

Ph.D. Research & Thesis

Vulnerability and adaptation options smallholder farmers to Changes in Ecosystem Services, Land use/Land cover and Climate Variables.

Background

Ecosystem services are the direct and indirect contributions of ecosystems to human well-being (Smith & Sullivan, 2014; Millennium Ecosystem Assessment, 2005). The Millennium Ecosystem Assessment's (MEA) framework recognizes that ecosystem services are often co-produced through nature-human interactions in social-ecological systems.

The framework notes that inter-human relations have a bearing upon human-nature relations and hence ecosystem services. The trade-offs between these interactions have several implications for the distribution of ecosystem services benefits to socially differentiated communities and groups under different institutional arrangements. Ecosystem services in semi-arid areas vary over space and time based on several factors such as a changing climate, increasing human populations, land use and land cover changes.

The livelihoods of communities living in semi-arid areas are typically dependent on limited ecosystem services (Boon & Ahenkan, 2011; Egyir, et al., 2015). Characteristically, agriculture in semi-arid areas are dependent on stable and fertile soils, surface and groundwater resources and non-timber forest produce such as fuel wood, fruits and honey. Smith & Sullivan observes that ecosystem services may be subjected to seasonal cycles and may be available perennially.

This research explores the patterns of vulnerabilities and adaptation options of different social groups to differentiated impacts of ecosystem services changes in the context of a changing climate in semi-arid areas of the Upper West Region of Ghana.

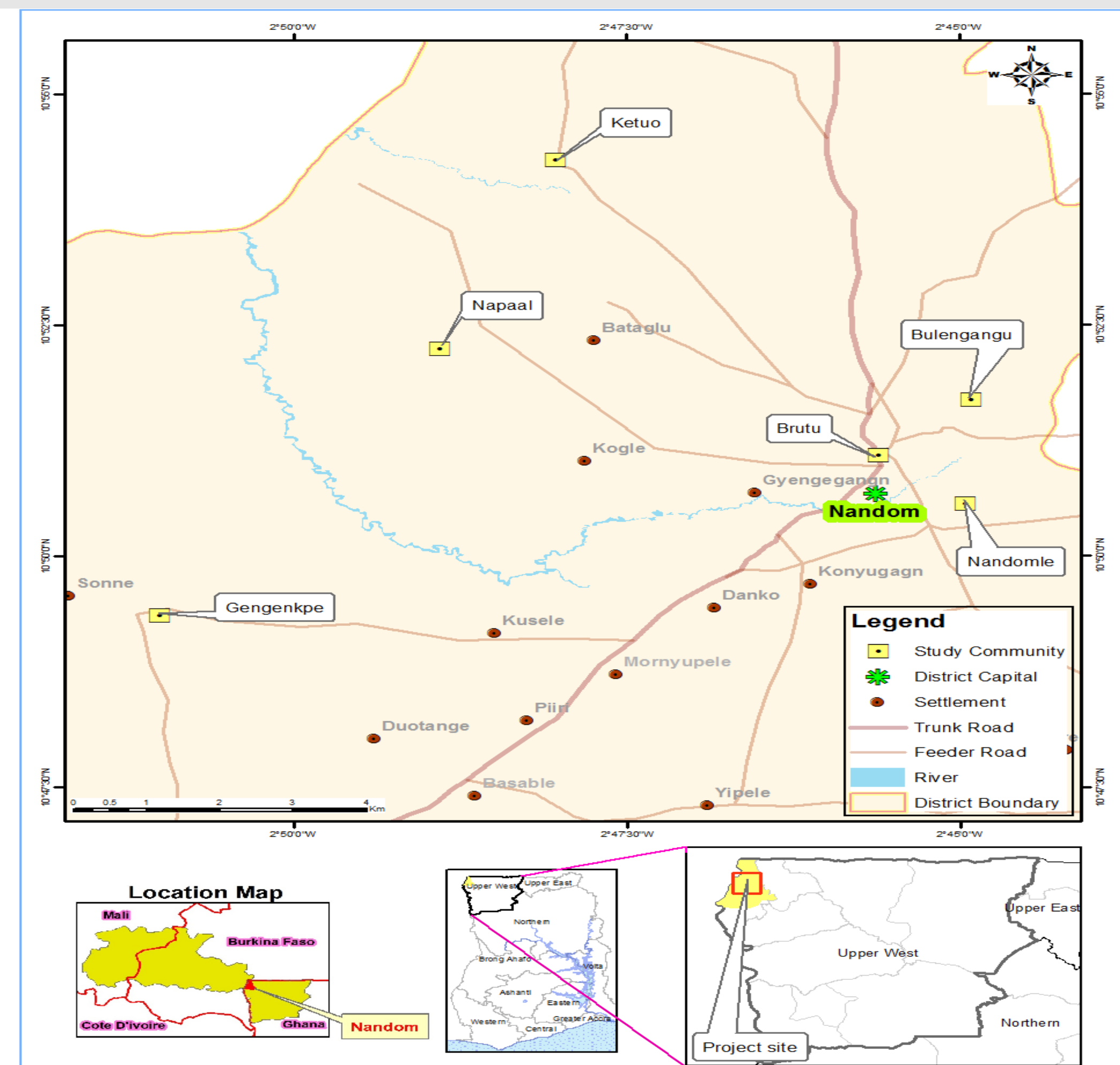
Research Objectives

The specific objectives of the study are to:

- Determine the spatial and temporal variations in land use/land cover change and climate trends in the study area.
- Investigate the availability of ecosystem services and the link between land use/land cover change and ecosystem services changes in the study area.
- Determine the key drivers of ecosystem services change in the study area.
- Determine who are the most vulnerable to loss of ecosystem services in the context of a changing climate.
- Investigate how changes in ecosystem services affect adaptive capacities of different social groups.
- Investigate the institutional arrangements and knowledge sources available for regulating land use and ecosystem services in the context of a changing climate in the study area.

Study Areas

This study is carried out in the Nandom District (located at longitude 10°50' N and latitude 2°35' W) of the Upper West Region of Ghana and involves farming households across six communities (i.e., Gengenkpe, Napaal, Ketuo, Bulengangu, Nandomle, and Brutu) as shown below.



Research Activities Carried Out

- ❖ Rainfall and Temperature Data for the study area between 1984 & 2014 and LANDAST ETM Image for 1984, 2004 & 2014 have been acquired and is being analyzed.
- ❖ **Reconnaissance Study:** Community engagement and profiling
 - ❖ Meeting with Nandom District Officials-NADMO Officer, Coordinating Director and Planning Officers.
 - ❖ Meeting with chiefs and community members of Gengenkpe, Napaal, Ketuo, Bulengangu, Nandomle, and Brutu (See pictures below)

Research Methods

The research is conducted using both qualitative and quantitative techniques through descriptive survey design. The study procedures for achieving the research objectives are as follows:

- Desk review and Study (Literature Review);
- Acquisition and Analysis of Data:
 - Rainfall & Temperature (1984-2014); and
 - LANDSAT ETM Image (1984, 2004 & 2014)
- Community Engagement and profiling (Household interviews, key informant interviews and Focus Group Discussions are employed in this study);
- Deeper exploration of social differentiation, decision-making and actions; and
- Analysis of vulnerability and adaptive capacity through survey instruments.
- Data Analysis: Using multivariate descriptive statistics and difference-in-difference (DiD) regressions. EVI, SAVI, NDVI and TNDVI Maps



Preliminary Findings

The main findings from the community engagement and profiling are summarized in the table below.

No.	Community	Ecosystem Services	Social Group	Main Challenges	Most Vulnerable
1.	GENGENKPE	Fresh water-Black Volta River	Village Saving & Loan Assoc.(VSLA), ethnic, women & church groups	Low crop yield and loss of soil fertility.	Elderly, Children & PWD
2.	NAPAAL	Black Volta river (fresh water), forest trees, streams.	Village Saving & Loan Assoc. (VSLA), women (Aakyere & Daateng) & men groups.	Deforestation, Erratic rainfall pattern, loss of livestock, lack of extension services, floods, low crop yield, high interest rate for loans	Elderly, Children & PWD
3.	KETUO	Black Volta River, streams,	Village Saving & Loan Assoc.(VSLA), women & men groups.	Floods, lack access to fertilizers and farm implements	PWD, Elderly & Children
4.	BULENGANGU	Streams, soil, ground water	Village Saving & Loan Assoc.(VSLA), women & church groups	Bushfires, Loss of soil fertility, lack access to fertilizer, Erosion, lack of improved crop varieties.	PWD, Women, Children, Elderly.
5.	NANDOMLE	Streams-Babiara, chapo, ghemupo, Rain water, ground water, bush meat,	Women group, VSLA, Clan groups, Nnobia group.	Lack of farm inputs-fertilizers, Erratic rainfall, loss of soil fertility, Bushfires, Floods,	Women & children, elderly, animals, PWD
6.	BRUTU	Streams, ground water, Dam/wells	Women group, VSLA, Clan groups, clan group, garden group, church groups, and farmer groups.	Erratic rainfall, loss of soil fertility, low crop yield, bushfires, floods, lack of farm inputs, lack of Agric. Technical officers	PWD, children, women, elderly

Poster Prepared by:

Ishmael Lente, Ph. D. Candidate, Institute for Environment and Sanitation Studies (IESS), University of Ghana, Legon, P. O. Box LG 209, Accra; ishmaelente@yahoo.com/inlente@st.ug.edu.gh

