

Drivers of Degradation: Linking Large-scale Degradation to Human Influence in the Nigerian Guinea Savannah

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1. Introduction

Land Degradation, that is, a decline in the quality of land resources and a loss in their productivity, is widespread in Nigeria, and threatens biodiversity and land dependent livelihoods. Nigeria has lost nearly 81% of its biomass and ranked No. 4 in the world for biomass degradation between 2000 and 2010 (FAO 2010).

In particular, land degradation in the Nigerian Guinea savannah is a major challenge driven by deforestation, agriculture and other land use activities.

Although, the link between land degradation and human activities is widely acknowledged, it remains spatially under explored. This research thus examines the spatial relation of human influence with land degradation in order to inform better land use management in the Nigerian Guinea Savannah.

2. Research Area

The Nigerian Guinea Savannah (NGS) occupies 49% of Nigeria landmass and has been chosen as a case study because it is the major food producing zone in Nigeria.

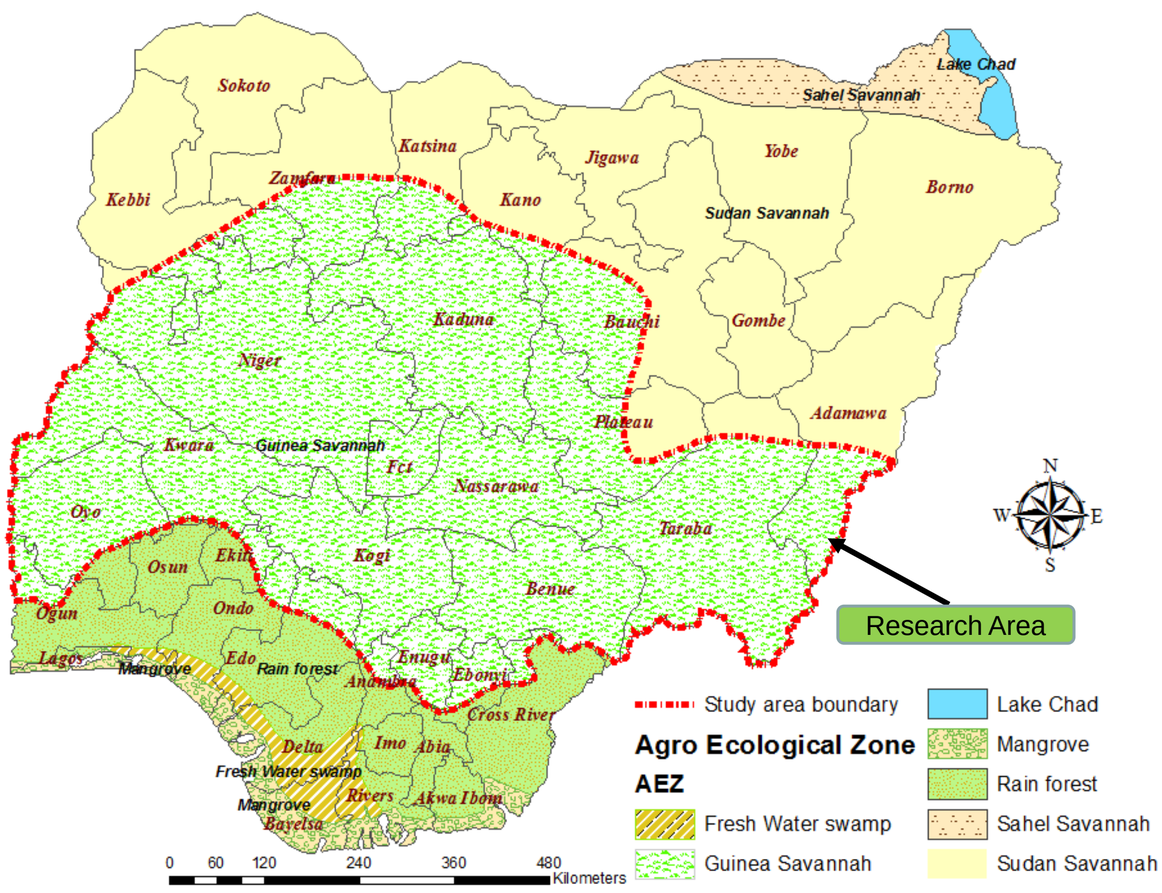

Figure 1 The Nigerian Ecological Zones focusing on Nigerian Guinea Savannah(NGS) Adapted from (Iloeje 2001)

3. Data and Methodology

- Data :(1) Moderate-resolution Imaging Spectroradiometer Normalized Difference Vegetation Index (MODISNDVI) time series Terra product; (2) Tropical Applications of Meteorology using SATellite and ground-based observations (TAMSAT);
- Human Influence Index data :(1) major cities; (2) land use/land cover; (3) human population density; (4) major roads; (5) railways; and (6) navigable waterways (Sanderson et.al 2002).
- After calculating the maximum value composite (MVC) of MODIS data, the observable changes in vegetation greenness map was produced.
- Residual Trend Analysis (RESTREND) was used to detect land degradation while controlling for climate variability i.e rainfall variability (Yahaya, et. al 2015)
- Spatial overlay of Human Influence Index with MODIS-derived land degradation status to explain the level of human-influence on land degradation. Figure 2 shows the workflow.

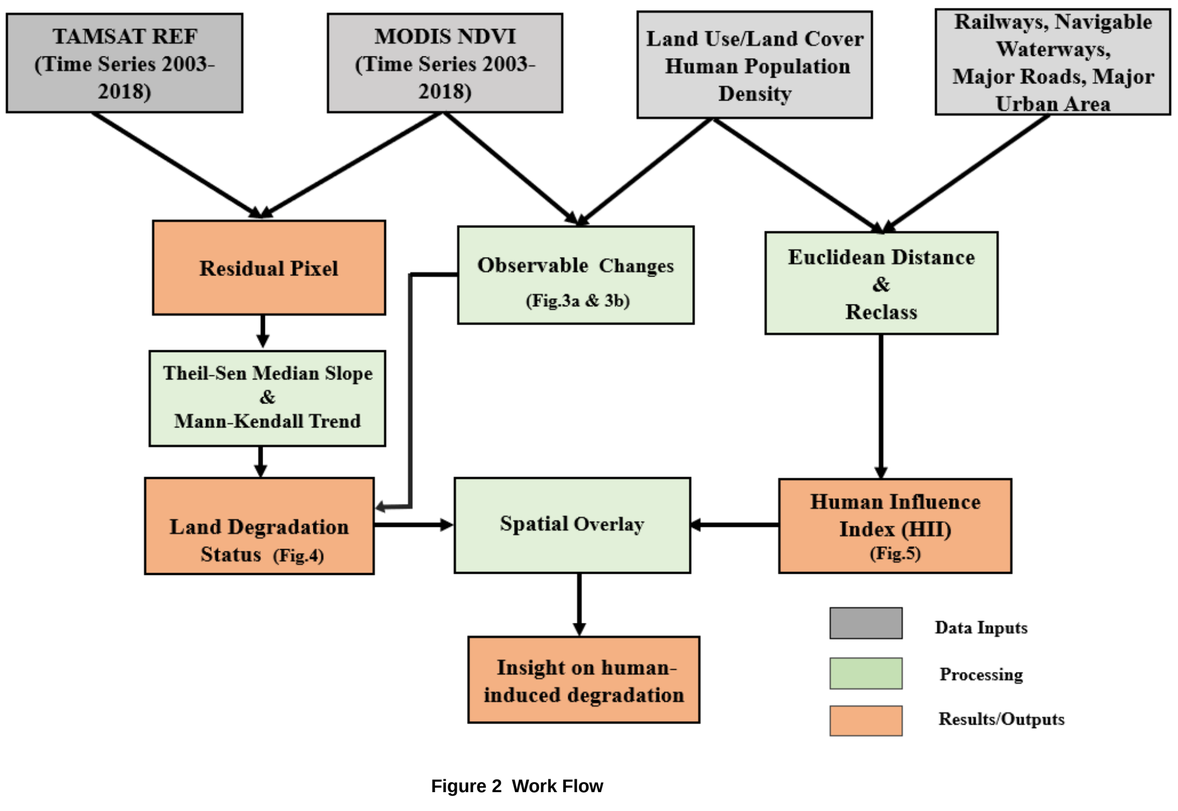

Figure 2 Work Flow

4. Result

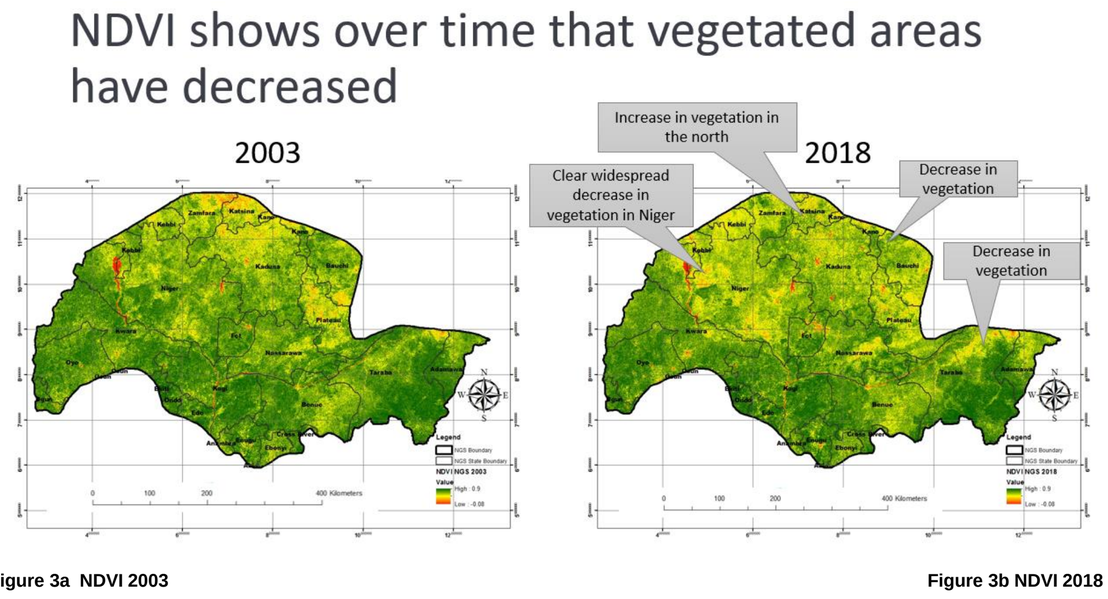

Figure 3a NDVI 2003 **Figure 3b NDVI 2018**

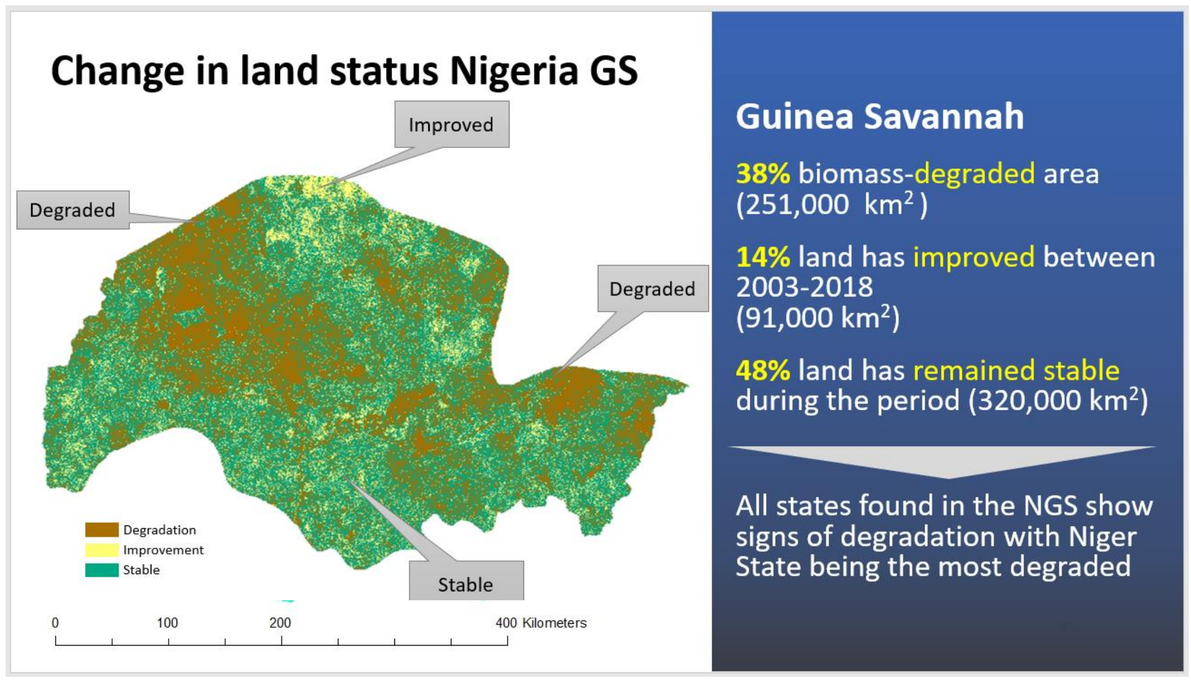

Figure 4 Land degradation status after controlling for rainfall

Very low to Moderate HII are tied to large-scale degradation

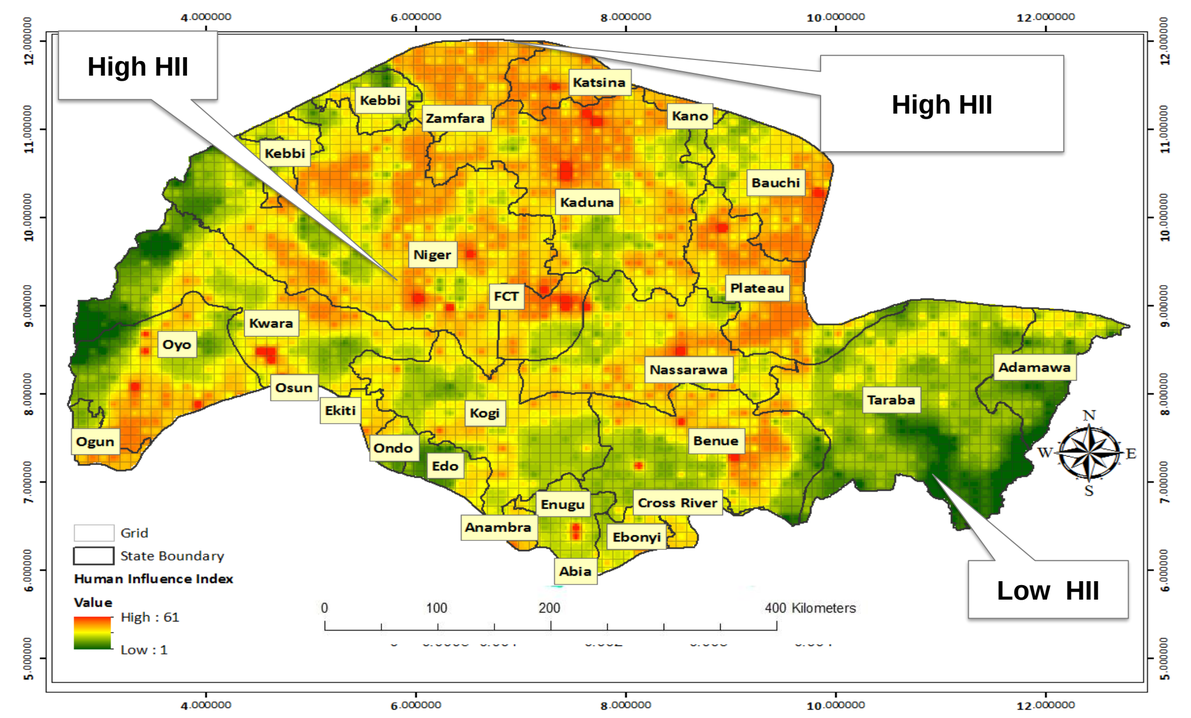

Figure 5 Land degradation status and population

- Area from the northwest to the central and northeast of the NGS, encompassing the states of Kebbi, Niger, parts of northern Kwara, FCT (mainly around Abuja, and parts of the states Nasarawa, Plateau, Taraba and Adamawa, are the hotspots of large-scale degradation areas in the NGS (Fig. 4)
- Similar spatial pattern between land status and HII i.e areas bordering northwest to the central and northeast (Fig. 4 and Fig 5)
- Very low to Moderate HII are tied to large-scale degradation in the zone
- Moderate HII amount to opening of NGS which modifies savannah by facilitating degradation activities such as deforestation.
- Areas of Very High and High HII (Fig. 5) are not necessarily associated with areas of large-scale degradation (Fig 4) compare northern part the study .i.e. Katsina Zamfara with stable and improved biomass.

5. Conclusion

- The Human Influence Index does not adequately explain land degradation in the NGS.
- Other human-induced land degradation drivers such as livestock density and history of fire occurrence need to be identified and integrated into the analysis.
- Archetype analysis is an option to explain the drivers in their different combinations, including the need to interface degradation solution with science-policy-practice

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