



# URBAN DEVELOPMENT AND SUSTAINABLE LIVELIHOODS OF COMMUNITIES AROUND ELEYELE WETLAND IN IBADAN, NIGERIA

<sup>1</sup>Oyedele P.B., <sup>2</sup>Olorunfemi F.B.

<sup>1</sup>West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL),  
Université de Lomé, Togo

<sup>2</sup>Nigerian Institute of Social and Economic Research, Ibadan

\*Corresponding author: [bolupeter@gmail.com](mailto:bolupeter@gmail.com)

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## ABSTRACT

Wetlands provide numerous ecosystem services supporting livelihoods of people around the world. However, in spite of these benefits, wetlands are continuously being degraded through over exploitation, poor management and other unsustainable uses. A major challenge on wetland development in Nigeria is how to raise awareness of, and provide guidance on, the importance of wetlands as providers of benefits to urban populations. This study assessed urban development and sustainable livelihoods of communities around Eleyele wetland in Ibadan, Oyo State. 240 respondents in three major communities around the wetland including Ijokodo, Eleyele and Apete were selected for this study. Also, indepth interviews and Focus Group Discussions were conducted in each on the communities. Findings revealed that almost all households surveyed derive benefits from the wetland. However, a wide range of human activities mostly resulting from urban encroachment have affected the wetland and caused their degradation hence negatively impacting the services provided by the wetland. The study recommends provision of alternative livelihoods for people living around the wetland. There is need to strengthen the implementation of existing laws and policies on wetland use, management and protection in the state and in the country as a whole so as to reduce the existing pressures on wetland use.

## 1. Introduction

According to Ramsar convention 1971, wetlands are defined as areas of marsh, fern, peat land or water, whether natural or artificial, permanent or temporal, with water that is static or flowing, fresh, blackish or salty, including areas of marine water, the depth of which at low tide does not exceed six metres (Davies, 1993). A wetland is a piece of land that is seasonally or permanently covered by shallow water, as well as land where the water table is close to or at the surface (Mitsch et al., 2009). Wetlands provide numerous goods and services to society, supporting millions of people around the world (Barbier et al., 1997).

Rural households often harvest natural products for food, medicines, cosmetics or materials for shelter (Adaya et al., 1997, Barbier et al., 1997). As Adeoye and Dami (2012) asserted, wetlands are among the most productive habitats in the world. We depend on wetlands for food, and clean water, for building materials and fuels, for livestock grazing and medicines and for water flow regulation. Nigeria is richly endowed with both coastal and inland wetlands and these wetlands are of economic, ecological, socio-cultural, recreational and scientific significance (Tijani et al., 2011).

However, in spite of the benefits wetlands offer to people, limited knowledge on the benefits of resources and their associated functions and values resulted in their conversion to other uses in many countries, and the impact of their loss is being realized in different forms. Millennium Ecosystem Assessment (MEA, 2005) reported that the increasing population and development in Africa are putting more demands on the natural resources. Studies revealed that wetlands are among the world's most threatened ecosystems, due to urbanization, pollution, continued drainage, overexploitation or other unsustainable uses of their resources (Adeoye and Dami, 2012, Olorunfemi, 2017).

In Nigeria, human activities continue to adversely affect wetland ecosystems (Orimoogunje, 2008). The alarming rate at which the country's wetlands are disappearing obviously portends some direct consequences. In particular, wetlands destruction is affecting water supply and water resources management in various parts of the country (Orimoogunje, 2008). There is no gainsaying, therefore, that the degradation of wetland ecosystems in Nigeria increases the task of food and water resources management in the country.

With urban populations increase in Nigeria, food production from the inlands cannot meet increasing population food demand; thus, wetlands may be the most logical environments in which this gap can be bridged (Tijani et al, 2011). Study done by Olanrewaju et al. (2011) on perceived benefits of selected wetlands in south-west Nigeria concludes that wetland benefits are lowly perceived by the people, especially their roles in ecosystem balancing and ensuring food security.

On a global scale, urbanization is increasingly homogenizing the biota of less developed countries. UNEP (2007) alerts that, globally, wetlands have been reduced by 50%. Even though urban sprawl is a worldwide problem, most studies on the effect of urbanization on wetlands and the conceptual models have focused on developed countries. South America has not escaped urbanization and therefore has undergone the effects of urban sprawl and development. Pavements replace native wetland ecosystems and what is left of the natural ecosystem is dominated by non-native ornamentals species (Tolba and El-khoy 1997).

A wide range of human activities have altered wetlands around the world and caused their degradation (O'Connell 2003). The existing pressures on wetlands have principally been economic or financial. Many of the existing benefits derived from the activities that negatively affect the status of the wetlands seemed to have overshadowed the economic benefits of the protection of wetlands (Schuyt and Brander, 2004). Despite international and national instruments instituted in recent times, there appears a widespread misconception that wetlands are wastelands and can therefore be converted to other uses such as agriculture, industrial development or residential. According to Dixon and Wood (2003), the misconception, especially among developing countries, is attributable to inappropriate government policies, socio-economic change and population pressure which exacerbate clamour for more agriculturally-productive land.

Like in many developing countries, urban environments have greatly changed in Ibadan with increasing population leading to increasing pressures on agricultural lands as well as wetland and green areas. In particular, Eleyele wetland has suffered major encroachment due to urbanisation in the recent past (Tijani et al, 2011). The overall results of Tijani et al's (2011) study highlighted the negative impacts of the human-induced influence on the wetland through land-use and waste effluent discharges with attendant degradation/loss on one hand. The implication of the study is that there is the need to control the increasing encroachment of farming and building activities around the wetland to avoid removal of the vegetation and degradation of the ecosystem within buffer zone.

An assessment of the wetland reveals a lot of new activities, which signify recent massive encroachment. The activities include; residential, religious and commercial buildings among others. There is a significant decrease in the vegetation cover, and the wetland now experiences more visible instances of flooding than before during heavy rains. All these activities put a lot of pressure on the wetland, and affect its ecological function and cause degradation. This paper study, therefore, examines the consequences of urban encroachment in the ecosystem provisioning of Eleyele wetland and livelihoods of the communities around the wetland.

### **1.1 Wetland Ecosystem and livelihoods**

Wetlands provide many ecosystem services that contribute to human well-being and poverty alleviation (Millennium Ecosystem Assessment, 2005). It is well established that provisioning services from wetlands, such as food and fibre are essential for human welfare while the regulating services, such as recharge of groundwater and protection from natural hazards, are critical to sustain vital ecosystem functions that deliver many benefits to people (McInnes, 2009). The importance of wetlands is alluded to by the fact that wetlands are the only single group of ecosystems to have their own international convention (Sakataka and Namisiko, 2014).

This importance is further reinforced by the increasing threats to wetlands manifested in the number of international instruments which govern their preservation and use (Mwakaje, 2009, Schuyt and Brander, 2004). The 1971 Convention on Wetlands (Ramsar Convention) universalised the importance and scope to embrace all aspects of wetland conservation and “wise use” of the more than 1800 wetlands designated as internationally important (Lukas, 2006 in Sakataka and Namisiko, 2014). Since then, however, the Convention has developed to cover all aspects of wetland conservation for biodiversity and well-being of human communities.

Wetlands are a very important source of natural resources upon which many rural economies and entire societies depend. Wetlands perform very important functions that supply goods and services that have an economic value, including food, medicine, building materials, water treatment and climatic stabilization (Schuyt and Brander, 2004). However, despite their importance to settlement and agriculture, wetlands are threatened by the over-exploitation of the functions, products and services they contribute to livelihoods, and now they face intense pressure (Mwakaje, 2009).

There is little consensus about what constitutes “wise use” of wetlands and there is often tension between conservation and development approaches that is rarely reconciled. Frequently, wetland policies are driven by a conservation agenda that actively discourages or ignores wetland agriculture. However, the value of wetlands for people arises from the interaction of the ecological functions they perform with human society. Those in Africa and Asia play a particularly vital role in directly supporting and sustaining livelihoods. They do this through the provision of a range of “ecosystem services” which bring both physical and nonphysical benefits to people (McCartney, et al, 2010).

According to Ramsar Convention Factsheet 7 (Ramsar Convention 2015), more than a billion livelihoods are presently sustained by wetlands in form of wide range of jobs globally: – almost a billion households in Asia, Africa and the Americas depend on rice growing and processing for their main livelihoods while more than 660 million people rely on fishing and aquaculture for a living. Importantly, wetlands are often inextricably linked to agricultural production systems. The need to increase food security in many places due to growing population is further escalating the pressure to expand agriculture within wetlands (McCartney, et al, 2010). Unsustainable use of wetlands can undermine their functions which support agriculture, as well as other food security and ecosystem services, including water-related services. Hence, many social and economic repercussions for people dependent on ecosystem services other than those provided directly by agriculture can result from the environmental impact of wetland agriculture.

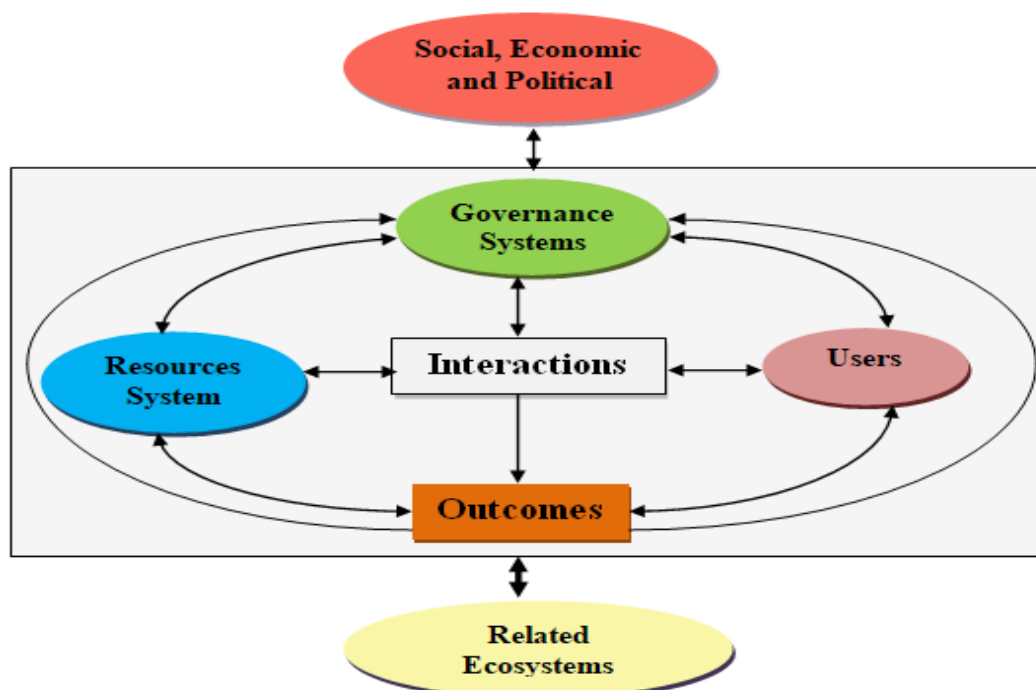
As a result of socio-economic benefits of wetlands, a wide range of human activities have altered them around the world and caused their degradation (O’Connell 2003). The existing pressures on wetlands have principally been economic or financial. Many of the existing benefits derived from the activities that negatively affect the status of the wetlands seemed to have overshadowed the economic benefits of the protection of wetlands (Schuyt and Brander, 2004). Current major threats to these wetlands include drainage for agriculture and settlement, excessive exploitation by local populations and improperly planned development activities.

Another explanation for the increasing use and ‘overuse’ of wetlands is the widespread misconception that wetlands are wastelands and can therefore be converted to other uses such as agriculture, industrial development or residential. According to Dixon and Wood (2003), the misconception, especially among developing countries, is attributable to inappropriate government policies, socio-economic change and population pressure which exacerbate clamour for more agriculturally-productive land. Populations thus resort to untested land use practices which often neither protect the environment nor adequately meet their basic livelihood and food needs.

### **1.2 Urban Development and Wetlands**

Widely regarded as priorities for the Sustainable Development Goal is the need to incorporate sustainable resource management concerns in the relevant human well-being goals like food security, water, energy, and urban development, etc. through appropriate targets and indicators (UNEP 2014). Natural resources are ecologically complex because they are highly interconnected and are ‘shaped by unpredictable internal and external changes’ (Rammel et al., 2007, p. 9). This complexity is compounded by the fact that

natural resources management involves a diverse array of institutions, stakeholders, and interests interacting across temporal and spatial scales (Potts, 2015; Ostrom, 1990, 2009) (Figure 1). Rapid economic and urban development is negatively impacting wetland resources globally. Within the context of natural resource management, urban development could both positively and negatively impact the development of natural resources.



**Figure 1: Framework for Analysing Socio-Ecological Systems**

**Source: Adapted from Ostrom (2009)**

Since the existence of the first settlements, a close relationship between resource management and urbanization has always been present. Resource management has been in response to the demand for urban resources like water, energy, and food. In recent history, resource management has been fostered by innovation and technology developments and has driven population growth and urbanization (Agudelo-Vera et al, 2011). However, natural resources (NRs), and their contribution to livelihoods have been widely explored within the rural context. For instance, issues of access, use and control of NRs, often within the context of contributions to livelihoods have received relatively little attention within the urban context (Slater and Twyman, 2003). Slater and Twyman, (2003) argue that in urban contexts, there is a need to incorporate a broader view of natural resources. This argument is supported by the fact that recent massive resource demand, especially in relation to energy and material flows, has altered natural ecosystems and has resulted in environmental degradation. In essence, natural resources can contribute significantly, if modestly, to urban livelihoods in a number of often ‘hidden’ ways (Slater and Twyman, 2003). Therefore, sustainable urban development requires integration of RM into urban development planning (Agudelo-Vera et al, 2011).

The literature clearly reveals on both sides (rural and urban) that our understanding of how NRs contribute to livelihoods, especially of the urban poor, is extremely limited. Where certain key activities have been investigated, such as urban agriculture, the analyses of these livelihoods have been partial, with a tendency to focus on their contribution to the cash economy of urban life, rather than the diverse ways in which agricultural activities in urban areas can contribute to a broad range of livelihoods issues for different people (Slater and Twyman, 2003). Whilst sustainable livelihoods approaches (SLAs) were conceptualised originally to understand and support livelihoods in rural areas, they are increasingly being applied in urban Areas. Farrington et al., (2002) argue that there are some substantial differences between livelihoods in rural and urban contexts, including differences in use of and access to capital assets, the vulnerability context, patterns of policy and institutions and levels of heterogeneity of livelihood portfolios (Quoted from (Slater and Twyman, 2003). More recently, the sharp distinction between rural and urban has been questioned, both through a recognition of the importance of linkages between rural and urban in supporting livelihoods, and with increasing recognition of the role of the rural non-farm economy (RNFE) in rural areas). A more appropriate view is of a continuum between rural and urban areas that recognises the economic, social and cultural links between rural and urban areas and the ways in which household livelihoods

straddle both the rural and the urban (Slater and Twyman, 2003).

Across the world there are many good examples of integrated and sustainable urban development which have considered natural resources and protected the vital ecosystem services that wetlands provide (Slater and Twyman, 2003). The 'wise use' of wetlands, at the centre of the Ramsar philosophy, is defined as "the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development" (Ramsar Convention Secretariat, 2007). The principle of wise use is especially relevant for wetlands located in urban or urbanizing areas and for those wetlands which support essential water and food requirements of urban areas (Emerton, et al., 1998).

In more than 50 of the documents reviewed in a study by Schueler (1987), indirect impacts to wetlands caused by land alteration due to urbanisation were pronounced. Urban encroachment increases stormwater to wetlands, and downstream crossings create flow constrictions. Together these changes lead to increased ponding, greater water level fluctuation and/or hydrologic drought in urban wetlands. In addition, urban wetlands receive greater inputs of sediment, nutrients, chlorides, and other pollutants; concentrations in urban stormwater unlike wetlands in rural or isolated areas (Schueler, 1987).

According to McInnes (2009), with increasingly rapid urbanization, wetlands have been subjected to threats in two major ways. First, through direct conversion of wetlands, whether planned or unplanned, to urban areas, leading to acute problems associated with polluted drainage, direct habitat loss, overexploitation of wetland plants and animals by urban and peri-urban residents and the increased prevalence of non-native invasive species. Secondly, wetlands have come under threat through the watershed-related impacts of urban development, including increased demands for water, increasing diffuse and point source pollution and the need for greater agricultural production to support the burgeoning urban population. According to the Australian Department of Energy and Environment (ADEE) (undated), urban and peri-urban wetlands are potentially at risk of direct habitat loss (from development, land reclamation, roads, in-stream dredging, etc), altered water regime (from dams/barriers, stream redirection, hard surfacing, water extraction, etc), and pollution (from garbage, sewage, oil and chemical spills, pesticides, airborne toxins, etc).

According to McInnes (2009), many of the essential ecosystem services provided by wetlands may be delivered directly within the limits of urban areas, such as through the regulation of surface run off, or may occur beyond urban limits within the wider watershed, such as the recharge of groundwater for urban drinking water supplies. Local communities also benefit from some of the unique benefits of urban and peri-urban wetland. For example, a study conducted on That Luang Marsh in Lao PDR revealed the extensive benefits the wetland provides to the urban population (Gerrard, 2004). In addition to long held cultural and spiritual values, the value of the provision of rice, vegetables, fish and other animal species in association with the Marsh's ability to regulate the magnitude of flood risk, store water and clean up city effluent has been estimated at just under \$US 5million per annum. The direct benefits to local people, such as providing food and fuel, make up 40% of this total value, demonstrating the importance of the area in contributing to the poverty eradication goals of the Government of Lao PDR (Gerrard, 2004).

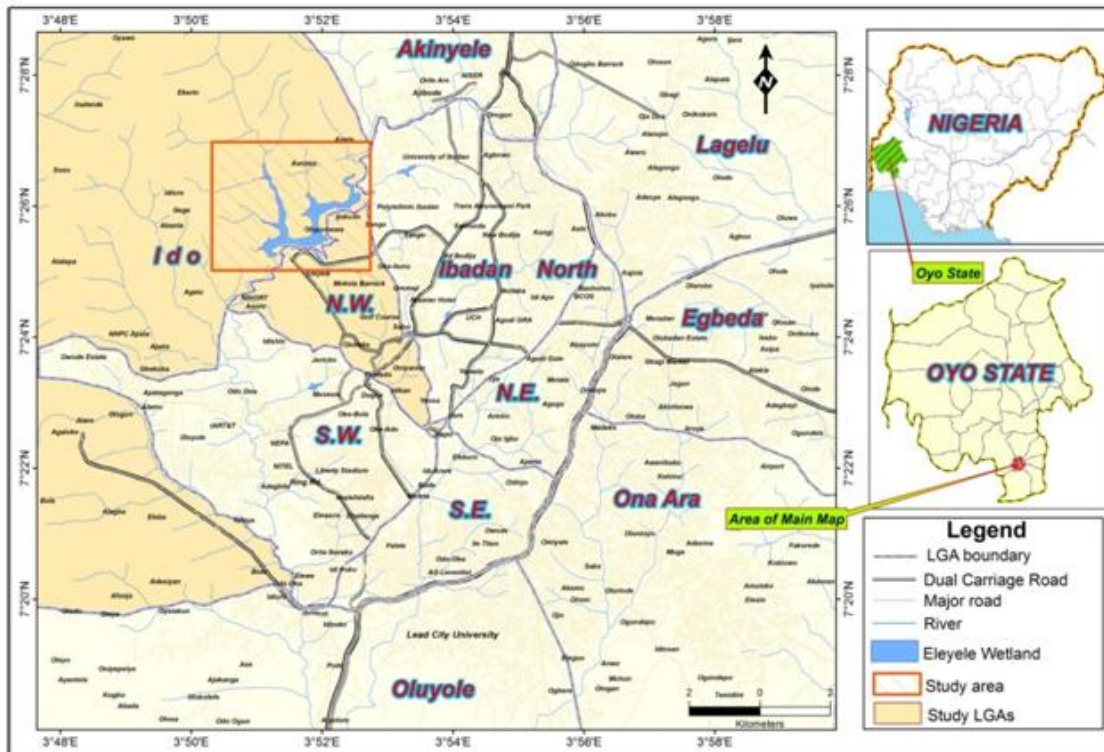
Whilst conceptual developments towards breaking down the rural-urban dichotomy continue apace, breaking down this division in policy is much more difficult. This is because the institutional frameworks and government structures through which policy is made and implemented are established either along sectoral lines or along spatial lines (Slater and Twyman, 2003). With these institutional arrangements in place, it is difficult to make policy that is appropriate for people who straddle the rural-urban divide. Therefore, for the prosperity of future generations and the protection of wetland biodiversity, McInnes (2009) suggested that society adopts a more sustainable approach to urbanization, recognizing the need to protect the natural resource base that sustains urban areas. Urban development can be planned and managed in ways that are sustainable.

## 2. Materials and Methods

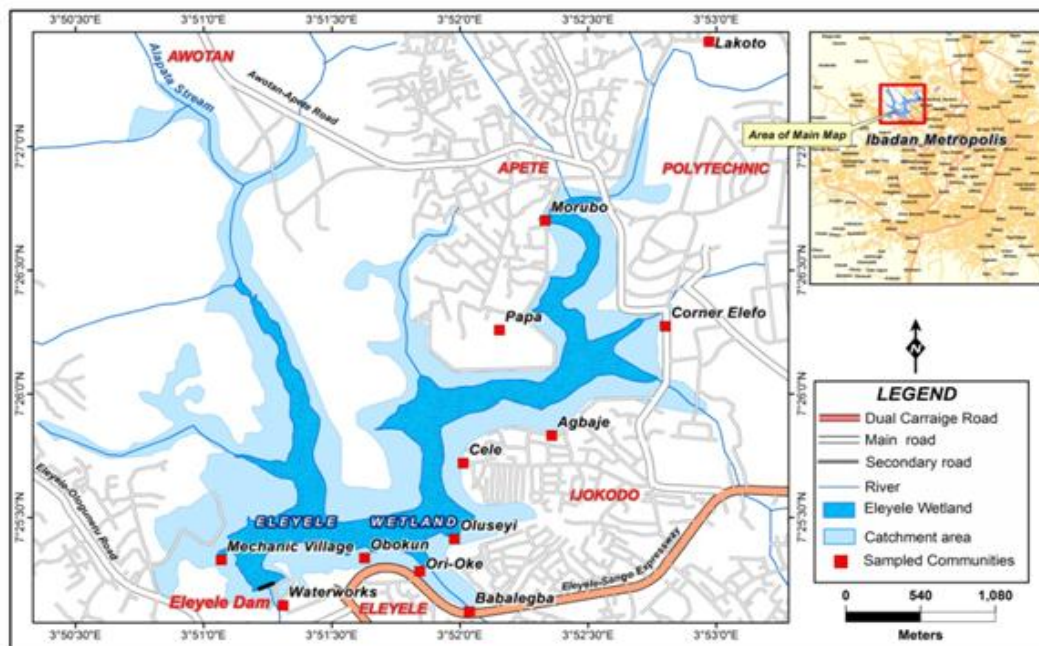
### 2.1 The Study Area

Eleyele wetland is located in north-eastern part of Ibadan, South-western Nigeria (Figure 2). The wetland is located within longitude  $N07^{\circ}25'00'$  and  $N07^{\circ}26'47'$  and Latitude  $E03^{\circ}52'50'$  and  $E03^{\circ}50'25'$ . Its boundary is between Ido and Ibadan Northwest Local Government Areas (LGAs) of the state. The wetland site is surrounded by Eleyele community in the south, Apete in the east and Awotan in the north. Eleyele wetland is a modified natural riverine wetland type with area of about  $100 \text{ km}^2$  including the catchment area. The elevation is relatively low ranging between 100-150m above sea level and surrounded by quartz-ridge hills toward the downstream section where the Eleyele dam barrage is located. A number of stream channels serve as feeding/ recharge streams to the Eleyele wetland basin. In 1942, the quest to create a modern water supply system to meet the challenge of water scarcity for the emerging Ibadan metropolis led to the construction of Eleyele Dam on the main River Ona with a reservoir storage capacity of 29.5 million litres. Figures 2 and 3 shows the location of the wetland and the sampled communities respectively





**Figure 2: Map showing the location of study area**  
Source: Composed by authors from base map from Oyo State Ministry of Urban and Regional Development, Ibadan



**Figure 3: Map showing Sampled Communities in the study area**  
Source: Composed by authors from base map from Oyo State Ministry of Urban and Regional Development, Ibadan

## 2.2 The Eleyele Wetland Physical Setting

The land area of Ibadan is 986 km<sup>2</sup> and a population of 5,580,894 (NPC, 2006). On account of extensive fertile soil which is suitable for agriculture, the basic occupation of the people is farming. There are pockets of grassland which are suitable for animal rearing, vast forest reserves and rivers. The people in the area grow varieties of crops such as cocoa, kolanut, mango, maize, rice and vegetables such as tomatoes and okra, among others. Ido Local Government Area is called the fruit and vegetable bowl of the state. Apart from farming, the local government area has also gained tremendously from the services of medium and small scale industries for processing agricultural products like cassava and cashew nuts.

From the review of studies conducted in different parts of Southwestern Nigeria, it is evident that Nigeria wetlands are rapidly degrading. For instance Orimoogunje et al., (2009) in their study on wetlands in Ilesa in Osun State revealed that between 1986 and 1991, the total land area for wetland decreased from 258 hectares to 148 hectares, there was further decrease of wetland area as at 2002 to 89 hectares while other land uses such as agricultural activities and settlement within this period increased. In the same Osun State, Adeoye and Dami (2012) observed human modification in terms of the reduction in the size of the original wetlands in Ile Ife.

Specifically, study by Tijani et al (2011) in Ibadan using satellite data (Figure 4), it was revealed that the built-up area within the catchment of Eleyele wetland increased by almost 70% between 1984 to 2004. This has resulted in a reduction or lost of forest and agricultural areas around the wetland to be more than 60%. They argued that while this increase in urbanization may not have resulted in total loss or degradation of wetland soils, there are clear influence of urban catchment activities on water and bottom sediments of the feeding stream and the main wetland lake. Consequently in the work of degradation and loss of wetlands and their biodiversity imposes major economic and social losses and costs on the ecosystem. As shown in Table 1, the size of the built up area around the wetland increased from 4.47 Km<sup>2</sup> in 1984 to 7.52 km<sup>2</sup> in 2004. It was projected to reach 9.04 km<sup>2</sup> in 2014. This shows a consistent increase in the size of the built up area over four decades. The overall implication of the study is that there is need to control the increasing urban encroachment on the wetland to avoid removal of the vegetation and degradation of the ecosystem within buffer zone Tijani et al (2011).

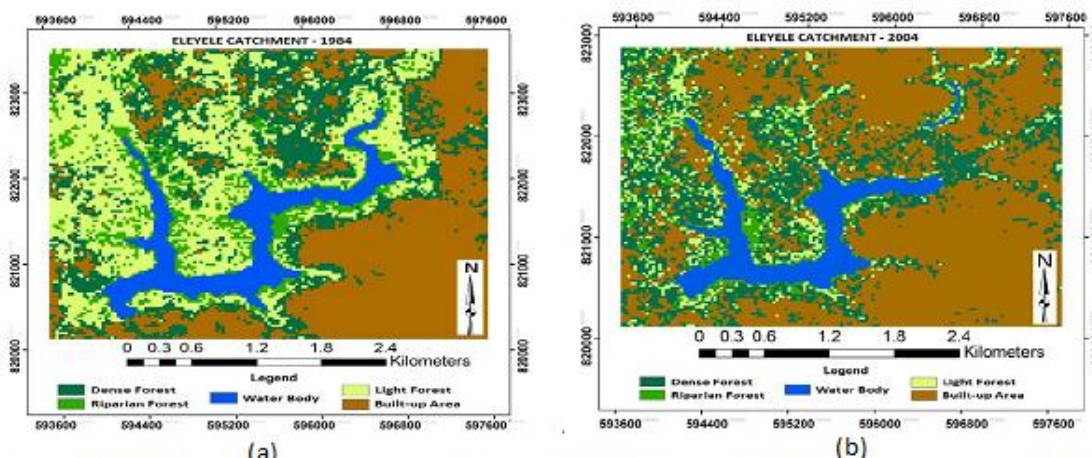
**Table 1: GIS-based estimated and projected temporal changes in the spatial extent of land use types (in km<sup>2</sup>) within the Catchment of Eleyele Wetland**

Land Use Type (km <sup>2</sup> )	1984 <sup>+</sup>	1994*	2004 <sup>+</sup>	2014*
Dense forest	3.38	3.20	3.01	2.52
Riparian (wetland) forest	1.25	0.98	0.70	0.42
Light forest	3.84	2.46	1.09	0.01
Water body (River)	1.25	1.19	1.14	1.09
Built-up Area	4.47	5.99	7.52	9.04

+ = Estimated

\* = Projected

Source: Tijani et al (2011)



**Figure 4: GIS-based imagery map of spatial distribution of the land-use type as at 1984 and 2004 (a and b) respectively**  
 Source: Tijani et al (2011)

### 2.3. Sampling Technique and Sample Size

The survey was conducted in three major communities located around the wetland. The main sampling unit of the survey was the household. A total of three (3) major communities surrounding the wetland, twelve (12) farming communities, and twenty (20) households in each farming communities were considered representative enough for the survey in the study area. This amounted to two hundred and forty (240) households. In addition to the questionnaire, indepth interview and Focus Group Discussions were held in the communities.

**Table 2: Sampling frame**

Communities Surveyed	No of Respondents	Percent	
<b>Eleyele</b>	Mechanic Village	20	8.3
	Orioke	20	8.3
	Waterwork/EleyeDam	20	8.3
	Obokun	20	8.3
<b>Ijokodo</b>	Agbaje	20	8.3
	Oluseyi	20	8.3
	Babalegba	20	8.3
	Cele	20	8.3
<b>Apete</b>	Papa	20	8.3
	Lakoto	20	8.3
	Morubo	20	8.3
	Corner Elefo	20	8.3
<b>Total</b>	<b>240</b>	<b>100.0</b>	

Source: Field Survey, 2017

## 3. Results and Discussion

### 3.1 Assessment of the importance of the wetland

Results of the analysis shows that majority of the respondents are males (59.2%) while females constitute the remaining 48.8%. More than half of the respondents are within the active working age of 20-60 years. The average age of the respondents was 52 years. 75.4 percent were married. Also, more than half of the total number of respondents (67.9%) has between 6-10 numbers of people in their household. 30.8 percent of the respondents have secondary education while close to one-fourth (20.4%) of the respondents have primary education. Close to half of the respondents (46.7%) have lived in the community for more than 10 years. More than one-third (39.6%) have lived between 5-10 years. It implies that the high number of years respondents lived in the community may likely increase their historical knowledge of recent changes in the status of the wetland

The analysis also shows that most of the farmers (82.1%) were fully engaged in farming and 17.9 percent get their income from other sources besides farming, including trading, craftsmanship and salaried jobs. The predominance of farming as major occupation have implications for the intensification of use of the wetland for farming. About one-third of the respondents (32.5%) have the average monthly income between ₦20,000 – ₦40,000, 25 percent have income below ₦20,000, while only 1.7 percent have income above ₦100,000 per month. Within the context of the Nigerian economy, many of the respondents are poor. The income of the respondents largely mirrors the situation of many of those living around the wetland

Respondents were asked the importance of the wetland to them in terms of livelihoods and resources they derive from it. More than 80 percent of the respondents said the wetland is very important to them. Only 3.0 percent said the wetland is not important to them (see Table 3). The importance of the wetland according to the respondents lies in the fact that they constitute asset to the communities and they are also available to be used for crop and vegetable farming, fishing and recreation.

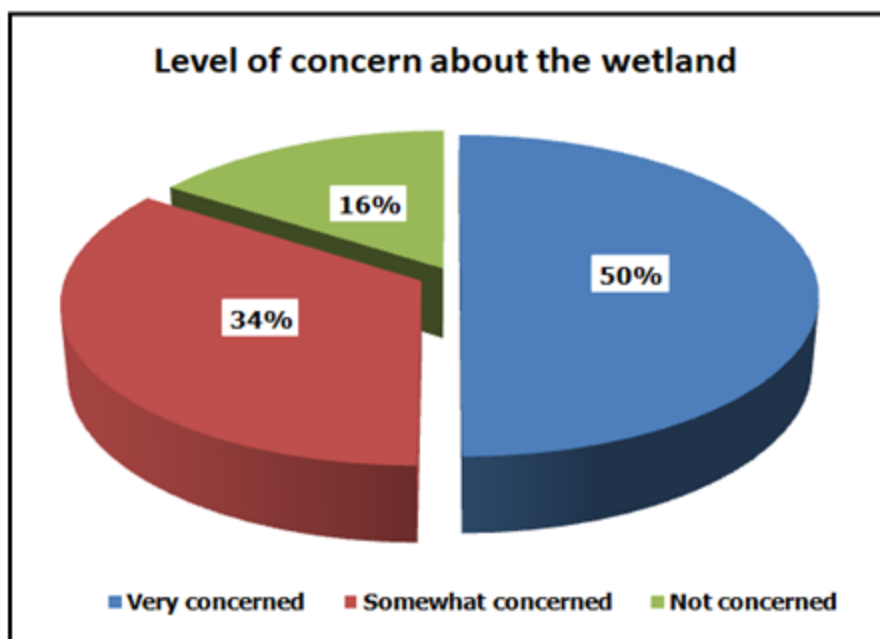


**Table 3: Level of importance attached to the wetland**

Importance	Frequency	Percentage (%)
Very important	196.32	81.80
Somewhat important	36.48	15.20
Not important	7.2	3.0
<b>Total</b>	<b>240</b>	<b>100.00</b>

Source: Field Survey, 2017

The respondents were asked about their level of concern with wetland. As shown in Figure 5, more than half of the respondents said that they were very concerned while only 15.6 percent said that they were not concerned. Major issue of concern raised by the respondents concerning wetland is gradual loss of the wetland which was ranked as number one by 55.5 percent of the respondents. Another 25.44 percent raised the issue of loss of recreational opportunities. However, about 21.46 percent of the respondents are worried about overuse of the wetland especially in converting it to farmlands rather than conserving it (see Table 4).



**Figure 5: Table 3: Level of concern about wetlands**  
Source: Field Survey, 2017

**Table 4: Issues of concern about wetlands**

Rank	Issues	Percentage
1	Loss of farmland	53.50
2	Loss of recreational opportunities	25.44
3	Overuse and need to conserve	21.46

Source: Field Survey, 2017

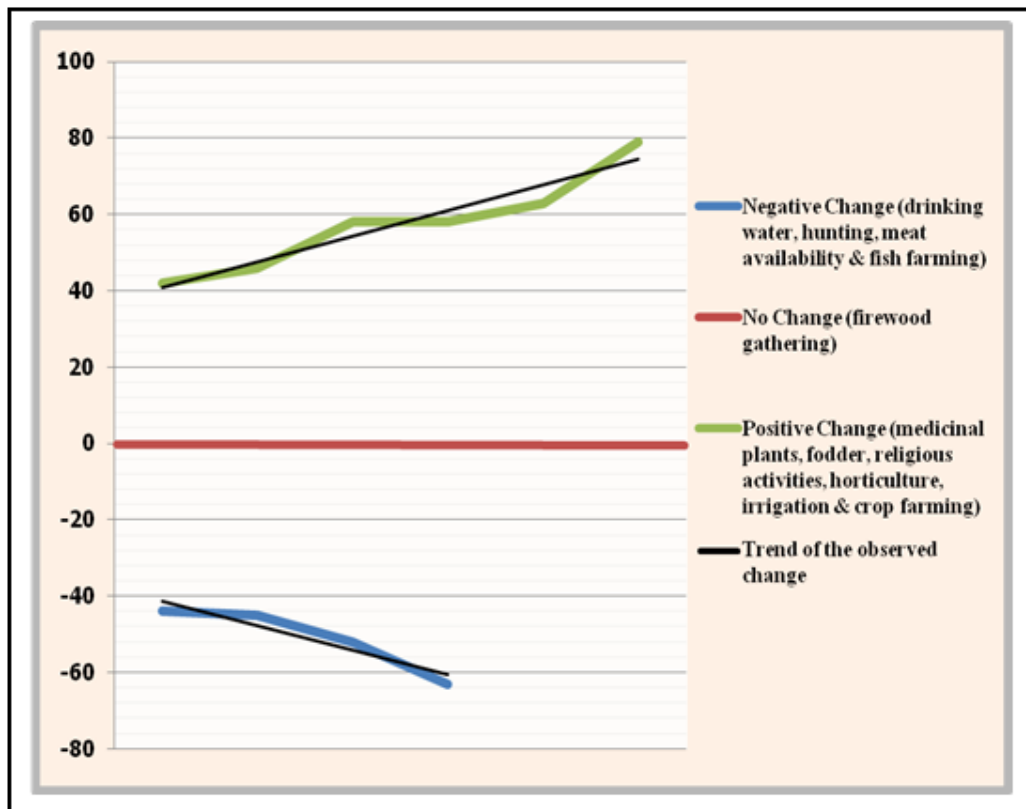
### 3.2 Ecosystem Services changes and Livelihoods around the wetland

Figure 6 shows the perceived changes in ecosystem services as obtained from the results of the analysis. Most of the respondents claimed that the ecosystem services have changed over the last ten years. These changes were perceived by the respondents to be either positive or negative. It is clearly revealed from the Figure that services such as, fodder for livestock, religious activities, horticulture, medicinal herbs irrigation farming and crop farming have positive change. The positivity of the change implies the abundance of the services or their increasing appreciation and use over the years. This result was corroborated by participants during the FGD sessions.

On the other hand, services such as water availability (for drinking), hunting, meat availability and fish farming have changed negatively. This observed negative change implies increasing scarcity or reduction in the availability of these services in the wetland.

However, firewood availability, a major source of energy for domestic cooking, was perceived to be constant.

Furthermore, during the FGD session in Obokun community where fish farming is predominant, the participants mentioned that the rate at which they catch fish either for household consumption or economic benefits have drastically reduced thereby leaving them to hunger and poverty. This implies that decline of ecosystem services have negatively impacted the livelihoods of these wetland-dependent communities. These results is similar to the findings of Bhatta et al. (2015) and Olorunfemi (2017) that declining trends in the availability or supply of ecosystem services threaten the livelihoods of local communities.



**Figure 6: Perceived changes in Ecosystem Services of the Wetland**

Source: Field Survey, 2017



**Plate 1: Farming activities around the wetland**

Source: Field Survey, 2017

### 3.3 Wetland Resource Use

As shown in Table 5, the top ranked service provided by the wetland was crop production (37.5%) followed by water availability (irrigation and drinking), fish farming, horticulture, livestock grazing, religious activities, firewood gathering, meat availability, sporting activities and medicinal herbs collection. The least ranked (0.8%) was game hunting. These services were ranked based on their use by the households and/or ability to sell them for economic benefits. Opinions expressed during the FGDs shows that the respondents were highly dependent on the services provided by the wetland, showing the high contribution of ecosystem services of the wetland to their livelihoods. This result is similar to the assertion of Paudyal et al. (2015) that farming communities are mostly dependent on ecosystem services such as water, forest products, grass, and fodder for livestock, fisheries, for their livelihoods, although the priority of ecosystem services may vary depending on different interest groups.

**Table 5: Ecosystem services, their use and ranking by communities around Eleyele wetland**  
**Wetland (Lower number indicates higher preference in the ranking column)**

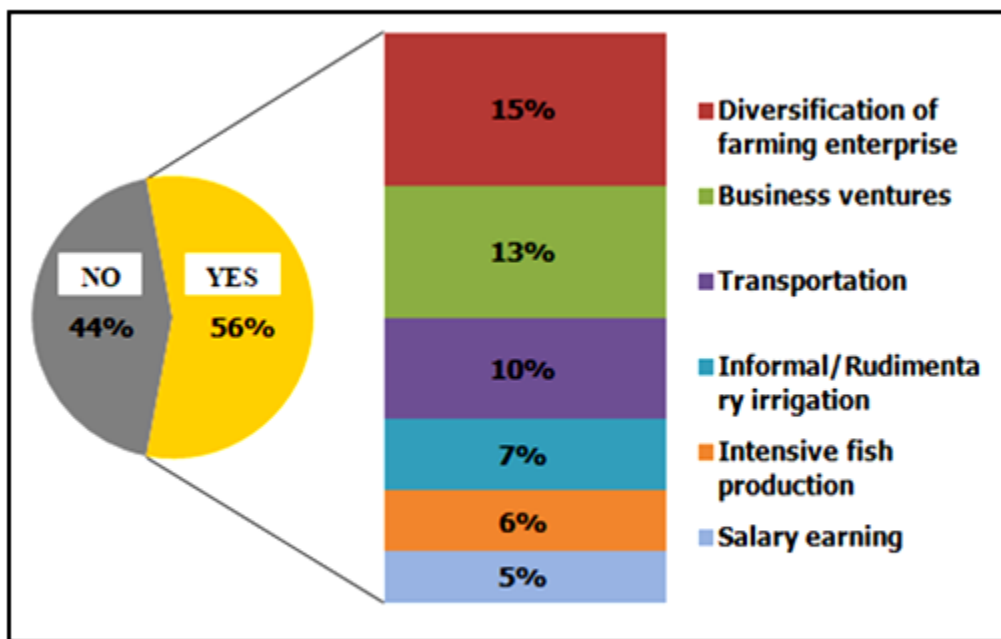
Ecosystem Services	Use	Frequency	Percentage	Ranking
Crops farming	Food, crop production and sales	90	37.5	1
Water provision	Irrigation, drinking, boost farming activities	70	29.2	2
Fish farming	Food and selling in the market	25	10.4	3
Horticulture	For beautification and selling also in the market	12	5.0	4
Fodder, leaf litter	To feed the animals	11	4.6	5
Religious activities	Available lands for various religious activity	9	3.8	6
Firewood gathering	Cooking and heating	8	3.3	7
Meat availability	Food and selling in the market	6	2.5	8
Sporting activities	For recreational and leisure	4	1.7	9
Medicinal herbs	To cure diseases	3	1.2	10
Hunting	Food and selling in the market	2	0.8	11
<b>Total</b>	-	<b>240</b>	<b>100</b>	-

Source: Field Survey, 2017

### 3.4 Respondents' Coping Mechanisms with changes in Ecosystem Services

Wetlands are considered sustainable when people have the ability to cope with and recover from stresses and shocks, which allows them to maintain or improve their capabilities in the future. A necessary condition for conserving these resources is the ability of the local communities to detect, measure, and reverse ecological changes (Lamsal et al., 2015). Figure 7 shows that 56 percent of the respondents engage in alternative livelihoods to cope with changes in the wetland while 44 percent of the household does not have any other sources of livelihoods to enable them cope. This implies that household that have no means to cope may not be able to overcome the shock brought by these changes, hence the reason for their vulnerability to food crisis and poverty.

Furthermore, during the FGDs, diversification of farming enterprise such as mixed cropping, horticultural practise, intensive fishing (where fishes are reared in plastic containers) and vegetable garden farming, were found to be the livelihood strategy adopted by some of the respondents to cope with changing conditions of the wetland. Watering of crops using water from wells during the dry season was a major strategy adopted by some of the respondents to cope with increasing shortage of water from the wetland. Also, transportation using motorcycle and other business ventures are other alternative livelihoods for the respondents.



**Figure 7: Respondents' coping capacity to observed changes in ecosystem services**  
Source: Field survey, 2017



**Plate 3: Invasion of the wetland by weeds**



**Plate 4: Abandoned fish pond due to erosion**

Source: Field survey, 2017

#### 4. Conclusion

A major challenge on wetland development in Nigeria is how to raise awareness of, and provide guidance on, the importance of wetlands as providers of benefits to urban populations as well as the potential for wetlands to operate as essential water management infrastructure and regulate the impacts of urbanization. This study examines the consequences of urban encroachment in the ecosystem provisioning of Eleyele wetland and livelihoods of the communities around the wetland.

Almost all households surveyed in the three major communities around Eleyele wetland derive various benefits from the wetland. Twelve (12) key ecosystem services were identified from which eight (8) were provisioning, one (1) regulating, one (1) supporting and two (2) were cultural services. These services were reported important as people get immediate returns either in cash or direct use for the improvement of their livelihoods and maintenance of food security. This shows the high contribution of ecosystem services



from the wetland to people's livelihoods.

Majority of the respondents attested to the fact that the wetland has changed over the years as evident in reduction in size and flow of the river, loss of some reasonable numbers of plants and animal species. Some ecosystem services were reported to either diminished or gone into extinction. A negative change was observed in water availability (drinking and irrigation purposes), hunting, meat availability and fish farming. The decreasing trend in the services was reported to have negative impact on their livelihoods. There are a number of direct and indirect drivers negatively impacting the availability of such services. Siltation and aquatic weeds invasion (water hyacinth). Of particular concern is urban encroachment on wetland resources, weak implementation of laws to protect the wetland and lack of a management plan for the area as important factors contributing to the wetland's degradation.

To reduce the existing pressure on wetland use, there is need to provide alternative livelihoods for people living around the wetland and strengthen the implementation of existing laws and policies for wetland use, management and protection in the state and in the country as a whole. This is in line with Tijani et al's recommendation of the adoption of Integrated Water Resources and Environmental Management (IWRM) in order to ensure proper ecosystem functioning of such urbanized wetland and thus safeguarding the overall quality of the wetland ecosystem.

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## Conflicts of Interest

The author hereby declares that there is no conflict of interest regarding the publication of this article.

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