

Social-Ecological Resilience of Agro-ecosystems in the White Volta Basin in Ghana.



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Background

Global intensification of land use is on a rise resulting in the decline of ESS especially in agricultural ecosystems. This is more prominent in the ecosystems of West Africa where most of the people are poor and depend on agriculture for their livelihoods. Ecosystem services are essential in maintaining both human welfare as well as ecological integrity, yet these services can be affected by natural changes and management actions.

Agroecosystems are experiencing significant land use changes which are characterized by the rapid conversion from traditional and subsistence farming use, to alternate farming practices, commercialization and intensification, to urban development, and to non-agricultural use (De Groot 2005).

Volta River Basin

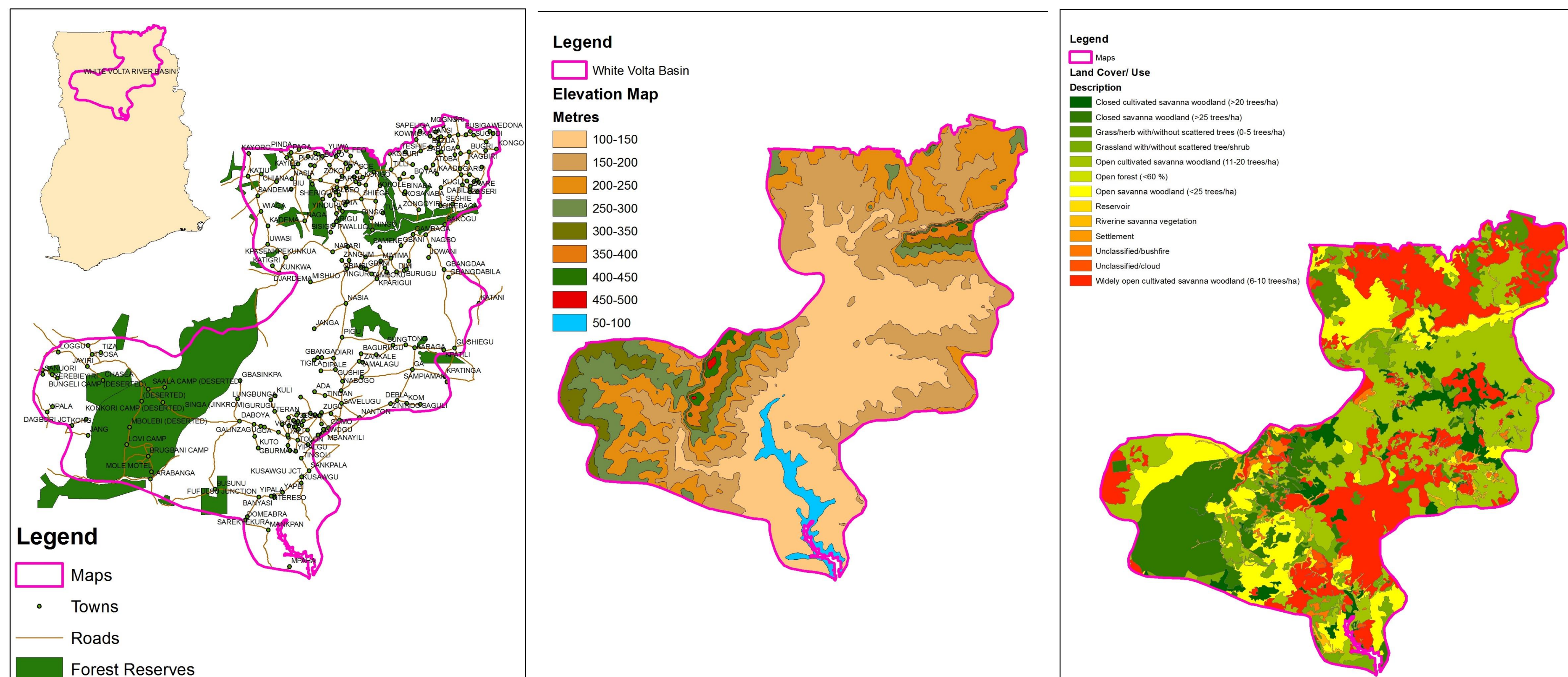
The White Volta Basin in Ghana is characterized by vast lands of a mixture of savannah woodland whose species depend on the local soil and climatic conditions to thrive. Much of the vegetation is in its modified forms consisting of converted and cultivated lands feeding most urban communities in Ghana. Precipitation in the basin although adequate for agricultural purposes, is highly variable resulting in periods of drought aided by burning exposing the soils to excessive drying and erosion, rendering the area less attractive to farming. The Volta Basin is at a high risk of losing multiple high value ESS due to the constant phenomenon of land use and land cover changes due to the combined effects of human induced land use and rapid changes in biophysical factors due to climate change (Conservation Alliance 2014). The biodiversity (woody vegetation with its associated fauna) present in the basin provide both direct and indirect services for daily needs of the rapidly growing population in the area.

The Problem

Demand for agricultural land for both subsistence and commercial purposes is on the increase. Cropping cycles which rely on the low use of fertilization techniques to replenish the soils have been intensified and have shorter fallows. This system of land use coupled with the effects of bad farming practices such as slash and burn, bush burning and improper use of agrochemicals results in the rapid loss of the agriculture potential of most of the land in the basin (Conservation Alliance 2014). Land unavailability results in farmers expanding into marginal lands where cropping may not be suitable and in riparian forests resulting in the removal of the top soil and increase risk of siltation.

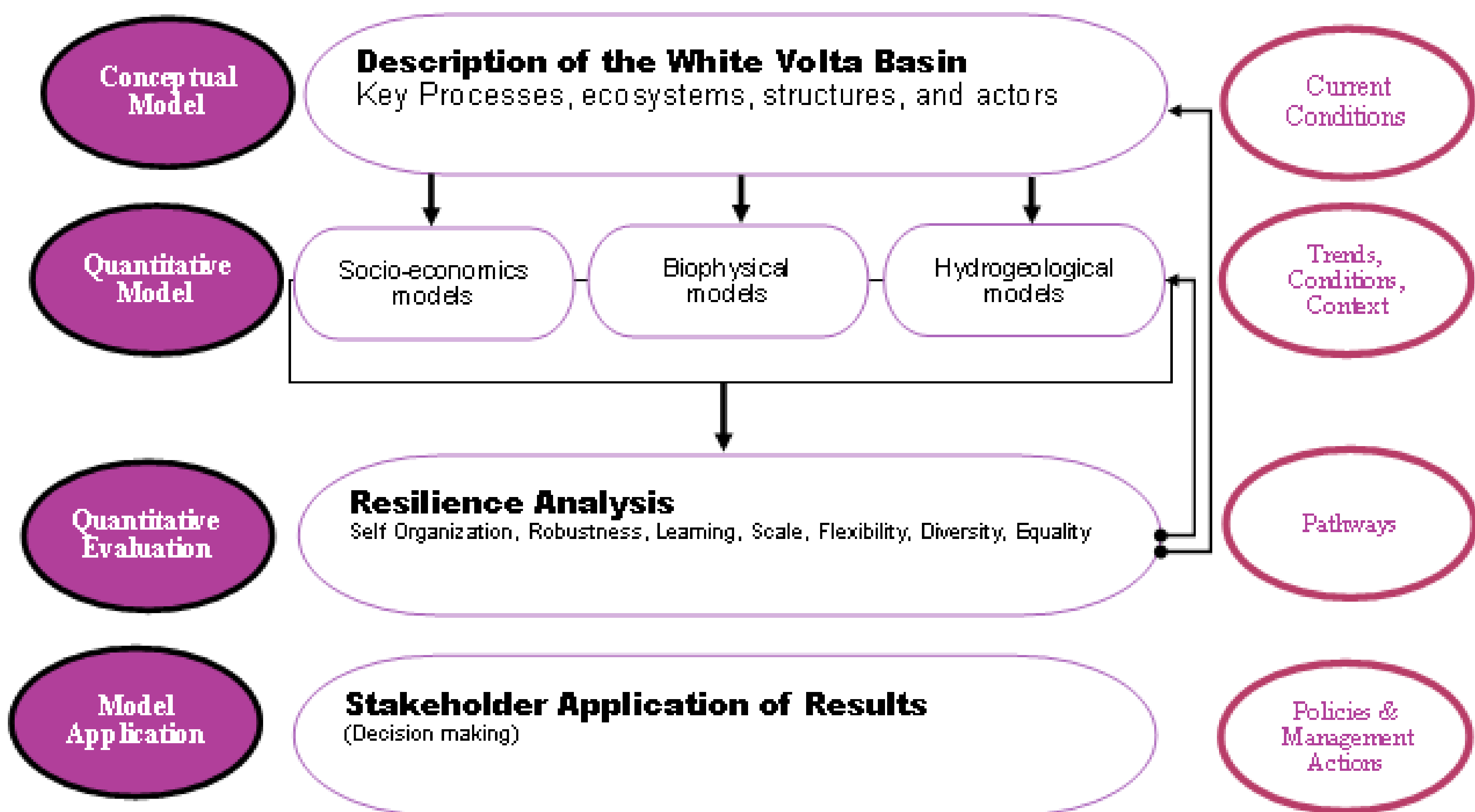
These changes in the land use practices and decline in biodiversity affect the hydrological cycle and the ability of the landscape to provide critical ecosystem services that promotes the agriculture potential of the basin and the wellbeing of the communities living there.

Management options will be modelled to determine potential pathways that recognizes both sustainable production of ESS for human wellbeing and agriculture potential in the Volta Basin. This will consider physical, biological and economic trade-offs of various agricultural practices that support ESS.



Our Approach

A better and detailed understanding of the complex relationships between agricultural potential, human wellbeing and ecosystem health (biodiversity) is largely lacking for the smallholder farming systems in the Volta Basin in Ghana. This makes it difficult to quantify the extent to which anthropogenic activities (including social systems) affect the provision of ecosystem services, the capacity of the ecosystem to continue to support agriculture potential and wellbeing of smallholder farmers in the area. This will enable farmers, policy makers and natural resource managers to better understand ecosystem functions and optimizing services including the consequences of exceeding ecosystem limits particularly in terms of human wellbeing and crop security due to changing environmental conditions and future agriculture scenarios.



Research Questions

1. What are the key processes, ecosystems, structures, and actors in the White Volta Basin of Ghana?
2. What are the key social factors, structures and processes that promote the provision of ESS in the White Volta Basin and their relationship with human wellbeing and agricultural potential in the Volta Basin?
3. What are the perceptions of farmers and their families about wellbeing? How does this perception influence the ability of the ecosystem to provide its services and goods?
4. What management potential pathways to enhanced wellbeing and agricultural potential are available to farmers and their families and how are these potential pathways affected by ecological resilience?