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The local experts' perception of environmental change and its impacts on surface water in Southwestern Nigeria

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ABSTRACT

In this study, we investigated whether environmental changes (climatic conditions, deforestation and surface water) in the woodland savanna and rain forest zones of Southwestern Nigeria, as observed by the rural communities' local experts', can be used to evaluate Land cover change (LCC) in the region. LCC was conducted using orthorectified Landsat multi-temporal imagery for 1970/1972, 1986/1987, 2000/2001 and 2006 using maximum likelihood classification and change detection techniques. The results showed a decrease in the forest area and an increase in built-up and cultivation/others (open space, bare land, grassland) areas. Between 1972 and 2006, forest reduced by about 50% while built-up areas increased by about 300%. A Participatory Learning Approach (PLA) involving experienced elderly local experts above 65 years old was conducted to assess their observations in the region on (i) LCC and (ii) the causes of water shortage, and (iii) the associated risk and adaptation/recommendation. The communities' local experts reported that changes in climatic condition, deforestation in the last 30 years and constructions of surface storages (reservoirs) are the major factors responsible for declining surface water in the region. There is thus, a good corroboration between the results of remotely sensed data of LCC assessment and the communities' local experts' observations of land cover changes and changes in surface water resources in the region. The study therefore inferred that LCC map products-information could be used in a participatory approach involving the communities to assess the impact of environmental change on an important service of forest ecosystems such as fresh water resources.

1. Introduction

The vast changes in land cover and land use in tropical environments are negatively impacting on their ability to provide essential services to the human community, thus threatening food, water, and energy security (Hulme et al., 2001; Challinor et al., 2007; Shemsanga et al., 2010). This could be exacerbated by climate change i.e., increasing frequency and severity of extreme climatic events and long-term shifts in temperature, rainfall patterns and water availability, in the aggravating context of rapid population growth and fast-paced urbanization (IPCC, 2012; Ren et al., 2012). This will increase the risk of

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leaving many of the vulnerable rural communities in a fragile economic situation for some time to come (Adeniji-Oloukoi et al., 2013).

An important question is whether inhabitants of tropical biomes in Africa are aware of the changes occurring to the environment and the consequences thereof. Published research results seldom trickle down to the general population and let alone to the uneducated masses. This makes it particularly challenging for rural populations to craft common adaptation and mitigation measures to land cover change (LCC, and associated land use), and climate change (Mapfumo et al., 2013; Fasona et al., 2013). The question arises whether local perceptions of LCC can be corroborated with quantitative and objective assessment of LCC using remote sensing data and whether inhabitants of tropical environments see these and climate change as the causes of resource depletion, more specifically fresh water. Several studies have argued that people's perceptions and attitudes towards depletion of natural resources are instrumental to wise use and management of natural resources (Mogome-Ntsatsi and Adeola, 1995; Pavlikakis and Tsihrintzis, 2003; Kerr and Cihlar, 2005, Fasona et al., 2013; Ayeni and Olorunfemi, 2014). Ayeni et al. (2013) assessed the relationships between LULCC derived from remotely sensed data and the communities' perception of land use change and water stress using three LGAs to represent the region. It was found that change detection analysis and the choice of nine communities from three LGAs over the region are subjective, and therefore could not give detailed interpretation of people's perception on changes in surface water, land-cover and climate relatively to what obtained from remotely sensed data. In addition, the complexity of human-environmental influences can be addressed not through only scientific protocols but also through active participation of community based indigenous knowledge and informal science education that involves indigenes' attitudinal and behavioral mechanisms. This has not be explored in environmental change research in the region

These therefore create the lacuna that this present study intends to fill. This is very important in the process of finding solutions to the problems affecting local communities in Africa.

The aims of this study are to: (i) assess local experts' perception of land cover change (LCC) and climate change in the woodland and secondary rainforest areas in Southwest Nigeria, (ii) assess local experts' perception of the causes of water stress in the region, and (iii) investigate whether information from the local experts' perceptions of environmental change (LC and climate changes) corroborate LCC information derived from remote sensing data.

2. Study area

The study area lies between longitude 3°2' and 6°0'E, and latitude 6°5' and 8°20'N, in the Southwest corridor of the Niger River (Fig. 1).

The mean annual temperature ranges from 29 °C in the northern part to 27 °C in the southern part. The annual rainfall ranges from 1000 mm in the northern part to 1800 mm in the southern part depending on the vegetation zones. The geology is characterized by undifferentiated igneous and metamorphic rocks, mostly granite, mischist, gneisses, and

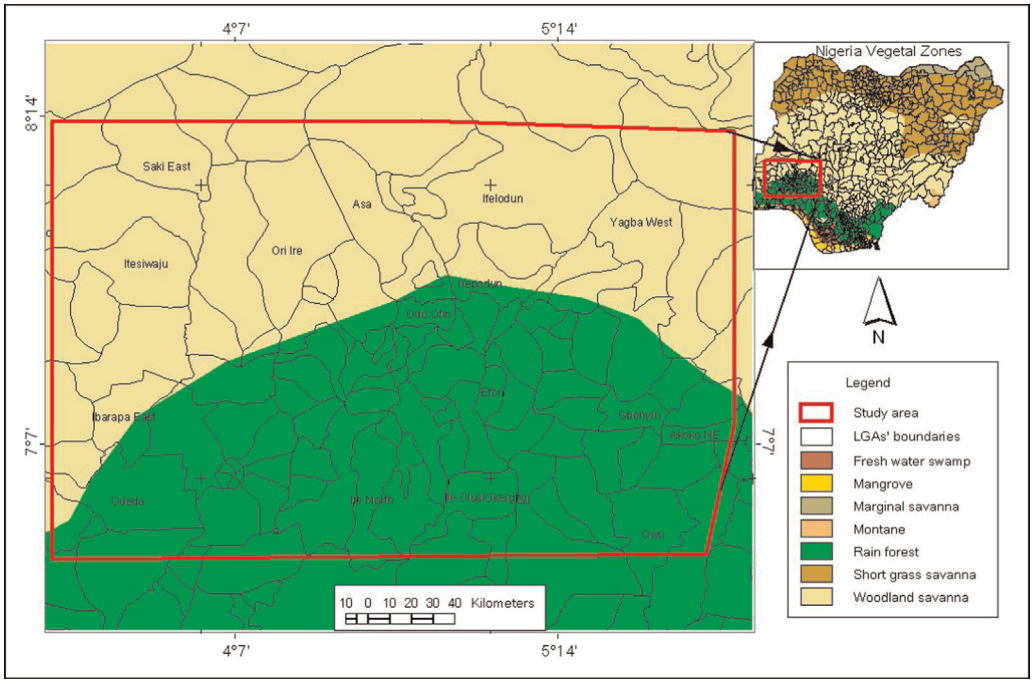

Fig. 1. Location of study area in the southwest corridor of the River Niger.

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