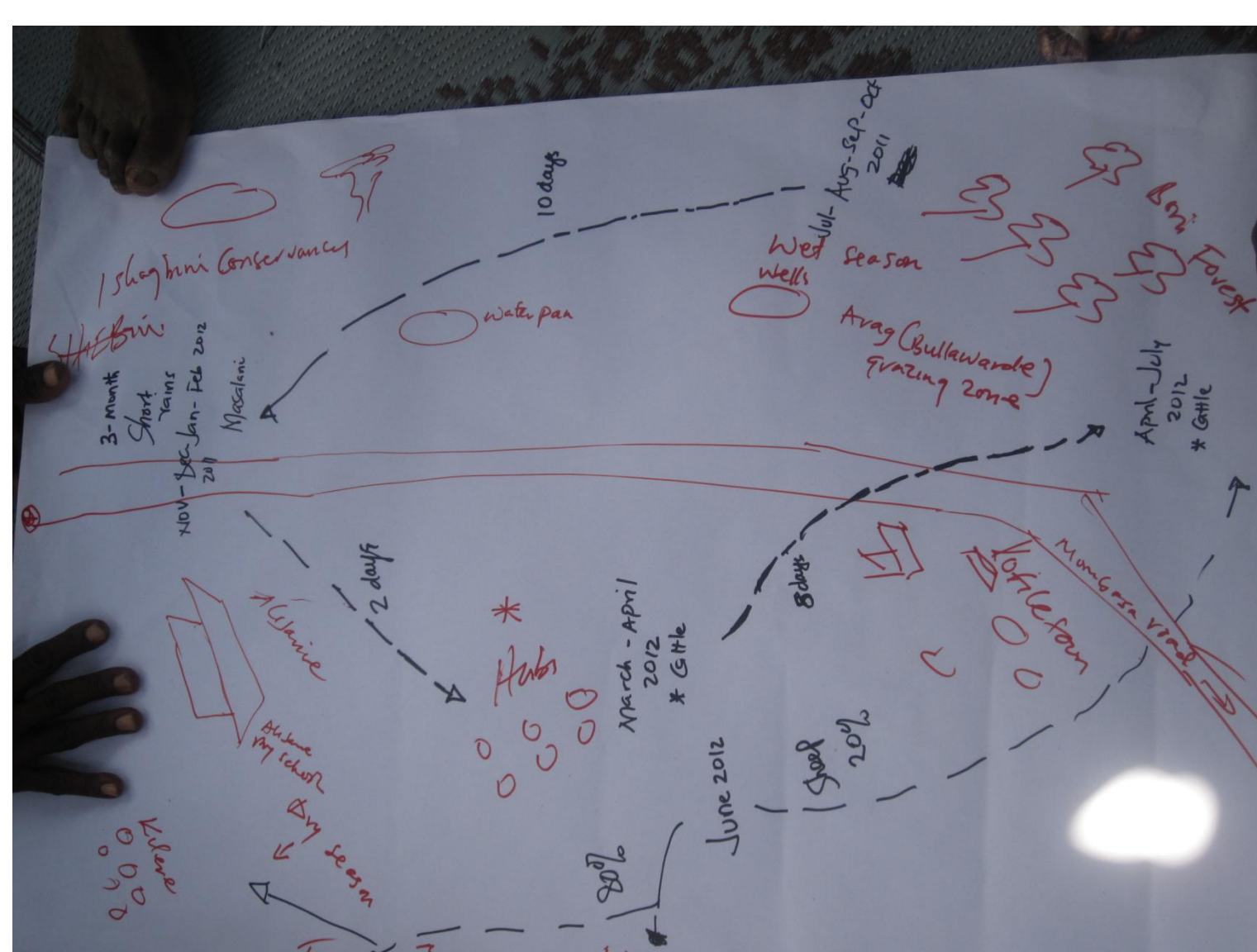


Figure 3. A participatory map illustrating grazing patterns in a Somali community in northeastern Kenya

Disease-ecosystems dynamics

- Uses an integrated analysis of ecosystems and disease, guided by spatio-temporal process-based models, to identify ecological drivers of RVF.
- Types of ecosystem services available in the study sites are being mapped and quantified using Integrated Valuation of Environmental Services (InVEST) modelling tool.
- RVF transmission model that integrates vector, host and socio-economics modules is also being developed. This involves adapting a model that has been developed by other projects (Figure 4) to analyze climate change effects.

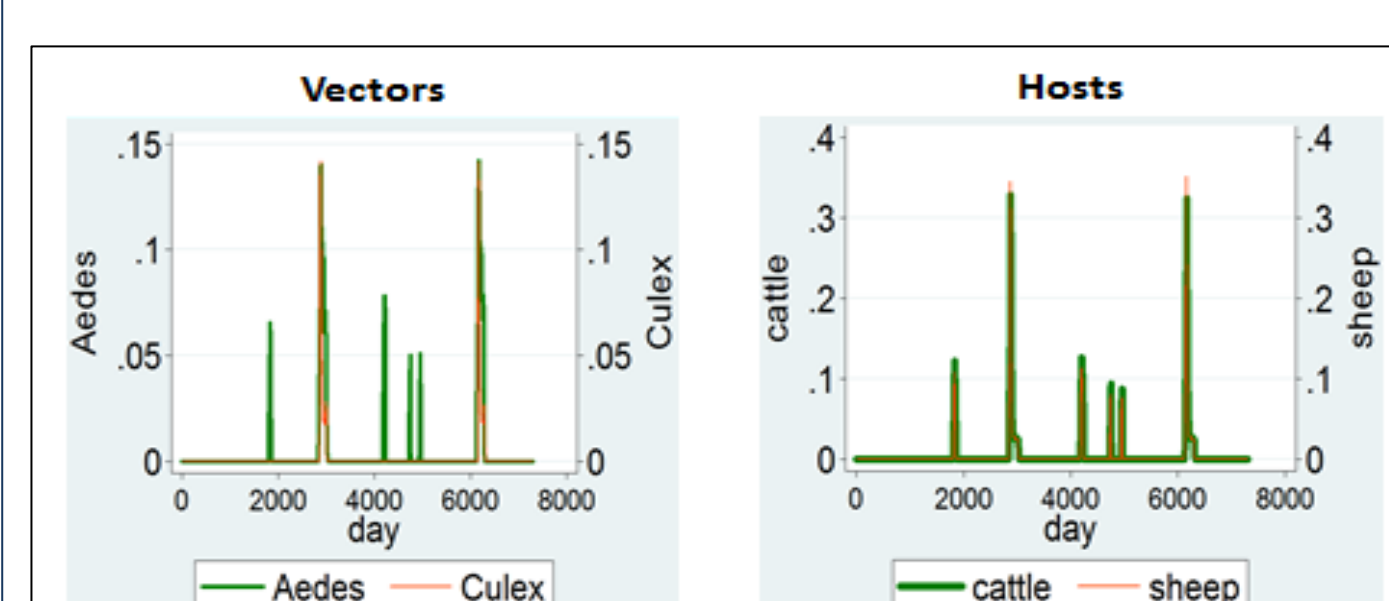


Figure 4. Outputs from an RVF transmission model showing predicted incidence in vectors and vertebrate hosts for the period Jan 1990 to December 2009

- Biological sampling of livestock, people and vectors will be implemented to generate data for model parameterization

Social, economic and environmental values

- Determines how people value health with respect to RVF, perceive economic values and trade-offs in ecosystem services, experience costs and benefits from RVF control, and adapt to some of the implications of the disease control measures.
- Contingent valuation methods will be used to estimate economic values of ecosystem services and their trade-offs.
- The theme will also determine how values attached to health with respect to RVF influence the daily choices that people make to avoid exposure. These objectives will combine household surveys and assessment of public records to address most of the objectives described.

Political economy of knowledge and policy

This theme addresses key policy questions including:

- How is RVF understood, labelled, differentiated (or not), prioritized or neglected as part of a cluster of diseases/health issues?
- Which drivers of the disease are seen as being significant?
- What kinds of ecosystem change are seen as significant, and which are ignored?
- What kinds of spill-over and transmission dynamics are identified as important?
- Which groups of people are identified as vulnerable and why?
- What poverty impacts are identified?

References

IPCC. 2007. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds. [Cambridge University Press](http://www.cambridge.org/9780521464601), Cambridge, UK. 976 pp.

Millennium Ecosystem Assessment. 2005. Washington, DC, Island Press.