

**EFFECTS OF HUMAN ACTIVITIES ON THE ENVIRONMENTAL CONDITIONS IN  
OLD OYO NATIONAL PARK (OONP) 1972 - 2015**

**BY**

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AHMADU BELLO UNIVERSITY  
ZARIA-NIGERIA**

**MAY, 2018**

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Ph.D/ENV-DES/50528/2005-06

BSc (Geog.), M.URP

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**DEPARTMENT OF URBAN AND REGIONAL PLANNING  
FACULTY OF ENVIRONMENTAL DESIGN  
AHMADU BELLO UNIVERSITY  
ZARIA-NIGERIA**

**MAY, 2018**

## **DECLARATION**

I hereby declare that this Doctoral Thesis entitled EFFECTS OF HUMAN ACTIVITIES ON THE ENVIRONMENTAL CONDITIONS IN OLD OYO NATIONAL PARK (OONP) 1972 – 2015 has been carried out by me based on field investigations in the Department of Urban and Regional Planning, Ahmadu Bello University, Zaria under the supervision of Professors T.T. Gyuse, M.B. Yunusa, A. Ahmed and Dr. M. Sani. It has not been presented elsewhere for a higher degree award, and all sources of information quoted are specifically acknowledged in the references.

**Adebayo Waheed ISMAIL**\_\_\_\_\_

## CERTIFICATION

This is to certify that this thesis “EFFECTS OF HUMAN ACTIVITIES ON THE ENVIRONMENTAL CONDITIONS IN OLD OYO NATIONAL PARK (OONP) 1972 - 2015” by ADEBAYO WAHEED ISMAIL meets the requirement for the award of the Doctor of Philosophy Degree in Urban and Regional Planning of the Ahmadu Bello University Zaria, is an original research work that has been read and approved by:

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## **DEDICATION**

To my late parents, Alhaji Bello Ismail Ayinla and Madam Sauliat Amope Ismail for their love for education and inspiration.

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## ABSTRACT

This study is aimed at establishing relationship between human activities in the park wider region and its environmental conditions. There is limited knowledge on the impact of human activities on the park environmental conditions. This study fills the gap by focusing on the details of human activities in global context. It examines the impact of human activities on the environmental conditions of the OONP. The variables measured in this study were farming, logging, hunting, settlement, charcoal business, vegetation cover and animal species. The study adopts a random technique in selecting the sample for socio-economic survey. Quadrat sampling was also used to examine the flora density, while line transect sampling technique was used to determine the quantity of fauna species in the park. Data collected was analysed with the aid of simple descriptive statistics. The principal findings of the research are; firstly, the study has shown that the extent of vegetation cover of the park has decreased in size from 2526.31km<sup>2</sup> in 1972 to 2077km<sup>2</sup> in 2015. The density of the hitherto predominant tree species in 1972 was 106 but the figure diminished to 72 in 2015. The animal species richness in the park has reduced. Animals like lion, elephant and buffalo are no longer in the park as at 2015 which is detrimental to the success of the park management. Secondly, the research result reveals that there is strong relationship between the population of people in the park host communities and the exploitation of the park resources with a correlation coefficient of 0.986. Thirdly, the research finding has proved that there is a weak relationship between the population of the people in the park host communities and vegetation cover of the park with a correlation coefficient of 0.118. The study has shown that noise pollution from traffic flow have driven animals away from their natural habitats which led to decline of animal species in the park. Confronting the negative impacts of human activities on park resources, the study recommends the need to assess and manage inherent trade-offs for sustainability of the park and healthy environmental conditions through policy formulations.

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## **ABBREVIATIONS**

CAMPFIRE –	Communal Area Management Programme for Indigenous Resources
CBC –	Community Based Conservation
CIB –	The Congolese Industrielle des Bois
DURP –	Department of Urban and Regional Planning
ETM -	Enhanced Thematic Mapping
FAO -	Food and Agriculture Organization
FGD -	Focus Group Discussion
GDP -	Gross Domestic Product
GPS –	Global Positioning System
ICD –	Integrated Conservation and Development
NPC –	National Population Commission
ONADEP –	Oyo North Agricultural Development Project
OONP –	Old Oyo National Park
RECTAS –	Regional Centre for Training in Aerospace Surveys
SPSS –	Statistical Package for Social Sciences
SZDP –	Support Zone Development Programme
TM -	Thematic Mapping
UI –	University of Ibadan
UN -	United Nation
US –	United States
WTO –	World Tourism Organization

# CHAPTER ONE

## INTRODUCTION

### 1.1 BACKGROUND TO THE STUDY

A national park is a piece of land or water set aside for recreation, protection, propagation and preservation of wild animals and vegetation, or for the preservation of objects of aesthetic, geologic, prehistoric, archaeological or other scientific interests for the benefit and enjoyment of mankind (Ayodele, 1988). National parks have become the most widely used category of protected areas in sub-Saharan Africa (Ite, 2003). The original idea for the creation of national parks as part of conservation movement centres on the need to protect natural habitats, and encourage tourism and related activities.

Over the years, in Africa, there has been a growing interest in the development of national parks as means of protecting the continent's wildlife heritage for tourism, socio-economic, political, regional and environmental development (Muhumuza and Balkwill, 2013). Besides, national parks are useful in stabilizing the climate, and for the supply of products usable for food, medicines and fuel. The development of national parks has, in recent times, become a major source of revenue for countries like Barbados, the Bahamas, USA, Indonesia, Australia, Tanzania, Kenya, Zimbabwe, South Africa, Uganda and other countries around the world (WTO, 1999). During the late 1960s and the early 1970s, for instance, tourism was the third largest foreign exchange earner in Uganda after traditional cash crops like cotton and coffee (Ahebwa, 2012). In Kenya, one of the leading African countries that benefit from the national park development receives approximate revenue of KSh228,850,000:00 from hunting, game photography and motorized game viewing in

Amboseli and Nairobi National Parks in collaboration with the Kajiado County Council (Nelson, 2004). The ability of a park to achieve its aim is dependent, among others, upon ongoing factors, including threats of the rapid population growth in its immediate region and increasing demand for forest, animal and other natural resources.

Human activities in park regions affect the environmental conditions of parks in different ways. The functionality and economic value or status of the park as a natural habitat and as a foreign exchange earner can be affected either negatively or positively by a number of human activities including human settlement, agricultural development, and other forms of land uses within and around the park. Human activities which have the ability to affect the park include farming, settlement expansion, road construction, logging, and animal husbandry. Increased pressure on farmers to produce more crops for the growing human population has led to increased pressure on land and forest resource. The efficiency in the use of land and the increasing demand for it can create a demand and supply chain which, in turn, can exert pressure on the park environment, leading to environmental degradation in terms of soil erosion, river and stream siltation and reduced wildlife species, as well as general deforestation.

From the foregoing, it can be said that human activities have the capacity to effect change on park environmental conditions. The human activities, as observed by Kwadha (2009) and Xu *et al.* (2014), are marked by the expansion of human population, increase in socio-economic activities, and demand for forest resources and spatial settlements' growth proportional to the increase in population. The increase in population and settlements' growth are major parts of these hidden mechanisms. The need to understand the relationship between the park and its surrounding population is the focus of this

study. Against this backdrop, this research examined the effects of human activities on park environmental conditions using Old Oyo National Park (OONP) of Nigeria

## **1.2 STATEMENT OF THE RESEARCH PROBLEM**

The establishment of the OONP in Nigeria, was guided primarily by ecological study of the park resources. The study shown that there were wildlife species which could be sufficiently justified the establishment of the park. However, since the creation of the OONP, the population and human activity system around it have changed. Consequently, wildlife resources had greatly diminished. Human activities are responsible for exploitation of park resources. The activities responsible for the decline of park resources are hunting, farming, logging and settlement development.

Past studies have shown that these activities are limited to the park's immediate host community and also confirmed that diminishing of park resources are linked to human activities around the park host community. However, human activities impacting on park resources are beyond the host community of the park and the relationships within human activities which is impacting on park resources are also important. The knowledge of how these relationships work is lacking, and studies are needed as part of the learning process to guarantee that parks resources are sustainable. This is the focus of the present study.

The earlier studies carried out on park have been useful, but their spatial scope have been limited to within immediate host community of the park, understanding of supply-chain of park resources has been low and speculative. This implied that there are common shortcomings in previous studies regarding spatial scope and the relationships within human activities impacting on the park. Therefore, the coverage of factors as they influenced park development in the previous studies is inadequate. These constitute the gap



in knowledge which needs to be filled through studies that look at supply-chain of park resources exploitation. Also, this will give better understanding of factors responsible for diminishing of park resources, and establish causal relationships within the activity impacting the park is also important. To this end, the central question of this study is: In what ways have human activities affected the environmental conditions of the OONP?

### **1.3 RESEARCH QUESTIONS**

1. What are the types and patterns of human activities in OONP region between 1972 and 2015?
2. In what ways has OONP changed overtime between 1972 and 2015?
3. What is the structure and implication of the supply-chain of forest products exploitation in the OONP?
4. What are the overall effects of human activities on the OONP?

### **1.4 AIM AND OBJECTIVES**

#### **1.4.1 Aim**

The aim of the study is to examine the ways human activities have affected the environmental conditions of the OONP, with a view to formulating policies that would guide the management of the park and such others in developing countries.

#### **1.4.2 Objectives**

The objectives are to:

1. identify the types and patterns of human activities in the OONP region between 1972 – 2015;

2. establish the environmental conditions within the OONP between 1972 and 2015;
3. establish the effects of supply-chain of human activities within the region on the environmental conditions of the OONP;
4. identify the implications of the changes in environmental conditions in the OONP; and
5. make planning and policy recommendations for improvement of the park environmental conditions in view of the implications.

### **1.5 SIGNIFICANCE OF THE STUDY**

The significance of this study is in resolving the challenges facing the OONP as a result of the effects of human activities around the park which have limited its capacity to grow and function effectively as a natural spot of attraction and a national income-earner. The attempt to address the environmental problems of the park is an important contribution made by the study. This include providing the explanations required to understand the dynamics of change within and adjoining the park and suggesting ways of managing human activities within the park region. In particular, tourism planning and development will benefit from this study.

### **1.6 SCOPE OF THE STUDY**

The main focus of this study was to examine the human activities in the OONP area as they affect the environmental conditions of the park. The OONP, in this study, is an area of land between latitudes  $8^{\circ}.10'N$  and  $09^{\circ}.05'N$  of the equator and longitudes  $3^{\circ}.0'E$  and  $4^{\circ}.20'E$  of the Greenwich Meridian. The area is bounded on the north and east by Kwara

State and on the west by Republic of Benin. The park area covers more than two-thirds of the eleven local government areas in the Oke-Ogun region, Oyo State, south-western portion of Nigeria. The study period was limited to 43 years starting from 1972, before the area was declared as a national park, to 2015.

The human activities considered in this study included: farming, logging, hunting, settlement and charcoal business. The environmental parameters consisted of vegetation cover and animal species. The relationships between patterns of change in population and settlements sizes in the area and exploitation of resources in the OONP were analyzed.

### **1.7 LIMITATION OF THE STUDY**

The study was designed to cover the entire settlements in the OONP area and identify all the human activities in the area. However, during the survey, it became obvious that it was not possible to determine the effects of a wide range of human activities on the environmental conditions in the park because of the high cost of the exercise and limited time available for the study. The inference was, therefore, made from previous studies to establish the environmental status of the park area in 1972 and remote-sensing techniques were used to track changes in forest cover in the park from 1972 to 2015. The management of the park service located at Isoku, Oyo-Iseyin Road, Oyo did not cooperate but interview were granted by one of the staff of the park service and required information was provided through anonymous individual staff.

## **1.8 CONCEPTUAL FRAMEWORK**

### **1.8.1 The concept of supply chain**

Supply chain is the network of the organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services delivered to the ultimate consumer (Christopher, 1992). According to the Council of Supply Chain Management Professionals (2010), the supply chain is the material and information interchanges in a logistic process, stretching from acquisition of raw materials to delivery of finished products to the end-users. All producers, wholesalers, retailers, vendors, service providers, and customers are links in the supply chain.

With globalization of demand and supply of goods and services, the gap between producers and consumers has been relatively bridged. In a bid to gain competitive advantage, firms must make effort to move products and services across the supply chain. The materialization and attractiveness of the Internet has helped in providing opportunity to the producers and consumers to make transaction with each other. This has been assisting producers around the world to control their supply networks and delivery products to their target customers. E-commerce generally offers customers more convenience and at cheaper prices than the normal retailing opportunity to transact business. At the same time, companies are able to reach more customers, as well as produce, and sell their products at lower costs.

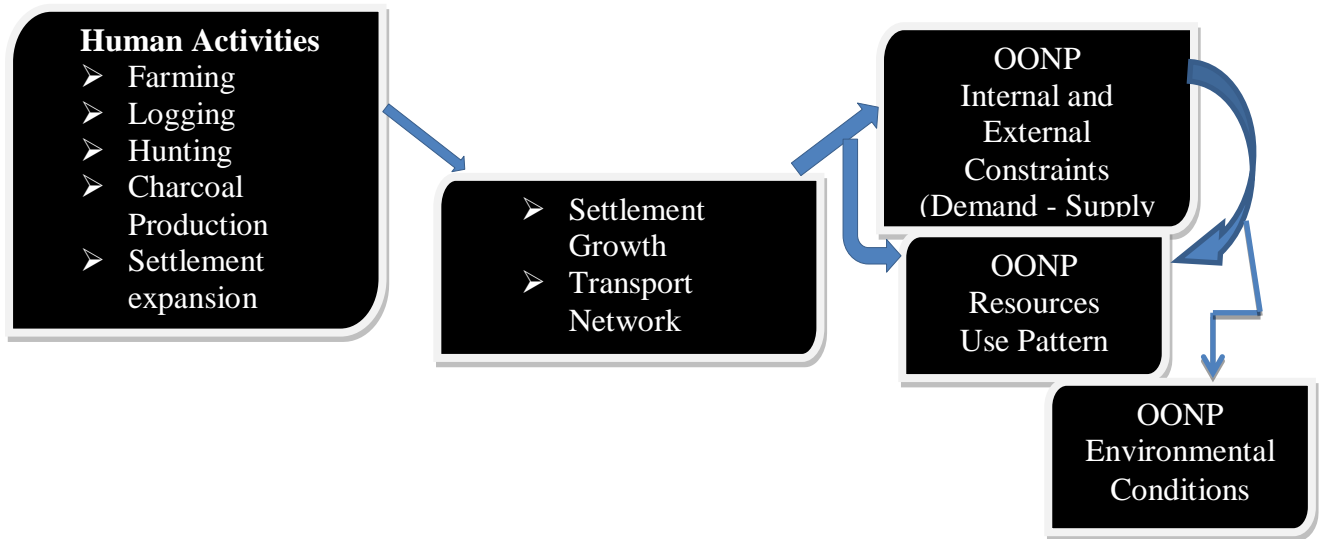
Globalization has enabled producers in the hinterland to supply more products across the globe. This encouraged the producers to increase their outputs because they are very sure that their products would flow to the final consumers. The benefit of the supply

chain concept to this study lies in its ability to explain the circumstance that encouraged an increase in the proportion of certain human activities in a remote place.

For example, people that are engaged in charcoal business are influenced by the geography of globalization which provides an avenue for marketing their products in Europe, Asia and other parts of the world. The local charcoal producers benefit from strong and stable supply chain of geographically diverse markets abroad. To gain maximum benefit from the supply chain, a company must dynamically draw upon its available internal capabilities and the external resources of its supply chain network to fulfil customer requirements. This network of organizations, their facilities, and transportation linkages facilitate the procurement of materials, transformation of materials into desired products, and distribution of the products to customers.

The human activity system in the OONP region is influenced by the supply chain, which involves a linkage between the source and the final destination of goods and services produced in the region. Items sourced from the region include food, fibre, and timber. Supply chain would assist in describing the patterns of human activities in the OONP. Traders on articles depend mainly on the patronage of buyers from major towns and cities, like Oyo, Ogbomoso, Ibadan, Lagos, and Abeokuta. The supply chain of these goods starts from the activities of hunters, farmers, loggers and the charcoal producers, and their products terminated at the point where they are finally consumed. Their activities have a significant effect on the OONP environmental conditions. They influence not only how they produce their goods, but also how they move the goods and what kind of resources they take from the park land.

Supply chain was therefore adopted in this study to establish a link between the park environmental conditions and the activities of people in the park area. Limited or no endeavour has been made in previous research (Arungbemi, 1984; Ayodele, 1988; Marguba, 2000; Alarape, 2003; Ismail, 2004; and Tijani, 2007) to explore the opportunity of using this concept for understanding the effects of human activities on environmental conditions. Further analysis of human activities and observation of environmental conditions in the park area may help to gain more insight into the factors responsible for the change in the park environmental conditions and also useful in establishing a link between human activities and the park environmental conditions.



**Fig.1.1: Conceptual Framework**

The framework of this research was formed based on the thesis that human activities at the wider park area affect the environmental conditions of the park. This framework was used to examine the human activities in the park area and describe the links of these activities to various sectors and the effects on the park. It considered the human activities as independent factors that are responsible for the park environmental

conditions. The OONP and the ongoing human activities in its area are considered as a system. This is a relationship or link between the elements that make up an entity. This research model, as depicted in Fig.1.1 above, is consistent with system theory because it breaks down the whole process of the relationship between human activities and the park environmental conditions. The human activities considered in this study were, crop production, animal grazing, hunting, logging, bush burning, charcoal business, firewood collection. The human activity-related processes included, settlement and non-official route. The attributes of the park environmental conditions considered were, vegetation cover and wildlife resources. Each of the human activities was analyzed to determine its effects on the park environmental conditions.

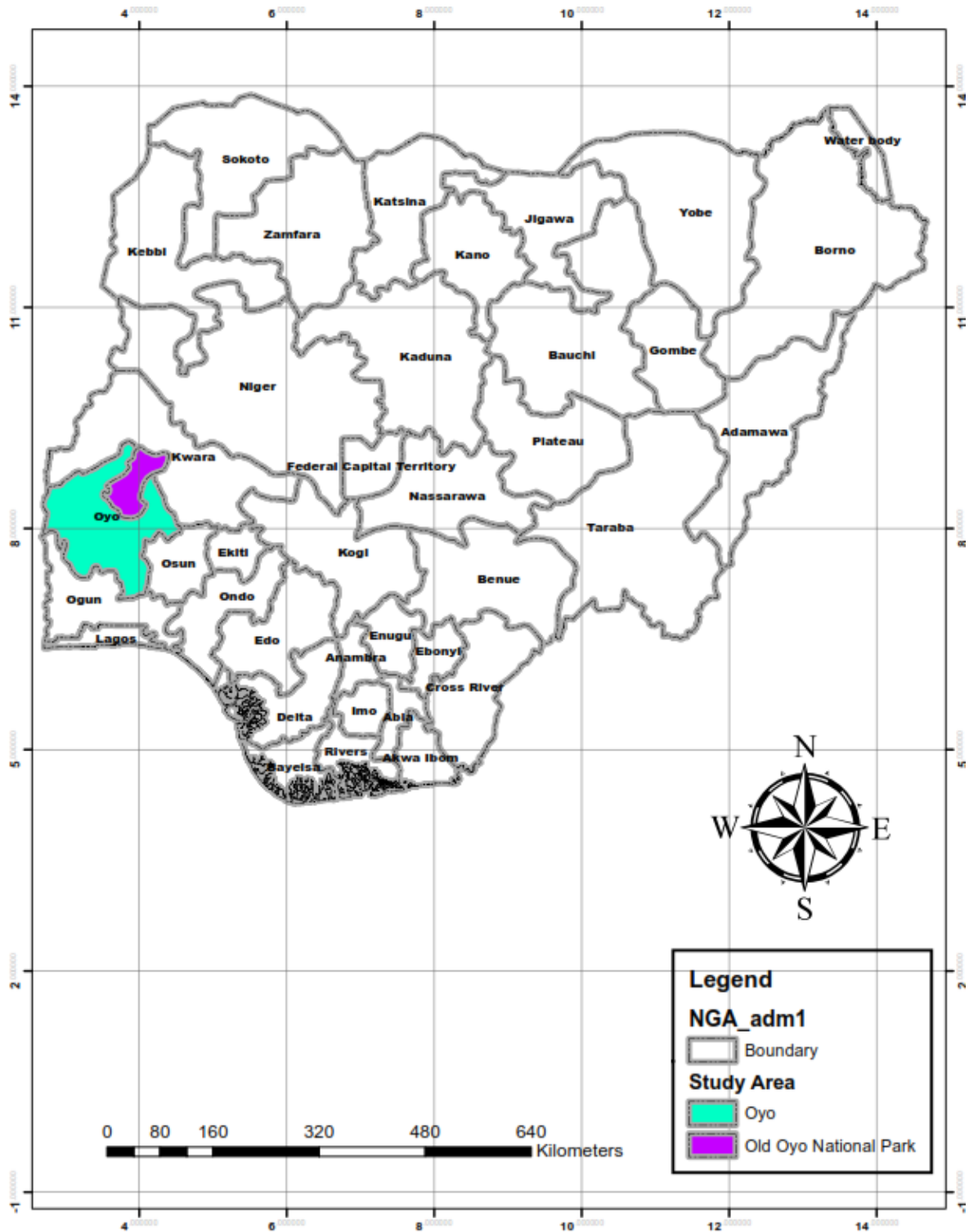
Park environmental condition is an end-product of human activities that promote interconnectedness of the park area to its wider society. In order to have a better knowledge of the determinants of environmental conditions of the park, we need to appreciate the role played by the accomplices. The starting point of the park resources supply chain is the raw material vendor that supplies raw materials to the producer who converts the material into products, followed by the warehouse or wholesaler that stores and distributes the products to the market retailers, who convey the product to the ultimate user. The product can be directly or indirectly consumed by the local or external consumers. Park resources supply chains are concerned with value chains because the producer will not be able to give the consumers what they want without them. For example, in charcoal supply chain, the forest constitute the major raw material from where the loggers harvest trees and supply them to the charcoal users; charcoal wholesalers buy charcoal from charcoal producers and resell the charcoal to the retailers, and the end-users.

Sub-Saharan African tropical forest has been rated very high in supply of hard wood. Many people in OONP region engage in production of charcoal. There is a large market for charcoal from African countries in Europe, USA, and Asia. The bulk of the timbers for the domestic and export market comes from the park area.

## **1.9 THE STUDY AREA**

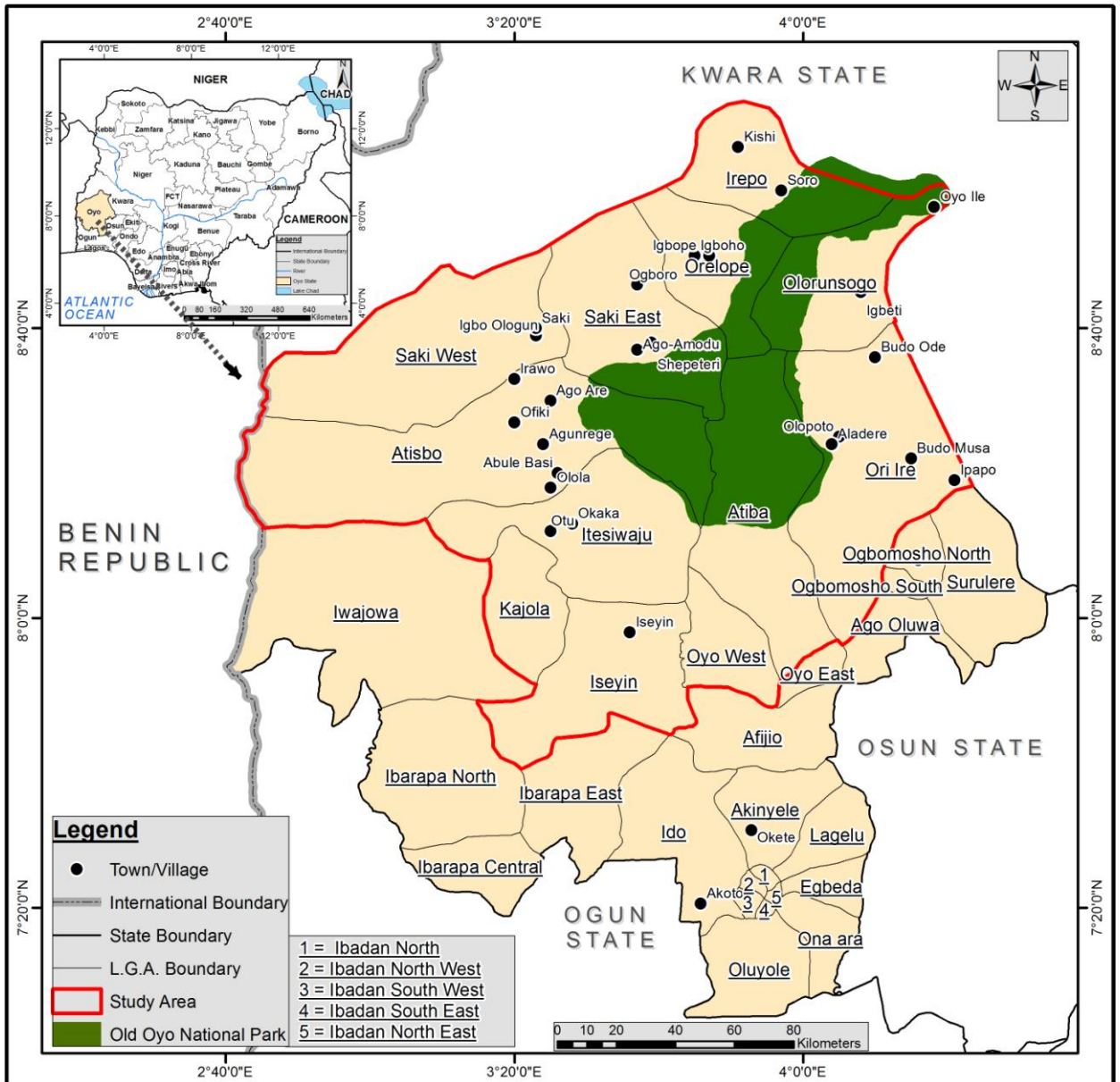
Old Oyo National Park (OONP) is one of the eight national parks in Nigeria created by Decree 36 of 1991, which was later repealed and replaced with Act 46 of 1999. The park was created out of the two contiguous forest reserves, namely Upper Ogun River Forest Reserve and Oyo-Ile (Old Oyo) gazetted in 1936 and 1941, respectively. They were changed to Game Reserves in 1952, and later joined together to become Old Oyo National Park in 1991 (OONP, 2003). The park is territorially lies within Oyo State and Kwara States in the south-west of Nigeria (see Figure 1.2).





Source: Modified from the Administrative Map of Nigeria, 2015  
**Fig. 1.2: Map of Nigeria: Oyo State**

The main objectives of establishing the Old Oyo National Park included the preservation of the cultural, historical and archaeological features in the abandoned sites of the then capital city of the ancient Oyo Empire, and the need to protect the watersheds of Ogun and Tessi Rivers. Other reasons include protection, preservation, conservation and management of the indigenous flora and fauna of the south-west geographical region of Nigeria; encouraging and promoting sustainable abundance and growth of biological materials for zoological and botanical specimens to support scientific research and education; encouraging general interest and education among the public in the knowledge of wild fauna and flora; and encouraging the public to visit the park in order to enjoy and appreciate the aesthetic, spiritual and ecological values of nature in the maintenance of a healthy environment (Act 46 of 1999). Figure 1.3 is the modified administrative map of Oyo State showing the study area.



Source: Modified from the Administrative Map of Oyo State, 2015

Fig. 1.3: Map of the Study Area

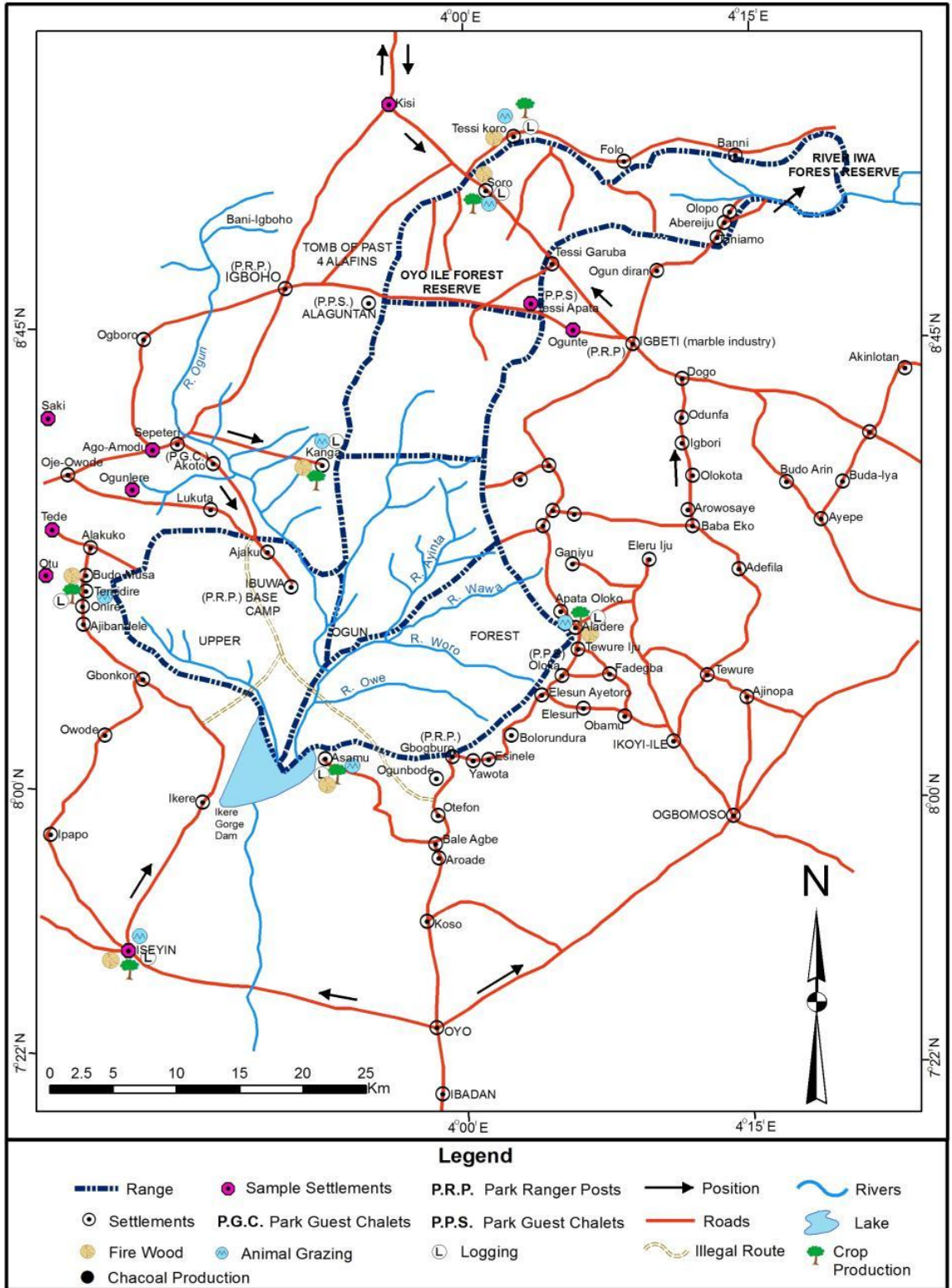
The park lies between latitudes  $8^{\circ}.10'N$  and  $9^{\circ}.05'N$ , and longitudes  $3^{\circ}E$  and  $4^{\circ}.20'E$  (OONP, 2003). It covers an area of approximately  $2,512 \text{ km}^2$  (that is 251,200ha) making it the fourth largest park in Nigeria after Gashaka-Gumti, Kainji Lake, and Cross River (see Table 1)

**Table 1: Ranked Land Area of National Parks in Nigeria**

S/N	National Park	Land Area in Sq. km
1	Gashaka-Gumti	6,731
2	Kainji lake	5,341
3	Cross River	4,000
4	Old Oyo	2,512
5	Chad-Basin	2,258
6	Yankari	2244
7	Kamuku	1121
8	Okomu	173

*Source: OONP, 2003*

Old Oyo and Upper Ogun River Forest Reserves were formerly under the administration of the OyoState Government until 1988 when the reserves were taken over by the Federal Government through the Federal Department of Forestry and finally declared and gazetted as a national park by the promulgation of Decree No 36 of 1991. Figure 1.4 shows the map of Old Oyo National Park and its adjoined settlements.



After: Google Earth (2015) & Field Survey, 2015  
**Fig. 1.4: Old Oyo National Park and Adjoining Settlements**

The park falls in the sub-humid savannah belt of Nigeria. Some parts of the land to the extreme south-eastern and southern parts fall within the derived savannah-zone characterized by mosaic forest. According to Udo (1982) the vegetation of the study area consists of a mixture of tree and grass, but there are numerous variety of trees. The more important trees in this zone include the fan palm, shea butter tree, mahogany and African locus beans. There are traces of natural vegetation consisting of greater stands of trees, and well established woodlands of trees of up to 15m high up till the early 1970s. The average weather temperature of the region is 31<sup>0</sup>C/88<sup>0</sup>F. The greater part of the park lies within Guinea Savannah. The OONP is highly blessed with natural resources. The environmental features include the range of inselbergs running from Igbeti, in the south through Ago-Amodu to Aiama Hills. The artifactual resources are generous resources, such as monuments and tools of different kinds (Udo, 1982).

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 CONCEPT AND PURPOSE OF NATIONAL PARKS

A national park is a piece of land or water set aside for the recreation of the people. Knobel (1962) defines a national park as an area set aside for the protection, propagation and preservation of wild animal, plant life, and the preservation of objects of aesthetic, geologic, prehistoric, and archaeological or other scientific or leisure interest for the benefit and enjoyment of mankind. National parks are spiritual places – sacred, and inspirational. They are places with great restorative powers of enormous benefit in a ‘stressful’ modern world (Ayodele, 1988). From the beginning to the present, national parks have been theatre of education – classrooms for science and the humanities. In the parks, millions of Americans, for example, have expanded their knowledge of natural history through experiences that have served to foster better citizenship. Appreciation of the scenic beauty of the national parks has nurtured a greater understanding of the ecological complexity and biodiversity of the world (Sylvia *et al.*, 2004).

The first national park in Africa was Albert National Park, established in the former Belgian Congo in 1925. It embodied the concept of preserving natural Africa from man-made change primarily for scientist interest. The park was established by Belgian Royal Decree, which commenced with the words “The park is created with a scientific objective” (*Le Parc est cree dans un but scientifique*), but this original aim has long been lost. The second national park was Kruger National Park, created by South Africans in 1926, Park Kruger has been a game reserve since 1898 (Marguba, 2000).

The major reasons for establishing the park include the protection, preservation, conservation and management of the indigenous flora and fauna of the region where the park is located; encouraging and promoting sustainable growth of biological materials for zoological and botanical specimens to support scientific research and education; and encouraging general interest and education among the public in the knowledge of wild fauna and flora. Others are encouraging tourism and recreation-related activities by motivating the people to visit the park in order to enjoy and appreciate the aesthetic, spiritual and ecological values of nature in the maintenance of a healthy environment, preservation of the cultural, historical and archaeological features that may be found in the park region, and the need to protect the watersheds of the streams and rivers in the region of the national park (Arungbemi, 1984; Ayodele, 1988; Alarape, 2003; and Ismail, 2004 and 2007).

A national park is important for the development of successful biodiversity conservation. It protects the environment and the indigenous genetic resources that serve as the basis of any meaningful discovery in agricultural researches. Parks enhance ecological processes and life support systems like vegetation and soil regeneration, protection of biological nutrient cycles. National parks also help countries to achieve its socio-economic growth by provide opportunity for development of ecotourism (Ayodele, 1988; Alarape, 2003; Ismail, 2007; Tijani, 2007; and Machira *et al.*, 2014).

Studies by Charlie and Grazia (1994) and Rutten (2002) have shown that national parks account for the progress recorded in wildlife conservation and tourism development activities. For the success cases, income derived from tourism activities in the national parks has been used to finance communal infrastructure, like schools and dispensaries;



grants to individuals for healthcare; and payment of tuition fees and other benefits. The studies by Emerton (1997), Emerton and Tessema (2001), World Bank/MIGA (2002), and World Bank (2003) revealed that the development of National Park has provided a strong basis for the sustainable growth of the tourism industry in Kenya, South Africa, Namibia and Tanzania. As an outstanding example, during the 1990s, national tourism earnings in Tanzania grew by over 10 per cent annually. In 2001, tourism accounted for 12 per cent of the country GDP and 51.7 per cent of export earnings (World Bank/MIGA, 2002; World Bank, 2003). Unlike other national parks in Tanzania, Kenya, South Africa, and Namibia, the OONP is one of the greatest failures of all the national parks (Oladeji *et al.*, 2012; Mohammed *et al.*, 2013). Establishing the rationale behind the outcome of this park development requires deep knowledge of the other hidden independent variables such as change in both population and physical sizes of settlements and their corresponding human activity processes that are associated with the performance of the OONP in realizing its aim.

Principally, park management must be based on knowledge and available information. To reduce pressure on parks environmental conditions, detailed explanations of the links between human activities and the park environmental conditions are required. This is essential in consideration of the complex nature of the relationships between human activities and the environmental conditions in the park area. The details of human activities, like change in population and settlement size, crop production, hunting, charcoal production, logging, transportation as they affect the park environmental conditions are little known, and inadequately mapped.

There are weaknesses in previous studies (Arungbemi, 1984; Marguba, 2000; Alarape, 2003; Bauer, 2003; Chhetri, *et. al.*, 2003; Ismail, 2004; and Tijani, 2007) regarding human activities and the coverage of factors as they influence the environmental conditions of the parks which need to be corrected. The studies are based on the analysis of human activities, using the park-host communities relationship analysis method. The analyses are carried out based on a micro scale of human activities limited to the park area and its immediate host communities. The data used for the analysis are sourced from the parks and their immediate host communities rather than considering the effects of human activities on the park environmental conditions at a wider global scale. Therefore, the coverage of factors as they influenced the park environmental conditions in the analysis of previous studies is inadequate.

The gap in knowledge about what could have been the effects of human activities at a wider global level on the park environmental conditions needs to be filled through a study that notices the weaknesses in the scope or coverage in the data collected for the park environmental conditions analyses. This study filled this gap by focusing on supply chain of human activities in OONP and its effects on the environmental conditions of the park. Therefore, this study provided answer to the question: how human activities influence the environmental conditions in the parks? The study described the dynamic nature of human activities in the OONP area and analysed how these activities affect the environmental conditions in the park area.

Emphasis on the wider regional area is very crucial given the magnitude of the dependency of people in the park area on the park resources and the human activities taking place in the area. However, human activities are bound to impact on the OONP

environmental conditions because the park is the only pool of flora and fauna resources in the area that is surrounded by continuous and rapidly expanding settlements. These settlements strongly depend on the park area as a regional resource pool that has considerable potential for exploitation for development of the region. The argument in this study is that the park has suffered environmental decline since its inception as a protected forest and game reserve in 1952. This decline has been primarily as a result of anthropogenic activities. The focus of studies thus far has been on immediate communities that border the park. A close observation would indicate that what is happening in the park is only the beginning of a supply chain that could be global in scope.

This study tried to bridge the gap of understanding this network by examining the human activities in the park area and their link to the outside world as a means of obtaining greater understanding of the processes that determine the environmental conditions of the park and, therefore, fashioning more effective responses to the conservation of the resources.

## **2.2 DEVELOPMENT OF NATIONAL PARKS IN NIGERIA**

In Nigeria, protection of the natural ecosystem can be traced back to the 19th century in the Colony and Protectorate of Lagos. The foundation for the establishment of a national park was laid through Nigerian Ordinance of 1916, which stipulates that National Park is expected to play the role of conservation, thereby protecting the lives of animals and plants as living museums. To achieve the policy aim, the Forestry Department was charged with the responsibility of protecting the existing forests and drawing up plans for the reforestation of denuded areas. Nigeria's first Game Reserve, Yankari was established in Bauchi Province (now Bauchi State) in 1956, followed by the Borgu Reserve (now the

Borgu sector of Kainji Lake National Park) in 1959 in the Ilorin province (now Niger State). The first national park in Nigeria was established in 1975. This was done through re-designation of the Borgu Game Reserve in Kwara State, as the Kainji Lake National Park, and the transfer of responsibility for the land from the State Government to the Federal Government. The establishment of the second national park, that is, Old Oyo National Park, has also involved the re-designation of the Upper-Ogun Game Reserve and Old Oyo Game Reserve (both in Oyo State). Of all the country's national parks, Yankari, Kainji and Cross Rivers are the most developed and successful, generating a reasonable amount of income (between 1999 and 2005, ₦96,517,235.94, ₦21,578,565.97, ₦9,871,815.52, respectively) compared to Old Oyo National Park that generated a total revenue of ₦3,241,473.0 (Marguba, 2000).

### **2.3 HUMAN ACTIVITY IMPACTS ON NATIONAL PARKS**

A great level of forest destruction has been taking place in Africa. It is reported by United Nation Environmental Programme (2009) that, between 1990 and 2000, the continent lost about 52 million hectares of forest, that is, 56 per cent of the world total forest loss. The estimate revealed that rainforest cover is shrinking by about 0.8 per cent per year. The common strategy adopted worldwide to ameliorate the decline in tropical forest led to the establishment of national parks. It is also estimated that 60 per cent of the tropical forest areas cleared in Africa as a whole between these periods were converted to permanent agricultural small land holdings. An effective and efficient assessing and monitoring of the anthropogenic activities on park environmental conditions is sine-qua-non to achieving a positive park development. Having a good understanding of the factors responsible for the making of park environmental conditions assists in throwing more light

on the ever-increasing challenges facing national park development, and helping in devising means of ameliorating those challenges (Lauren *et al.*, 2008)

The most popular anthropogenic effect on environment is the rising level of concentrations of greenhouse gases in the atmosphere. Increasing concentrations of aerosols negatively affect the ozone layer, thereby modifying the vegetation cover of the park area. Greenhouse gases warm Earth's surface by increasing the net downward long-wave radiation reaching the surface. This resulted in general global warming (Sahney,*et. al.*, 2010).

The advancement and application of technology in national development often have environmental impacts. The application of technology in national park management and development is unavoidable for many reasons. First, the purpose of several technologies is to assist the park resources in order to exploit, control, or “improve” upon nature for the potential benefit of humanity. However, any disturbance of these natural processes by technology is likely to result in negative consequences (Commoner, 1971). Second, the alteration of the ecosystem in the park area always affects the park ecological stability in line with the conservation of mass principle and the first law of thermodynamics (conservation of energy) that determines whenever material resources are moved around or manipulated by technology. Third, according to the second law of thermodynamics, order can be increased within a system (such as the human economy) only by increasing disorder or entropy outside the system (the environment). Technology aids increase in park resource exploitation. Thus, technologies can create “order” in the human economy (order as manifested in buildings, factories, transportation networks, communication systems) only at the expense of increasing “disorder” in the park environment. According to a number of

studies, increased entropy is likely to be correlated to negative environmental impacts (Faberet *al.*, 2012). Human Impact on the environment equals the product of population, affluence, and technology. This shows how population, affluence and technology produce an impact (Commoner, 1971)

The environmental impact of agriculture varies based on the wide variety of agricultural practices employed around the world. Ultimately, the environmental impact depends on the production practices of the system used by farmers. The connection between emissions into the environment and the farming system is indirect, as it also depends on other climate variables such as rainfall and temperature. Encroachment of the park area by the farmers diminish the quantity of land area available for conservation of park resources.

The environmental impact of agriculture in the park land involves a variety of factors, from the soil, to water, the air, animal and soil diversity, people, plants, and the food itself. Some of the environmental issues that are related to agriculture are climate change, deforestation, genetic engineering, irrigation problems, pollutants, soil degradation, and waste. All these issues individually and collectively determine the outcome of the national park management programme.

The environmental effect of transport on the national park is significant because it is a major user of energy, and burns most of the world's fossil fuel. This creates air pollution, including nitrous oxides and particulates, and is a significant contributor to global warming through emission of carbon dioxide(Fuglestvedet *al.*, 2008)

There are many studies on human-wildlife conflicts in and around the national parks in East African countries, especially Kenya. These studies used socio-economic survey to understand the attitude and expectations of local communities toward reforestation projects and conservation. Akiko (2007) studied park buffer zone reforestation initiative in Batang Gadis National Park using GIS analysis techniques to examine ecological impacts and to select priority sites. Through the studies, threats to wildlife conservation in many of the national parks have been identified. Among these studies is a study on industrial land use activities impacts on Lake Nakuru National Park. In this study, industrial pollution was found to be a great threat, especially to birds and fish, in the national park (Mhlanga and Mares, 1976). In another study on the same Lake Nakuru National Park, urbanization was identified as a major threat to the park. These studies did not attempt to draw any relationship between human settlements and population changes and the effects on the national park development. The major limitation of these studies was their coverage areas, which were limited to the park area and its immediate host communities. They did not consider the national park as a regional land use. None of them attempted to look at the park land as a pool of natural resources located at the centre of a group of dynamic human settlements. They did not consider the likely effects of human activities-related factors, such as population increase, and settlement expansion on the consumption of park resources and park development. Apart from these other issues relating to urban land uses, their corresponding threats to national parks were not considered.

Morie (2007) studied the causes of land use and land cover changes and also quantified the degree of changes in terms of biodiversity loss, as well as wildlife habitat

destruction and analysed the implications of land scarcity and rapid population growth in Nairobi National Park using remote sensing. He attributed the changes in land use and land cover to high demand for land due to rapid population increase that has forced rural families to expand their demand for more natural forests land even in the national park area for intensive cultivation. He also established a relationship between loss of vegetation cover and biodiversity loss.

Kwadha (2009), used a combination of survey and trend analysis in studying the impacts of urbanization on the sustainable conservation of Nairobi National Park, Kenya. It was revealed that there was a relationship between human population growth and the declining migratory wildlife population inside the National Park. The animal most affected was the immigrant ones. This relationship was ascribed to the land use activities of immigrants in Isinya. This claim was supported by the majority of the respondents (70%) from Isinya. Through their perception and reported cases of wild animal they spotted around them, they agreed with the fact that wild animals have greatly reduced. The reduction of the park resources was attributed to high level of immigration of agricultural households into the Isinya area. From this submission, it is evident that new settlements have contributed to the depletion of park resource. These findings are similar to those of earlier studies by Omondi (1984), Oimbo (2002), and Otuoma (2004), which reported that park resources pasturing livestock were diminishing owing to competition over land.

Another study that used multi-special satellite remote sensing, in-depth fieldwork surveys, land-use and land tenure policy analysis linked with habitat change and human, livestock and wildlife population data analysis to investigate the Maasai Mara National Park resources depletion. It found significant spatial expansion in agriculture land close to



Maasai Mara national Park. It also reported that the area under agriculture increased from 1 per cent to 12 per cent, while the forested area decreased from 11 per cent to 9 per cent. Significant expansion of farmland, extending to over 100,000ha was observed to have taken place in areas previously under grasslands that were used by wildlife as dispersal areas and also as breeding and calving grounds during the wet season. There was significant expansion of agricultural farms and deforestation to create room for mechanized farming and tourism businesses. This has been posing threats to Maasai Mara National Park development.

Amboseli National Park and its dispersal areas have been the focus of a number of long-term ecological, behavioural, and social science studies (Campbell 1984, Campbell, 1999, Campbell *et al.*, 2003). While these studies recognized human species as an essential component of the ecosystem, there have been few attempts to directly link the extensive land-use within the swamps to the distribution and abundance of large mammals. Those studies established a baseline for further longitudinal study of land-use change and its impacts on the Amboseli National Park ecosystem, but were primarily concerned with quantifying and characterizing the nature of land use and its spatial interaction with both livestock and wildlife on the landscape at high resolution.

From the foregoing, it is clear that a comprehensive survey of the impact of population and settlement changes on the national park resource has never been carried out in the West Africa region, most especially in Nigeria. Most of the studies (see Ayodele, 1988; Okafor, 2000; Marguba 2002; Alarape, 2003; Tijani, 2007; Chakravarty *et al.*, 2012; Mohammed, *et al.*, 2013; Syombua, 2013; Ijeoma and Ogbara, 2013; Muhumuza and Balkwill, 2013; Binlinla *et al.*, 2014) focus on the national park resources but not

on empirical examination of population and settlements changes and their relationship with national park resource depletion. Most of these studies concentrated on the national parks and their immediate adjoining communities.

Logging activities may cause species extinction, thus reducing species diversity and potential of the forest (Abdullhadi and Surkardjo, 1981). Unguided logging activities has considerable effects on biodiversity conservation, species composition, forest cover, forest structure. This may lead to habitat fragmentation and loss of forests (Foaham and Jonkers, 1992). Several studies have reported decline in the number of large tree species after logging (Okali and Ola-Adams, 1987; Primack and Lee, 1991). Even when there is a minimum of mechanization and relatively little incidental damage during extraction (Ganzhorn *et al.*, 1990), there are decline in over storey tree size, increased abundance of a few small-stemmed species, and decrease in larger commercial species even several decades after a logging activity. Sometimes, the species composition changes in favour of pioneer species but the overall population of tree species remains constant (Primack and Lee, 1991). According Cochrane and Schulze(1999) and Nepstad *et al.*(1999) logging reduces forest cover and generates huge quantity of litter fall and dead phytomass, and the fuel material produced by the litters renders fragments more susceptible to human-induced forest burning.

Park resources are the major source of livelihood of the people living in a national park region. The community members harvest and sell the resources to enrich their pockets. Todaria *et al.*(2010) reported that the increasing population trend over the past few years has led to the massive exploitation of park resources. Pitchairamu *et al.* (2008) assert that more and more species are threatened due to land-cover and land use changes all

over the world. Understanding the impacts of disturbance on vegetation and the resilience of plant communities to disturbance is imperative to environmental management (Speed, 2010)

## **2.4 PHYSICAL INFRASTRUCTURE AND ROAD DEVELOPMENT IN NATIONAL PARKS**

Road density is closely link to resource and market accessibility, economic growth, natural resource exploitation, habitat fragmentation, deforestation, reduction and disappearance of wildlife. The development of road networks is highly associated with national wealth and the scale of ecological disturbance and natural resources degradation.

The national road network is currently estimated to be 194,200km with ownership structure as stated thus: federal roads – 34,120km (17%); state roads – 30,500km (15.7%); local and rural roads – 129,580km (66.7%) (Abimbola, 2013). Modern transport network is in line with the colonial legacy with emphasis on development of evacuation routes and with the dominance of roads specifically (Filani, 2012). Road development facilitates easy access to national park resources, most especially the local and rural road network.

Canning and Petroni (2004) note that infrastructure stimulates long-run growth effects. Road infrastructure has both direct and indirect impact on growth and development by raising efficiency and providing facilities which enhance the quality of life. In addition, Akinlabiet *al.* (2011) assert that infrastructure tends to raise productivity of other factors while serving as intermediate inputs to production which translates into an increase in aggregate output. A major constraint in achieving Nigeria's vision of becoming one of the 20 largest economies in 2020 is the deficit in her investment in transport infrastructure. However, this should be considered as a blessing in disguise to the national park

development(Sanusi, 2011). Ortiz-Moctezuma *et al.* (2010) give two perspectives with respect to the link between infrastructure and development: infrastructure generates economic development itself and infrastructure is being handled as a production factor in the same style as labour and capital. Transport as an infrastructure promotes factor, mobility and reduces costs in addition to promoting market integration (Oyesiku, 2003; 2007; 2010; 2013).

#### **2.4.1 Road Construction and Logging Activities**

Road construction often facilitates access by loggers who destroy forest through logging activities and rural settlers who convert logged forest to pasture, permanent crops, or shifting cultivation (Johnson and Cabarle 1993; Kummer and Turner 1994). Road construction is a principal cause of erosion, particularly in mountainous areas and perennially wet areas both in the tropic and in temperate latitudes', these areas also usually suffer soil loss and flooding as a result of road construction (Chomitz and Gray, 1996).

Luoma (1989) and Buie (1996) from their studies on Idaho forest in the USA, reported that one square kilometre of forest can contain 5km of roads Goldberg (1997) submits that soil erosion and river siltation occurring from as little as 0.5km of road per square kilometre of forest can seriously deplete aquatic resources stock in a given area. Micro population has effectively trapped in ever smaller patches of forest, where inbreeding and lack of adequate food supply threaten their survival. More roads are associated with more wealth and more landscape disturbance in the context of market globalization and emerging democratic system.

However, by the end of the 1960s, timber was the Northern Republic of Congo principal export (between 1947 and 1980, 14.5 million units of timber were exploited,

approximately 1.5-2 million trees), and much of the southern forests had been logged (Wilkie and Sidle, 1990). Although timber sale now generate < 5% of export earnings (US Department of Commerce, 1988), logging remains a major focus of Congo's economic development plans. European and Mediterranean wood products companies have traditionally dominated the logging industry in Congo. This business facilitated access to forest resources in a great manner. The Congolese industrielle des Bois (CIB) employs approximately 700 Congolese workers (Wilkie *et al.*, 2000).

Transportation contributes most of the product cost of timber (Carret and Clement 1993). Therefore, the existence of high quality road and river routes is critical to the profitability of concessions. In fact, logging companies in northern Congo are primarily engineers (Wilkie *et al.*, 2000). Between 1987 and 1989, the secondary roads and cuts were more than 60km of primary roads and 80km of secondary roads; and cuts were more than 3000km of primary and secondary transects within the forest (Wilkie *et al.*, 1992). One major factor facilitating national park forest resources exploitation is access to the park forest. Prior to the establishment of OONP anyone interested in exploiting forest resources, such as game, honey, or timber needed to walk into the forest from the nearest access point. The effects of the activities of people were not even noticed because their operation was on subsistence level.

However, in Cameroon, roads that were more than 100km roads were constructed and maintained to transport logs by truck. Between 1991 and 2013, the loggers cleared vegetation cover to enable them to transport logs. The approximate length of these rough roads was about 300 km. It was assumed that hunters travelled along the roads within the park land to access the wildlife with minimum effort. These roads reduced the amount of

hours required by the hunters to gain access to the wildlife. There was a significant relationship between bush meat exploitation and access to logging roads in the study area. It was a similar scenario in the most logging-integrated settlement in the CIB concession, the Ndoki Camp in Democratic Republic of Congo.

Moreover, other than in urban areas, fuel wood extraction is not a direct cause of vegetation cover degradation, because farmers rely primarily on the wood they fell when clearing their fields. Studies in Niger have shown privatization of wood land extraction for sale in urban market (Foley *et al.*, 1997). Forests cover almost a third of the earth's land surface, providing many environmental benefits including playing a major role in the hydrologic cycle, soil conservation, prevention of climate change and preservation of biodiversity. Forest degradation occurs when the ecosystem functions of the forest are degraded but the area remains forest rather cleared. Thirty percent of the earth's land area or about 3.9 billion hectares are vegetation. It was estimated that the original forest cover was approximately six billion hectares (Bryant *et al.*, 1997).

Conversely, the South American, Africa and Oceanic had registered the next annual loss of forest areas (Sumit *et al.*, 2012). The FAO FRA 2001 and 2010 reports indicated considerable deforestation in the world in 1990 to 2010 but this was entirely confined to tropical regions. Deforestation occurred at the rate of 9.2 million hectares per annum from 1990 -2000 and decreased to 13 million hectares per annum in 2000 -2010. The net change in forest area during the last decade have been estimated at 3.2 million hectares per year, the loss area equivalent to the size of Costa Rica or 140km<sup>2</sup> of forest per day (Rowe *et al.*, 1992).

#### **2.4.2 Road Development and Wildlife Habitat Degradation**

Roads not only increase access to previously isolated natural resources; they also fragment landscape into small, disconnected patches. And as a result of this, the biomass declines and the species community structure changes and the rate of pest invasion and the rate of species loss increase greatly (Wilkie *et al.*, 1992; Gullison and Hardner, 1993; Skole and Tucker 1993; Kreuss and Tscharutke, 1994; Forman and Alexander, 1998; Laidlow, 2000; Malcolm and Ray, 2000)

Experience from Yellowstone and Great Smoky Mountains in the United States of American showed that heavy vehicular traffic even at low speed per hour hinder free movement of wildlife in the parks. Other road-related impacts include the attraction of wildlife to food from passing vehicles and invasion of non-native plant species (Tyser and Worley, 1992; Gunther *et al.*, 2000; Gibeau, 2000; Strittholt and Dellasala, 2001; National Park Service, 2003; Hansen and Clevenger, 2005).

The level of wildlife road accident mortalities in some parks is in tens of thousands (Kline and Swann 1998) with significant negative effect on some animal species populations (for example moose: Bangset *al.* (1989); snakes: Bernardino and Dalrymple (1992); Rosen and Lowe (1994); large mammals: Gunther *et al.* (1998). Robert *et al.* (2007) claim that Canadian parks lose hundreds to thousands of animals each year through road accidents. Other than isolated information on cases of traffic-related fauna resources loss, there is little knowledge of how roads might affect wildlife populations in the United States national parks. Access to roads and markets encourages poaching. More access to roads and markets increases supply of bush meat per capita. As noted by Wilkie *et al.*

(2000), it appears likely, therefore, that the focus on bush meat hunting and marketing in Ngorongo household is based on a combination of access to markets and absence of logging-based income.

In terms of bush meat consumption, households that are located very close to the OONP area eat more bush meat than their semi-urban counterparts but trading (marketing) and hunting of bush meat are more intensively done by the people from semi-urban settlements. Logging in the oak land has created an extensive system of road networks and higher rate of habitat fragmentation. It also provides charcoal and hunters with easier access to the park resource. This increases the production and export of charcoal, planks and bush meat from the OONP. In conclusion, it is glaring that commercialization of parks resources could barely exist let alone flourish without roads development in the OONP area. Roads are vital to economic growth and are conditions for exporting natural resources (Riversonet *et al.*, 1991).

Studies of the effect of urbanization on wildlife have generally shown a shift in the species using an area following development (Noyes and Porgulske, 1973; Adams and Dove, 1989). In general, wildlife species diversity declines along gradients of increasing urbanization, while the population density of some well-adapted urban species increase. A significant factor in this relationship is the proximity of the developed area to undeveloped wood lands and factors.

Knowledge of the frequency of pairing between various land use types and vegetation types may provide some insights into the character of future wildlife habitats in the area. For instance, pairing of rural residential areas with woodland would produce a landscape for harvesting of firewood, hunting of wild animals and farming within the park



land. This would also encourage habitat fragmentation and introduction of exotic species which can endanger the health of the wildlife. Natural vegetation along the high way always suffers fragmentation (which is about a half of the total road networks inside the OONP. Juxtaposition of natural cover, road development and rural and urban housing development has adequately represented the potential impact of human settlement pattern along the Saki-Iseyin-Igboho-Kisi-Ogbomoso axis.

According to Gordon *et al.* (2004), wild large herbivores provide goods and income to rural communities, have major impacts on land use and habitats of conservation importance. The Africa savanna biome carries the earth's greatest diversity of ungulates and has sustained multispecies animal production systems for millennia (Du Toit and Cumming, 1999).

However, the geographical distribution of many species in Africa has been reduced due to hunting, pastoral activities, encroachment into protected areas, habitat modification and disease control (Happold, 1995; Homewood *et al.*, 1991; Stephenson *et al.*, 2001; Lamprey and Reid, 2004; Bonnington *et al.*, 2007; Mamo and Bekele, 2011:). The importance of these factors depends on the species, its location, habitat, and density of the human population (Happold, 1995). Furthermore, many African parks are becoming isolated because of habitat loss, fences and roads, overhunting and disease. Some of the major drivers of national parks in Africa are rapid population growth, economic expansion, social and spatial processes. These lead to threat to sustainability of the national park resources.

## **2.5 LAND USE AND LAND COVER CHANGES**

Land use is the term used to describe human uses of land, or immediate actions modifying or converting land cover. Land cover refers to the natural vegetation cover types

that are peculiar to a specific location. Land use refers to man's activities on land which are directly associated to the land. The land cover describes the vegetation and artificial constructions covering the land survey (Morie, 2007). This means, land use change is the proximate cause of land cover change. FAO (1997) describes the land-use land cover dynamics by characterizing land use as the arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it, while land cover is the observed biophysical cover on the earth's surface. Going by this definition of land use, a link between land cover and the actions of people in their environment has been justified. Land use typically causes distinctive patterns of land cover and this is why all remote sensing techniques primarily deliver images of land cover and not of land use. Although, to some extent, inferences about land use are made from these patterns of land cover, to achieve a complete classification, ground information is essential (Alex de Sherbinin, 2002). Human beings are the key player in the land use and land cover change.

The livelihoods of most of the human population in developing countries depend almost entirely on natural resources. Thus, there exists rising rivalry between the utilization and sustainable management of land resources and the need to monitor land use and land cover changes over the years (Syombua, 2013). The information on land use and land cover changes and drivers is an important input in the formulation of policies and programmes required for development planning of national parks as well as for projecting the consequences of these changes on the parks development and conservation of natural resources and their sustainable management. This is very important considering the fact that demands for land for settlements and other human activities are likely to increase in the face of the ever-increasing population growth rate (Syombua, 2013).

Land use activities have transformed a large proportion of the planet's land surface, by clearing tropical forests, practicing subsistence agriculture, intensifying farmland production, or expanding human settlements. Although land use practices vary across the world, their outcome is generally the same, that is, acquisition of natural resources for immediate needs, often at the expense of degrading environmental conditions. Studies have revealed the environmental impacts of land use throughout the universe, ranging from changes in atmospheric condition to the severe change of Earth's ecosystems. The land use practices have played a major role in causing declines in biodiversity through the loss, modification, and fragmentation of habitats, degradation of soil and water, and overexploitation of native species (Foley *et al.*, 2005).

Humanity has become dependent on an ever-increasing share of the appropriate nearly one-third to one-half of global ecosystem production, and as development and population pressures continue to mount, so could the pressures on the biosphere. Mostly deforestation has occurred in the temperate and sub-tropical areas of developing countries. Extensive tropical deforestation is a relatively modern event that gained momentum in the 20th century and particularly in the half of the 20th century. Chakravarty *et al.* (2012) revealed that deforestation occurred at the rate of 9.2 million hectares per annum from 1980-1990, 16 million hectares per annum in 1990 to 2000 and decreased to 13 million hectares per annum in 2000-2010. The net change in forest area during the last decade was estimated at -5.2 million hectares per year. The loss area equivalent to the size of Costa Rica or 140 km<sup>2</sup> of forest per day was, however, less than that reported during 1990 – 2000 which was 8.3 million hectares per year equivalent to a loss of 0.20 per cent of the remaining forest area each year.

Chakravarty *et al.* (2012) listed five countries with the largest annual net loss for 2000 -2010 AD. These include: Comoros (-9.3 per cent), Togo (-5.1 per cent), Nigeria (-3.7 per cent), Mauritania (-2.7 per cent) and Uganda (-2.6 per cent). The area of other wooded land globally decreased by about 3.1 million hectares per cent in 1990-2000 AD and by about 1.9 million hectares per year during the last decade. The area of other wooded land also decreased during the past two decades in Africa, Asia, and South America.

Distinguishing between the agents of deforestation and the causes is very important in order to understand the major determinants of deforestation. The agents are those slash-and-burn farmers, commercial farmers, ranchers, loggers, firewood collectors, infrastructure developers and others who are cutting down the forests. Causes of deforestation are the forces that motivate the agents to clear the forests. However, much of the existing literature usually distinguishes between two levels of specific factors: direct and indirect causes of deforestation. Among the direct causes of land cover loss are conversion of forest land to other uses, such as infrastructure development, settlement expansion, expansion of farming land, logging and fuel wood, over-grazing, fires, mining, wars and the role of the military, tourism, urbanization/industrialization and pollution. The indirect causes include: colonialism, neo-colonialism, exploitation by industrialized countries.

However, twenty per cent of the world's population is consuming about 80 per cent of the world's resources. The debt burden, overpopulation and poverty transmigration, land rights, land tenure and inequitable land distribution and resources, economic causes – fiscal policies, market and consumerism, undervaluing the forest, corruption and political causes constitute some of the indicators of the risks associated with imbalanced human

resource consumption. Harrison Ngau, a Malaysian and Sarawak the winner of the Golman Environment Award in 1990, puts the causes of tropical deforestation like this:

The roots of the problem of deforestation and waste of resources are located in the industrialized countries where most of our resources such as tropical timber end up. The rich nations with one quarter of the world's population consume four fifth of the world's resources.

The ecological footprint is dominated by energy, as over 50% of the footprint of most high-and middle-income nations is due to the amount of land necessary to sequester greenhouse gases. According to the Global Footprint Network database used by Moran et al, mankind is consuming 25% more resources than the bio-capacity of the Earth. If, for instance, only 50% of the current greenhouse gas production is determined ex ante beyond the sustainable capacity of the Earth, then mankind is currently within the limits of sustainability as defined by the footprint (Biaou, 1993; Bisong, 1994; Colchester and Lohmann, 1993; Caviglia, 1999; Chakravarty *et al.*, 2008; Barbie *et al.*, 1994).

However, many land uses are essential for humanity, because they provide critical natural resources and ecosystem services, such as food, fibre, shelter, and fresh water. Some forms of land use are degrading the ecosystems and services upon which we depend. So, this question arises: Are land-use practices, as part of human activities, degrading the national park environmental conditions in ways that may ultimately undermine its development in terms of natural resources conservation and promotion of tourism and its related activities? This question was examined and the relationship between human activities and the national park development using Old Oyo National Park as a case study was also analysed.

## 2.6 ENVIRONMENTAL CONDITIONS OF NATIONAL PARKS

For a long time, people have transformed nature in an attempt to satisfy their needs. The increased scale of nature transformation for development and for meeting livelihood needs have often disregarded the basic laws of nature and is widely acknowledged as the main cause of the loss of biodiversity in the parks (Duffy, 2006). The consequence of biodiversity loss are manifested through the destabilization of the earth's systems resulting in problems, such as climate change, depletion of the ozone layer and, to some extent, the worsening poverty levels in many parts of the developing world. These problems are increasingly being recognized as social or human-induced. Although biodiversity degradation effects of parks can be regarded as a form of global risk, the developing countries have been hard hit due to their inability and very limited means to cope and adapt to nature transformation. Paradoxically, attempts to conserve the remaining national parks biodiversity in the developing world have also frequently threatened the livelihoods of the rural poor who directly depend on nature for their survival (Adams, 2004).

Conservation concerns and efforts amidst increasing human needs are not new, as human activities pressure and the associated threats to the park environmental conditions have been increasing in intensity and in response to growth in population (Hearne *et al.*, 2010). This has necessitated the application of different approaches by several actors and coalitions from individuals, national and international governments as well as local and international conservation agencies at various scales. The conservation approaches and debates have been shifting in response to changing human needs, concerns, new environmental threats as well as new knowledge based on a better understanding of the shortcomings of the old ones (Adams and McShane, 1992). To date, mitigating human-

induced environmental problems through biodiversity conservation is an urgent global priority. In the developing world, over the last few years, the focus has been on reconciling conservation objectives with the general need to improve human well-being, collectively referred to as 'development'.

Wildlife conservation, in its various forms, has increasingly been recognized as a valuable form of land use, either alone or with other forms of land use. The value of wildlife to the tourism industry has also been widely recognized, especially in Eastern and Southern Africa. The income from national parks in Botswana is over ₦696.5 million annually. In Kenya, tourism brings about ₦5,970,000,000,00 foreign exchange into the country annually (Ajayi, 1972; Tijani 2007). National park development appears to be particularly promising as an economic use of land resource compared to agriculture.

Travel to experience wild nature is an old and well accepted phenomenon, starting in 1872 in the United States of America with Yellow Stone Park, which occupied an area of 3,350 square miles (Burkart and Medlik, 1996). In Australia, with Royal Park, and in 1885 in Canada, with Banff Park and Niagara Falls, various governments set aside natural areas for protection and recreation in the form of national park. In Africa, many of the protected areas started as game reserves and, thereafter, transformed to national parks.

Over the years, global conservation approaches have changed in nature (Tumusiime, 2006), mainly to cope with pressures that natural resources face in an ever-dynamic world. Earlier, the challenges of degradation of the environmental conditions of parks, such as declining biodiversity populations and habitat transformation Adams *et al.* (2004), attracted attention and support to the separation of nature from human (Adams *et al.*, 2004). It appears, however, to have been only a fire brigade, quick-fix approach to the

problem. While national parks have proved to be largely effective in stemming habitat degradation and species extinction (Hutton *et al.*, 2005), it can be suggested that the national park environmental conditions may be negatively affected by the ongoing human activities in the park host communities (de Sherbinin, 2008).

People in national park regions, rely heavily on park resources and earn a great portion of their income and source of living from them (Cavendish, 2000; Ghate, 2002; Escobal and Aldana, 2003; Vedeldet *al.*, 2004; Mamo *et al.*, 2007). This has increased global attention towards biodiversity management in the last decades (Ferraro, 2001). Some people believe the “fortress approach” to managing park resources is no longer tenable, owing to its disadvantages, especially in relation to human cost (Brockington and Schmidt-Soltau, 2004) but also the difficulty in enforcing established national parks in the face of growing local community members opposition (Wells, and McShane, 2004; Hutton *et al.*, 2005). A new “community conservation” paradigm (Hulme and Murphree, 2001) that emphasized conserving biodiversity hand in hand with satisfaction of human needs later emerged (Adams *et al.*, 2001; Adams and Infield, 2003; Hutton *et al.*, 2005).

Several studies have illustrated that poor rural people depend on common-pool natural resources for their livelihoods (Reddy and Chakravarty, 1999; Narain *et al.*, 2005; Tumusiime 2006; Mamo *et al.*, 2007; Upton *et al.*, 2007). Common-pool resources, like national parks, are a source of food, fodder, and medicines for local use (Mugisha, 2002), but community members also need these common pool resources as a means of off-farm employment (Cernea and Schmidt-Soltau, 2006) and as gap fillers during times of financial hardship or famine (Scherlet *et al.*, 2004). Studies have shown that generally dependence on natural resources declines with income (Fisher 2004; Narain *et al.*, 2005). Poorer



households depend more on natural resources, although their extraction is usually lower than that for wealthier households (Vedeldet *al.*, 2007).

From the foregoing discussion, one may be tempted to conclude that the environmental condition of national parks has been influenced by the activities of people living very close to the park area. Through quest for sustenance, people in the park region engage in various activities related to using the park as a source of raw material for their economic activities. This has effect on the integrity of the park environment. Figuring out the factors responsible for the state of environment, therefore, requires deep knowledge of the hidden social, political and economic relationships and processes behind the cultural value of market economy or capitalism. The human activities in the park region are parts of these hidden mechanisms.

## **2.7 IDENTIFICATION OF KNOWLEDGE GAPS FROM PREVIOUS STUDIES**

The studies on the OONP can be cartegorised into three: the ecological monitoring and evaluation study, the planning and management study, and the park operational and impact study. Ayodele (1988) carried out an ecological monitoring study of the park area using the line transect sampling method to determine the population of large herbivorous animals. The survey revealed that there were about twenty-four species of animals, eleven species of birds and about ten species of reptiles. This was considered sufficient to justify the establishment of the park. Alarape (2003) followed up with a line transect sampling method to re-assess the wildlife resources in the OONP. The finding was that wildlife

resources had greatly diminished. The important species affected included elephant and lion, which were previously abundant in the area.

A study by Tijani (2007) established the effectiveness and limitations of the Support Zone Development Programme (SZDP) policy in the OONP and the factors that explain the extensive depletion of the park resources. The findings suggested that poaching, illegal bush burning, hunting are the indicators of ineffectiveness of the SZDP. Tijani (2007) also established that high levels of illiteracy, public apathy and poverty in the community were explanatory factors for the depletion of resources.

Studies by Marguba (2002), Alarape (2003), and Tijani (2007) have shown how logging and poaching have diminished park resources. Others by Repetto and Holmes (1983), Jodha (1989 and 1990), Spore (1993), Biaou (1993), Bisong (1994 and 2007), Fabiyi (1998) Holmes (2002) and Kinnaird *et al.* (2003) have equally shown that the decline in resource base and the forms of land use in the host community are inter-related, and responsible for the ineffectiveness of SZDP in different settings. Experiences in Central and South America as documented by Southgate (1992) and Eden (1994) also clearly show that apart from the spontaneous colonization of land by smallholder farmers resulting from population growth, government directed projects and policies have significantly facilitated the conversion of park lands to agricultural use.

Besides, studies carried out on park management and planning have been useful for park development, but as their spatial scope have been limited to within-park boundaries and the adjoining settlements, knowledge of how human activities in wider park regions are impacting on park environmental conditions has been low and speculative. The various measures put in place for the protection of park environmental conditions have failed to

produce the desired park development. The park resources are greatly diminishing. The impact of population growth and settlement expansion on park resources consumption has introduced the human activity dimension to the explanation of the factors responsible for the degradation of park environmental conditions. Exploitation of park resources for both subsistence and commercial purposes is the bane of the degradation of park environmental conditions. The change in both population and settlement sizes with their correspondent change in human activities assuming to have a direct relationship with the change in vegetation cover and wildlife species of the OONP.

However, if a link can be established between the park environmental conditions and the change in both population and settlements sizes and its correspondent resources consumption, then human activities influence the park environmental conditions. Also, if the park environmental condition is to be seen as a function of the human activities at a wider region, then the analysis of park environmental conditions should be based on the relevant independent variables. Marguba (2002), Alarape (2003), Tijani (2007), and Mohammed *et al.* (2013) focuses on the effect of biological and community-based conservation strategies on the resources depletion, leaving out other salient factors that can emerge when looking at the issue of park resources depletion from a wider regional area. This constitutes a challenge which is to be addressed by this study. This study showed some key human activities in the region that affect park environmental conditions using OONP as a case study. It also analysed and provided insight into the spatial extent of change in the OONP vegetation cover and wildlife species over the years, which covered the establishment period of the park as a game reserve in 1952. Also, issues of

therelationship between human activities and environmental conditions are of major concerns in this research work.

Oladejiet *al.* (2012) claim that the desire to provide shelter, road and social services under the urbanization process has led to serious modifications in the ecosystems of the OONP. These new expansions have encouraged farming and hunting to the detriment of wildlife and its habitats. Good park development and management depend on proper planning. Planning is principally based on knowledge and available information. To reduce pressure on parks, detailed explanations of the links between parks and their regions are required. This is essential in consideration of the complex nature of the relationships between park environmental conditions and their host communities in relation to resource exploitation and management. The argument held is that sustainable park planning and management are dependent on regional land use patterns and the knowledge of human activities occurring within wider territories. In reality, however, the connection is rarely made, nor studied. The convention is that most studies are limited to the immediate park host communities. The details of settlement patterns, agricultural land use, and socio-spatial processes as they affect the park environmental conditions are little known, nor adequately mapped.

Population increase leads to increase in demand for housing and encourages increase in human activities, such as farming and transportation networks. This poses threats to the environment, not only at the immediate surrounding areas, but also at the larger regional level. Human settlements and the corresponding activities always impact on the natural environment in various ways which differ in nature and magnitude. According to Kwadah (2009) urbanization is related to expansion of human settlements and intensity

of their corresponding activities. The natural resources in areas experiencing rapid urbanization are always vulnerable to human threats through direct or indirect consumption. The significance of resource exploitation by the rapid growth of human settlements must be taken care of in the face of maintaining the natural variability in the shape, size, and distribution of the habitats that exist within the national park area.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 DATA NEEDS AND SOURCES**

To achieve the objectives of this study, qualitative and quantitative data were obtained from both primary and secondary sources (see Table 3.1 below). The human activities in this study were categorized into two; the basic human activities which included farming, logging, collection of firewood, charcoal business, and hunting, and the second category which included other activities, comprising settlement expansion, regional infrastructure, and bush burning. The environmental conditions assessed in this study were the vegetation and wildlife densities.

The names of communities in the area were derived from the map of the OONP area produced by the Nigerian National Park Service and this helped to generate spatial data and established the proximity of settlements to the park. The population data for the selected communities were obtained from the National Population Commission (NPC). The data set for the 1991 Census and the 2006 Census were used to obtain the population size, using annual growth rate of 2.8 per cent for the region.

**Table: 3.1 Summary of Objectives, Data Required and Methodology**

S/N	Objectives	Data Required	Methodology
1	Identify the types and pattern of human activities in OONP region	Population figures of the communities in the OONP area over time. Checklist of human socio-economic activities, particularly those related to the park and its resources Pattern of communal interaction with the park and its resources over time. Satellite images of the park and the OONP over time.	Population figures projection of communities in the OONP. A socio-economic survey of communities within the OONP using the checklist.
2	Establish environmental conditions of the park in 1972 – 2015	1972 satellite images covering various aspects of the park will be obtained and should be complement with socio-economic survey of people in the OONP region. Vegetation cover.	Analysis of the satellite images particularly of the land cover conditions as well as other environmental components using GIS software. Quadrat and Line Transect Sampling Technique.
3	Investigate the spatial ramification of human activities in the OONP	Data on the types and pattern of such activities as settlement expansion, logging, charcoal making, hunting, farming, animal grazing were obtained to determine the impacts of each on the changing environmental condition of the park	Descriptive statistics of frequency table were employed to show the extent of human activities. Types and distributional pattern of the socio-economic activities in the OONP region were described.
4	Establish the effects of these human activities on the environmental conditions in the OONP	The time series satellite images of the OONP and the park were analysed to determine the various changes that had occurred over time. Relationship between human activities and OONP environmental conditions. Traffic flow	Identify the influence of each of the notable human socio-economic activities on the changing condition of the environment of the park. Spearman's Rank Correlation. Traffic volume count.
5	Identify the implications of the changes in the environmental conditions in the OONP	Data were obtained from the management of the OONP on the varying challenges confronting it, due to the changing environmental condition of the park	

*Source: Field Survey, 2015*

Based on the key issues derived from secondary data reviewed, a checklist of human activities in the region of OONP was prepared through explorative method which involved identification and documentation of human activities directly and indirectly connected to the park area (see Appendix I). Another checklist of physical elements of

environmental conditions was prepared to generate information on the effects of human activities on the park environmental conditions (Appendix II). The environmental condition items considered in this study were vegetation density and wildlife species. The changes that had occurred to these elements were observed and recorded. These were complemented with the information gathered through the satellite imageries.

### **3.2 INSTRUMENTS OF DATA COLLECTION**

Survey was carried out to acquire data on types and patterns of human activities in the study area. The major tools used to collect the primary data included: structured questionnaire, oral interviews, and physical observation. A set of questionnaire was administered to the community members in the study area to collect data on socio-economic characteristics, human activities and their relationship with the OONP (Appendix I).

### **3.3 DATA COLLECTION PROCEDURES**

#### **3.3.1 Focus Group Discussion**

Focus Group Discussion (FGD) was used as a diagnostic tool to gain insight into the human activities and their effects on the OONP. This was informed by the need to engage the community members as partners in the research process as they have relevant knowledge on the issues related to their activities. In this method, opportunity for interacting with small groups of people was utilized in generating more insightful information. This encouraged the discussion participants to give more candid responses to issues raised during the discussion session. The FGD provide a mean for collecting data that was used to generate a descriptive account of the human activities in the study area. It



helps to uncover respondents' subjective attitudes and experiences that are usually inaccessible through other research method. For example, the information in the satellite image might indicate that the vegetation cover is declining. This is necessary to know, but what are the factors responsible for the declining of the vegetation cover and why is the vegetation cover declining. FGD help to probe for detail explanation of a social issue because it allow participants to interact with one another during the session and help to build on one another's comments and provide facilitators opportunity to probe further for details.

Forty-two (42) groups were selected for the discussion: 13 groups were considered in each of the three zones; and a group of elders each from thirty-nine (39) settlements randomly selected to represent the total number of settlements in the study area-one group of charcoal dealers, a group of saw-millers, and hunters. The number of people that formed the groups ranged in size from five to nine participants each and the session for each group discussion lasted from 64 to 120 minutes. Each group was homogeneous because it represented an entity like settlement or trade union. This was meant to ensure copious discussion of the issues and matters arising therefrom. Effective management as well as co-ordination was also ensured. An open-ended interview was used to guide the discussion the researcher facilitated the focus group discussion with the assistance from field assistants. With the permission of the participants in the session, the discussions were tape-recorded and the anonymity of participants is protected. The tape-recordings discussions were transcribed and analysed. Each segment of specific thoughts and explanations of participants were analysed to determine the interconnectedness of issues and factors that may have influenced the direction of the findings. There were high levels

of agreement about issues and significant consistency in how the issues were talked about among the groups. In cases where an issue was addressed by all groups but discussed differently by different groups, these differences in the talk are identified and explained.

Training of the field staff took place at Saki. The purpose of the training was to ensure uniformity both in the comprehension and interpretation of the questionnaires and the other field instruments. The field assistants possessed Higher National Diploma (HND) in Urban and Regional Planning. Hence, the training exercise was relatively easy and was completed in one day. The exercise comprised discussions of the responsibilities of the facilitators, and interviewers, interview techniques, review of the survey questionnaire and focus group discussion (FGD) instrument as well as the mode of conducting FGDs. A pre-test of 10 questionnaires per residential area was conducted immediately after the training exercise to enable the researcher ascertain its appropriateness and the trainees' performance. The entire fieldwork was carried out between November 2014 and March 2015.

### **3.3.2 Questionnaire Administration**

To ensure that all the categories of settlements in the study area were adequately represented in the household survey, the multi-stage sampling method was used to determine sample size. Rawayau (2005), state that, to ensure a good representative in any data, 20% of the total population is considered to every 1000 people, 10% of the total population to 5000 people, and 5% of the total population to 2500 park people.

The settlement system in the study area is hierarchical in distribution, the closer to the park area, the smaller the size in terms of area coverage and population density. To

draw a sample from the population, a systematic sampling process was used, the whole study area was delineated into three concentric zones (Appendix VII). The first zone is the areas falling within 0-10km distance to the park boundary; the second zone is the settlements located within the distance of 11-20km distance to the park boundary, while the third zone refers to the settlements situated in the distance of 21-30 km and above to the park boundary. It was necessary to use this procedure to ensure equal chance of being captured in the survey.

In the first stage, in order to have a manageable number of samples and to also ensure that all parts are fairly represented, three (3) settlements were randomly selected from each zone of the three concentric zones of the study area as systematically divided for easy surveying. The uniformity in the choice of three (3) settlements is as a result of similarity of the characteristics of settlements within the same zone and variation of the characteristic of settlements between zones. The choice is to ensure that all settlements in the study area are adequately covered in the survey. At this stage, Kisi, Saki and Iseyin are randomly selected to represent the twenty-four (24) settlements that fall within a distance of 30km and above. According to the projected population figure for the year 2014, the figures for Kisi, Saki and Iseyin were 68,915, 155,733 and 136,510 respectively. There is controversy as to what is an ideal household size in Nigeria. However, according to World Data Atlas (2012) it is estimated that, Nigeria has a mean household size of 4.5 persons. NPC (2013) in a survey of Nigeria ideal household size report estimated that 49.5 per cent of the respondents agreed that more than six (6) children are ideal for a household. However, the National Bureau of Statistics (2012) submitted that the mean household size of the Federal Capital Territory (FCT) is 4.5. The level of urbanization in the south-west region

of Nigeria could be says to be responsible for the higher average household figure in the OONP as compare to the FCT. The people in the OONP area living in a form of traditional way of life where the practice of polygamy allows the husband to marry more than one wife with many children. Household size is also determined by cultural and occupational factors. Most of the people in the south-west Nigeria are mostly engaged in traditional occupation such as farming, trading or animal husbandry, while most people in the FCT are civil servant and migrant settlers whole style of living is rather regulated by the urban development authority. Above explanatory factors agreed with the finding of Ukoje (2011) which says that an average of nine (9) people constitutes the household size in the FCT.

An average of nine (9) persons per household unit as suggested by Ukoje (2011), was adapted to calculate the number of household units in the sampled settlements. Going by this calculation, Kisi, Saki and Iseyin had 7,657, 17,304 and 15,168 households respectively. The total number of households in the sampled area was 40129. A total of 191, 432 and 379 copies of the questionnaire, respectively were administered to the household heads in each of the sampled areas. It means that a total 1002 households were sampled in these areas. This total was two and a half percent (2.5%) representing the total number of households that fell within this category of the population in the study area (Table 3.2).

**Table 3.2 Settlements Population and Samples (30Km and above Distance)**

SN	Settlement	Population	Household	Household Head Sampled
1	Kisi	68,915,	7,657	191
2	Saki	155733	17,304	432

3	Iseyin	136,510	15168	379
	Total	361,158	40129	1002

*Source: NPC 1991 Projected Population Figure, 2015*

In the second stage, another three (3) settlements were randomly selected to represent all the thirty-six settlements that fell within the zone of 11 to 20 km distance to the park. These settlements included: Tede, Sepeteri, and Otu, with their corresponding population 24,283 (2698 households), 24,025 (2,669 households), and 21,852(2428 households), respectively. The total number of households was 7642 (Table 3.3).

**Table 3.3 Settlements Population and Samples (11 – 20Km Distance)**

SN	Settlement	Population	Household	Household Head Sampled
1	Tede	24,283	2698	69
2	Sepeteri	24,025	2669	67
3	Otu	21,852	2428	62
	Total	68772	7642	198

*Source: NPC 1991 Projected Population Figure, 2015*

In the third stage, three (3) settlements were randomly selected to represent all the twenty-eight settlements that fell within 0-10 km to the park area. These settlements were: Tessi-Apata 653, (72); Ogunlere 583 (63); and Ogunle 876 (95) (Table 3.4).

**Table 3.4: Settlements Population and Samples (0 – 10Km Distance)**

SN	Settlement	Population	Household	Household Head Sampled
1	Tessi-Apata	653	72	2

2	Ogunlere	583	63	2
3	Ogunle	876	95	2
	Total	2112	230	6

*Source: NPC 1991 Projected Population Figure, 2015*

A total of 1206 copies of the questionnaire were administered to the household heads in the study area. This figure represents two and a half percent (2.5%) of the population of the household heads in the sampled settlements.

The 2.5 per cent sample size is adopted for this study to reduce the challenge of undue coverage of a larger sample size which according to Schrijver (2013) can result to waste of precious limited resources such as time finance and energy.

### **3.3.3 Vegetation and Wildlife Survey**

To validate the information obtained, ground-truthing was conducted to determine the vegetation density and wildlife available in the park. This estimate was performed through the multi-stage sampling technique. The whole park area was divided into 5 divisions referred to as ranges for easy management purpose: Marguba range, Sepeteri range, Oyo-Ile range, Tede range and Yemoso range. The five (5) points of the existing park division ranges were adopted for siting of the sampling quadrats of 50m X 50m (Appendix XI). The number of quadrats facilitated sampling of one fifth of the ranges; this quantity of sample is suggested by Ayodele (1988) to be appropriate for any vegetation density sampling exercise.

A hand-held prismatic compass was used to align the quadrat lines delineation and marking of gridlines to ensure accurate plotting of the boundaries and maintain a straight

grid. The gridlines were marked 5m apart from the north to south and east to west directions. Assessment was done at each point on the lines inside the quadrat. The vegetation density was assessed by recording the sighted woody trees in each quadrat (Appendices XIV-XVI). Density was determined as percentage of the frequency of the occurrence of trees to the total number of trees recorded per quadrat. Simple cumulative value of the total figure observed was used to measure the species density. The density was calculated by dividing the total figure observed by size of the area. Information on change in wildlife species was sourced with the aid of checklist of the types of the animal species that were available in the park as documented in the National Park Services publication, 2003.

#### **3.3.4 Assessment of Change in Vegetation Cover**

Assessment of change in vegetation cover was done using satellites images (data) – Landsat TM for 1972, 1982, 1990 and Landsat ETM for 2000, and 2014. Landsat ETM data covering row 54 paths 191 were acquired at different periods: April 8, 1972, March 23, 1982, December 27, 1990, February 6, 2000, and April 10, 2014. The software packages used includes ILWIS 3.3 Academic, ArcGIS 9.2 and Microsoft world. The spatial resolution for the satellite images was 30m and the coordinates (latitudes and longitudes) of identifiable spatial entities like road junctions were collected with a hand-held GPS and ground-truthing was performed for data verification and validation.

Information on the past and existing trends of changes in vegetation density and other spatial processes were obtained from the satellite images collected at different period. The pieces of information on the available imagery were classified into forest cover, hydrological system, bare surface and agricultural land uses. This is the method commonly

used in study of land use and land cover change (Syombua 2013 and Binlinla *et al.* 2014). The different sources of data used in this study are necessary because it is not possible to obtain satellite imagery for a long time in the past due to its unavailability.

The data were captured during the dry season to allow for similar conditions from the targets or objects of study, and as such reduce erroneous conclusions which might have been arrived at, had the data been obtained at different seasons. The time interval of the images was purposively chosen to determine whether there was a change in the landuse / land cover of the study area after the establishment of the OONP in the area. This has been reported to be useful to predict and monitor the changes in vegetation cover over the years. This is also useful for planning events(Lillesand, Kiefer, and Chipman, 2004).A hand-held GARMIN GPS receiver was used to capture the coordinates of identifiable spatial entities, such as road junctions, and coordinates, which were later used for geometrically correcting the imagery through geo-referencing.

With the aid of previously established quantification of wildlife species through the line transect sampling technique (Appendix XII) and the report of previous studies on the wildlife density in the park, the change in animal species density was determined, and categorized into 3. These are those that have a constant population, those that have changed in population, and those that have gone into extinction. This gives relevant information on the changes that have occurred to the park resources over the decades.

### **3.3.5 Traffic Volume Counts**

Manual counting method was adopted to determine the quantity of traffic flow in the park land. Three (3) enumerators were stationed in three (3) different locations and engaged in



manual counting of car, buses, trucks, and motorcycles that moving to and fro of the park land. The exercise was carried out with the aid of hand counter. The two (2) observed peak hour periods are between 9 – 11am in the morning and 5 – 7pm in the evening were used for the counting exercise. The counting period was between Monday and Sunday (see Appendix XIX).

### **3.3.6 Data Analysis**

The primary goal of this research was to expand the frontiers of knowledge through provision of information base for making a rational planning and management decisions on national park development. The objectives and the nature of data collected are the major determinants of the type of data analysis used for the study.

In analyzing the data, the objectives of the study and types of data collected were considered and three layers of analysis were required. Information on the past and existing trends of changes in vegetation density and other spatial processes obtained from the satellite images were analyzed with the aid of simple descriptive statistics, Statistical Analysis System (SAS), tables of frequencies and percentages of variables. These were presented alongside satellite images, maps and photo plates. The last layer in analysis was related to the showing of the effects of human activities on the OONP environmental conditions. The qualitative data were presented in the form of discussion using themes and logical deductions for the explanation of findings. To determine whether or not there is relationship between the size of settlements, size of population and size of OONP region, correlation analysis was carried out using spearman correlation analysis.

Types and pattern of human activities in the OONP region were determined with

the aid of checklist of human socio-economic activities, particularly those related to the park and its resources. A socio-economic survey of communities in the OONP region was carried out and the quantitative data were presented in tabular form. In order to establish the environmental conditions of the park between 1972 and 2015, 1972 satellite image covering various aspects of the park was obtained to complement the socio-economic survey of people in the park region. The satellite image was used to establish the trend of change in vegetation cover of the park. The satellite images particularly of the land cover conditions as well as other environmental components were analysed using GIS software.

Quadrat sampling technique was adopted to determine the vegetation density. The vegetation density was assessed by recording the sighted woody trees in each quadrat. The density was determined as percentage of the frequency of the occurrence of trees to the total number of trees recorded per quadrat. Simple cumulative value of the figure was used to measure the species density. Line transects sampling technique and report of previous studies on the wildlife density in the park, the change in animal species density was to determine the level of animal species richness in the park. This was presented in a tabular form. Simple descriptive statistics and charts were used to determine the trend of supply-chain of human activities. Spearman's Rank Correlation of statistical analysis system was used to measure the relationship between human activities and the environmental conditions were presented in both scatter plot and tabular form.

### **3.4 CONCLUSION**

The variables, the sources of data and data collection tools and analytical techniques were presented in this chapter. The information related to the park environmental conditions which involved determination of the level of change in the park

environmental conditions was determined through the satellite images and quadrat technique. Under the section on human activities and their effects on the park, a participatory approach involving discussion, interview, and visual observation are to be used to generate relevant information. Overall, despite the challenges envisaged, the aim of the study was achieved through strong commitment and relentless efforts of the researcher. Simple descriptive statistical analysis method was used to analyse the data. This was carried out in line with the focus and research questions of the study. The effects of human activities on the park environment were identified to draw conclusions.

## **CHAPTER FOUR**

### **RESULTS AND DISCUSSION**

#### **4.1 INTRODUCTION**

The results of the data analysis are presented and discussed in this chapter. Types and patterns of human activities in the area of the OONP are presented in the first part and the environmental changes that have occurred within the OONP over the years in the second part. The effects of the surrounding human activities on the OONP are explained in the last part of the chapter. This provides opportunities to draw inferences and conclusion on the effects of human activities on the environmental conditions of the OONP.

#### **4.2 DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS OF OONP REGION**

The objective of this section is to provide information on the respondent's activities. The demographic feature of the OONP region is described in by sex, age, levels of education, family size and tribe.

##### **4.2.1 Gender Profile of the Respondents**

A cursory look at Table 4.1 below showed that males out number females. A total of 1206 household heads were sampled, as shown in Table 4.1 below. A total of 85 per cent of the respondents were male, while the remaining 15 per cent were female.

**Table 4.1: Sex of the Respondents**

S/N	Sex	Frequency of Respondent	Percentage
1	Male	1025	85
2	Female	181	15
	Total	1206	100

*Source: Field Survey, 2015*

This demographic characteristic shown that there are more males than females in the study area. This revealed that most of the household heads in the area are males and most human activities directly or indirectly that affect the environmental conditions of the park are mainly carried out by men. This population characteristic justifies the involvement of large percentage of people in crop production, animal grazing and hunting. These occupation are tends to be masculine and because the OONP area is experiencing rapid urbanization, the young are migrating out of the rural area to urban area. Processing of logs and woods to charcoal is usually masculine occupation in the area. The females usually assisting their husbands in packing the woods that would be used for charcoal production and also process farm products such as yam and cassava tubers to yam flour and ‘gari’ respectively. In most cases, they purchase the farm products from males and process them for sale. They also assist their husband to market their farm products.

#### **4.2.2 Educational Background of the Respondents**

Table 4.2 indicates the educational status of the respondents. It reflects that about 60 per cent of the respondents claimed to have primary education, while those that claimed to have secondary, tertiary and informal education were 20 per cent, 8 per cent and 12 per cent respectively.

**Table 4.2: Types of Education Received by the Respondents**

S/N	Education	Frequency	Percentage
1	Primary	724	60
2	Secondary	241	20
3	Tertiary	96	8
4	Informal	145	12
	Total	1206	100

*Source: Field Survey, 2015*

This information is important because the level of education usually determines the type of occupation of people.

#### **4.2.3 Household Size of the Respondents**

Table 4.3 reveals that 47 per cent of the respondents had a large household size of 15 and above number of people in a household. This was followed by 37 per cent of the respondents that had a family size of between 7 to 14 members. People with small household size accounted for the remaining 16 per cent of the respondents.

**Table 4.3: Distribution of the Respondents by Household Size**

Household Size	Frequency	Percentage
Large (15 & above)	567	47
Medium (7 - 14)	446	37
Small (2 – 6)	193	16
Total	1206	100

*Source: Field Survey, 2015*

The park area is a culturally heterogeneous community, especially in the major towns located around it. However, the Yoruba people had 94 per cent of the total population of the respondents. Other ethnic groups were Ibariba, with 3 per cent, and Fulani, Beninese and Togolese with 1 per cent each of the total number of respondents (Table 4.4)

**Table 4.4: Distribution of the Respondents by Tribal Identification**

S/N	Tribe	Frequency	Percentage
1	Yoruba	1136	94
2	Ibariba	37	3
3	Fulani	11	1
4	Beninoir	11	1
5	Togolese	11	1
	Total	1206	100

*Source: Field Survey, 2015*

### 4.3 HUMAN ACTIVITIES IN THE OONP REGION

Nine types of human activities were identified in the OONP (Appendix V and VI). These were farming, logging, charcoal business, animal grazing, firewood collection, settlement development, non-official route, hunting, and bush burning (Table 4.5).

**Table 4.5: Types of Human Activities in the OONP**

S/N	Activity	Frequency (Multiple response)	Percentage
1	Crop production	1004	83
2	Logging	306	25
3	Charcoal	464	38
4	Hunting	392	32.5
5	Settlement	216	18
6	Non-official route	587	49
7	Bush burning	175	15
8	Firewood	690	57
9	Animal grazing	818	68

*Source: Field Survey, 2015*

Human activities that are intensely carried out according to the respondents include crop production (83%), animal grazing (68%) and firewood collection (57%). These activities greatly effect change on the parks environmental conditions. Most people in the park area depend on these activities for their livelihood, and they posed danger to the environmental conditions of the park. The park serves as a pool of wildlife resources, it helps to maintaining regular supply of wildlife and forest products. It also helps in nurturing and maintaining agriculture and rural occupation in its area. The park material constitutes the resource base for the area and beyond.

#### **4.3.1 Farming**

Farming is an important sector of the economy in the OONP region. About 83per cent of the respondents engaged in farming. The farm lands were irregular both in sizes and shapes. The sizes were relatively small and often vary from one part of the park area to another, according to the size of the farmer's family. The average farm holdings were 2.0 hectares in 1972. Most of the farms in the southern part of the park area (Iseyin, Ilero, Okeho and Otu) were below 0.8 hectares (2 acres) in size. Farm sizes of 2-4 hectares (5-10 acres) could be found in the open savanna grassland areas (Saki, Igboho, Igbeti and Kisi). The participants in the FGD organized in Otu, Ago-Amodu, and Sepeteri reported that clearing of forest for crop production was more difficult in the forest area of the park than in the savanna grassland.

The farming system was characterized by low-level technology and manual labour was used for all forms of production. It was also reported that, in the 1980s, the headquarters of Oyo State Agricultural Development Project (OSADEP) was located in Saki, the then headquarters of Ifedapo Local Government. This has brought a major



transformation into the farming practice in the region through the introduction of various modern farm techniques and innovations. There were introduction of the use of farm machines to the farmers, education and enlightenment campaign through agricultural extension services. This revolutionized the farming system in the region as people acquired more land for mechanized farming. More feeder roads were constructed, and more areas were laid bare through man's quest for sustenance. The crops produced in this region are mainly staple food crops. These were grains, root tubers and fruits. Notable among them were cassava, yams, and corns. They had a very limited market in the largely subsistent food economy of the period between the 1970s and early the 1980s.

Table 4.6 below reveals that 1486.56 hectares of land area was used for farming in 1972. It increased to 3811.85 in the year 1990 and also increased to 5014.89 hectares in 2014. This change in human activities during the period under study (1972-2015) is captured in from Table 4.6.

**Table 4.6 Agricultural Land Use in the OONP Region, 1972-2015**

Year	Size of Farm Land (Hectare)	Percentage
1972	1486.56	7.54
1984	3223.62	16.35
1990	3810.85	19.33
2000	4335.46	22.00
2014	5014.89	25.44

*Source: Field Survey, 2015*

The quantity of land taken from the OONP land area for crop production increased from 1972 to 2015. The increase in the quantity of land used for farming might not be unconnected to the degree of change in population over the years (Figure 4.1)

The supply chain of farm products started from the producers (local farmers) that performed primary functions of crop production. Through the quest of supplying farm products to the consumers, they encroached on the park land in order to meet up with the demand from the city dwellers. Specialization of farmers in distinct crop production is far less feasible partly due to seasonal variations in commodity production and also to the generally rudimentary method of crop production and demand for individual commodities. The farmers usually engage in up to four activities either concurrently and staggering. In the second stage of the supply chain, there are assembles, forestallers, the traders/retailers they purchase the farm products directly from the farmers and either sell to the final consumers or the urban wholesalers that either sell the products in the local market or export it to other countries. Thus, there may be some overlapping in the specific functions performed by each group in the supply chain. This description applies principally to the supply chain of staple crops like cassava tubers, maize and yams.

Attempts were made by conducting FGDs in selected settlements to determine the common activities of the community members that are associated with the park and to know the supply chain of the products derived from the park area. The interviewees in the studied communities reiterate that there has been a channel of trading in farm products between the origin and destination. A further probe into their activities with a view to determining whether the park area has been encroached upon in meeting some communities' needs or not, questions were asked and they said that the park has been providing a fertile land for crop production and have made farming more easy for people in the area.

Nearly all the settlements in OONP area have been engaged in crop production and their harvest have been conveyed to at least specially designated sections of all-purpose daily or periodic markets for local sales of farm products brought in by the producers or itinerant assemblers. Fresh maize and vegetable are disposed of by the farmers in the small local markets surrounding such feeder markets as Oja-Ogboro, Oja-Igboho in Oorelope local government area of Oyo State. Alternatively, those producers who are located very close to the major settlements may decide to personally convey their fresh farm products direct to the urban wholesale bulking markets like Saki, Iseyin and Kisi. After necessary processing, the products are assembled in Saki, Iseyin and Kisi and convey the accumulated products to Ibadan, Oyo, Ogbomoso, Lagos, Ilesha and Osogbo. Some of these products at this point usually processed in their stores for final packaging and further shipment to other countries.

Just as the growth of settlements is known to depend on the extent of the area which serves it, so also does the growth and development impact of supply chain of the commodity depend on the range of other products or services upon which it depends for its own smooth operation or which depend on it for their own existence, hence, the park resources. The importance of forest products is no less due to its large number of important linkages and multiplier effects on other trades and services. The large variety of products, activities and services to which the farm products supply chain is linked includes demand for fertile land for more crop production, tangible products like machines, infrastructures like transport and road development, marketing and finance. Many of these linkages also generate feedbacks which in turn further promote the growth and development not only of the crops but also of other commodities.

However, the vast larger quantity of farm products from OONP area being consumed in urban centres like Ibadan, Lagos, Abeokuta, Oyo, Ogbomosho, Ilorin, in an ever increasingly demand for farm produce originated from OONP area. The importance of supply chain must be recognized in planning for national park development because of the pressure asserted to the park resources from challenges of park land encroachment.

#### **4.3.2 Logging**

As shown in Table 4.6, about 25 per cent of the respondents were engaged in logging activity. People from different parts of the OONP region made use of the park for logging activity frequently. The source of raw material was an important factor in the location of sawmills. This was the reason sawmills were strategically located in the OONP area in order to benefit from the pool of hardwood tree species found in the park land. In 1972, Saki had two sawmills (Alh. Adeleke and Alh. Ikorodu), and Iseyin had only one (see Table 4.8). Between 2000-2015 there was an increase in number of sawmills in the OONP region and logging activity supported the business greatly.

Information on the types, quantity, and the market extent or threshold of the timbers being exploited from the park land is provided in Table 4.7 below. This information confirms the rampant activities of illegal loggers and gives credence to the depletion of the forest/vegetation cover within the study area. Below is the record of logging activities in two selected cities of the study area, namely Saki and Iseyin.

**Table 4.7: Trees Commonly Extracted from the OONP Land in 2015**

S/N	Location	Name of sawmill	Name of tree	Source of tree	Quantity of logs (Tons per annum)	Use of the wood	Extent of Market for the product
1	Saki	Saki. Adeleke Sawmill, Ikorodu Sawmill, Asikolaye, Alh. Sarafadeen Baale Baabo Sawmills.	Mahogany,Iroko,	Ogboro,	150,500	Roofing	Local market: Oyo, Ibadan, Lagos, Sokoto.
			Obeche, Sapale- wood,	Irawo,	135,000	Furniture	
			Araba soft-wood,	Budo Alhaji,	125,000	Export	International market: Europe, Togo, Parakou, Safe, Niki, in Republic of Benin
				Soro, Oyo-Ile	45,000	Construction work (such as bridge, culvert etc.) Export.	
Teak wood (Gedu),		365,400					
		140,000					
2	Iseyin	Iseyin  Abaletu Sawmill.  Koso Sawmill.	Mahogany,Iroko,	Ajibandele,	170,000	Roofing	Local market: Oyo, Ibadan, Lagos, Sokoto
			Obeche, Sapale- wood,	Ajaku,	185,000	Furniture	
			Araba soft-wood,	Ikere-George,	120,000	Export	International market: Europe, Togo, Parakou, Safe, Niki, in Republic of Benin
					Teak wood (Gedu),	Owe	
					260,000		
<b>Total = 2,330,900</b>							

Source: Field Survey, 2015

The respondents also confirmed that the figures on the quantity of the logs were far greater than what obtained about ten years ago. This shows that there was a steady increase in logging activities during these periods.

**Table 4.8: Supply of Trees from the OONP to Selected Sawmillers**

S/No	Sawmill	Name of tree	No of trip per week	Qty of log per trip	Qty of log per week	Length in feet (ft)	Source of Logs	
<b>A. Saki Sawmill</b>								
1	Adeleke Sawmill	Mahogany	4	9	36	432	Ogboro, Irawo, Budo Alhaji, Soro and Oyo-Ile	
		Iroko	3	9	27	324		
		Araba	2	22	44	528		
2	Ikorodu Sawmill	Obeche	3	23	69	828		
		Araba	2	10	20	240		
		Mahogany	5	15	75	900		
3	Asikolaye Sawmill	Sapele wood	2	10	20	240		
		Mahogany	3	18	54	648		
		Iroko	2	20	40	480		
		Araba	2	23	46	552		
4	Alh. Sarafadeen Baale Baabo	Mahogany	3	25	75	900		
		Iroko	4	22	88	1056		
		Obeche	3	9	27	324		
<b>B. Iseyin</b>								
1	Abaletu Sawmill	Mahogany	2	21	42	504	Ajiband ele, Ajaku, Ikere-George, Owe	
		Obeche	2	17	34	408		
		Sapele wood	4	19	76	912		
		Iroko	3	10	30	360		
2	Koso Sawmill	Iroko	2	23	46	552		
		Obeche	3	15	45	540		
		Sapele wood	4	10	40	480		
		Araba	4	9	36	432		
<b>C. Kisi</b>								
1.	Ogunmolu Sawmill	Mahogany	3	9	27	324		Igbeti, Igboho, Orita, Oyo-Ile
		Araba	2	17	34	408		
		Sapele	4	10	40	480		
2.	Alhaji 14 Sawmill	Iroko	3	10	30	360		
		Mahogany	3	15	45	540		
3.	Alhaji Dogo Sawmill	Araba	3	25	75	900		
		Mahogany	2	10	20	240		
		Iroko	2	23	46	552		
		Araba	2	10	20	240		

Source: Field Survey, 2015

In recent times, high demand for timber products has made the logging business lucrative and the number of sawmills drastically increased to twelve in Saki and Iseyin. Similarly, there was report of increase in lumbering activities within the period under study as indicated by 77 per cent of the respondents (Table 4.11).

The participant observation method was adopted to collect information on the activities of loggers, which were usually carried out in the night. During the survey, it was

revealed that many young men from Iseyin, Saki, Igboho, Kisi, Igbeti engaged in this business. Their approach was different from the method being used by the conventional loggers that supply timber logs to the sawmills. For instance, Plates I and II show the Alamole's on-the-spot tree cutting; and the produce was later transported to the neighbouring countries, like Benin Republic and Republic of Togo. The conventional loggers usually transport their produce to the sawmills for local consumption, that is they sold in the towns' plank markets.



*Source:  
Field  
Survey  
(2015)*

**Plate I:  
Logging  
and  
Slashing  
Activities  
in  
the  
OONP**

**Area**





*Source: Field Survey, 2015*

## **Plate II: Logging and Slashing Activities in the OONP Area**

### **4.3.3 Charcoal Business**

Human activities that constitute threats to wildlife are very common in many national parks around the world and OONP is not an exception. The demand for charcoal for cooking is among the major needs of all the communities in the OONP region. Its demand from the urban centres is equally one of the reasons people engage in charcoal business in the park area. Charcoal is used in various forms. It is used as a source of energy for warming of houses in the temperate region. It is used as energy source to power commercial vehicles in places like Japan, North-Korea and Singapore. It is used as a source of energy for powering some industrial machines. In Nigeria, it is also used to cater

for some household energy needs, like ironing of clothes and roasting of corns. It is also a source of energy for other small-scale enterprises. Charcoal briquettes are widely used for outdoor grilling and barbecues in backyards and on camping trips. Charcoal business started in the OONP region in the early 1980s and the business has been flourishing since then. The result of the interview and personal observation conducted on the activities of charcoal dealers in the study area are shown in Table 4.10 below. The table indicates the percentage increase in the tonnage of charcoal that is monthly produced and sold in three settlements in the region of the OONP: Saki, Iseyin and Kisi. It provides a deep insight into the pattern and intensity of the use of forest resources in the OONP. It shows information on the amount being generated from the charcoal export from Saki, Iseyin and Kisi, amounting to about ₦12,960,000:00, ₦8,640,000:00 and ₦6,480,000:00, respectively in 2014. This amount is double the amount made from charcoal business when the OONP was established in 1991. Although, charcoal production in the study area started very recently, its effects on park environment cannot be underestimated.

**Table 4.9: Charcoal Marketing in Selected Settlements of the Study Area 1991 - 2015**

		Containers per week (720kg each)	Weekly Total (kg)	Monthly (50kg bags)	Percentage increase	Amount Monthly (N) (N750 per 50kg)
Saki	1991	3	2160	8,640		6,480,000.00
	2015	6	4320	17,250	50%	12,937,500.00
Iseyin	1991	2	1440	5,760		4,320,000.00
	2015	4	2880	11,520	50%	8,640,000.00
Kisi	1991	1	720	2,880		2,160,000.00
	2015	3	2160	8,640	33%	6,480,000.00
Total		19	13,680	54,690		41,017,500.00

Source: Field Survey, 2015

Table 4.9 indicated almost 50 per cent increase in charcoal business in some of the selected cities between 1991 and 2015.

Table 4.10 presents the list of human activities and the extent of people's involvement in each activity in the OONP region is also reflected. The table shows that crop production was a major economic activity taking place to a very large extent as claimed in about 92 per cent of settlements in the OONP area as at 1972. It reveals the proportion of the park area now taken over by crop production has reduced to 79 per cent in 2015. This shows that there is a decline in the population of the people that are now engaged in crop production. Table 4.10 shows that, although all the settlements in the park area were engaged in crop production, the extent of engagement differed from community to community. The people were involved in animal grazing to a limited extent in the periods under reference, that is, 1972-2015. This means that animal grazing is not in the list of major occupations of the people in the OONP area. The table also shows that firewood collection was a very popular human activity in virtually all the settlements in the OONP region, this was supported by the claim that firewood collection is taking place to a large extent in all the settlements sampled.

**Table 4.10 Human Activities and Their Spatial Distribution**

Activities	Extent of Human Activity															
	Very Large Extent				Large Extent				Limited Extent				Not at All			
	1972	%	2015	%	1972	%	2015	%	1972	%	2015	%	1972	%	2015	%
Crop	36	92	31	79	3	8	3	8	-	-	5	13	-	-	-	-
Production																
Animal	-	-	-	-	-	-	-	-	39	100	39	100	-	-	-	-
Grazing																
Timber	-	-	9	23	2	5	30	77	2	5	-	-	35	90	-	-
Production																
Firewood	39	100	39	100	-	-	-	-	-	-	-	-	-	-	-	-
Collection																
Charcoal	12	31	3	8	4	10	-	-	13	33	36	92	-	-	-	-
Business																
Settlement	-	-	31	79	-	-	3	8	3	8	5	13	36	92	-	-
Route	-	-	-	-	-	-	8	21	2	5	30	77	37	95	1	3
Bush	-	-	-	-	-	-	-	-	3	8	33	85	36	92	6	15
Burning																
Hunting	22	56	4	10	3	8	13	33	36	92	-	-	-	-	-	-

*Source: Field Survey, 2015*

**Table 4.11: Reasons for Engaging in Charcoal Business**

S/N	Reason for Chosen Charcoal Business	Frequency of Respondents	Percentage
1	Require little or no training to start the business	6	67
2	Proximity and access to park resources	8	89
3	Availability of raw materials	7	78
4	Availability of ready market for the product	9	100
5	No other business opportunity in this area	4	44
6	Making heavy income from the business	3	33

*Source: Field Survey, 2015*

As captured in Table 4.11, all the respondents claimed that availability of steady market for the product is a major factor responsible for people's participation in charcoal business. Proximity to the park resources and availability of trees constituted 78 per cent and 89 per cent of the responses, respectively.

The charcoal depots were located in various urban centres in the OONP area, including Saki, Iseyin, Okeho, Sepeteri, and Tede (see PlateIII)



*Source: Field Survey, 2015*

### **Plate III: A Charcoal Depot in Saki**

#### **4.3.4 Hunting**

About 32.5 per cent of the total number of the respondents claimed that they engaged in hunting (see Table 4.3). Through the accounts of oral discussion, some of the participants claimed that hunting activity was very critical to the livelihood of the

communities in the OONP region. Some of them reported that they engaged in hunting activity to get bush meat for consumption and to sell to people in towns like Saki, Iseyin, Oyo, Ogbomoso, Ibadan, Kisi and Igboho. Some of these activities were however, endangering the survival of park environmental conditions.

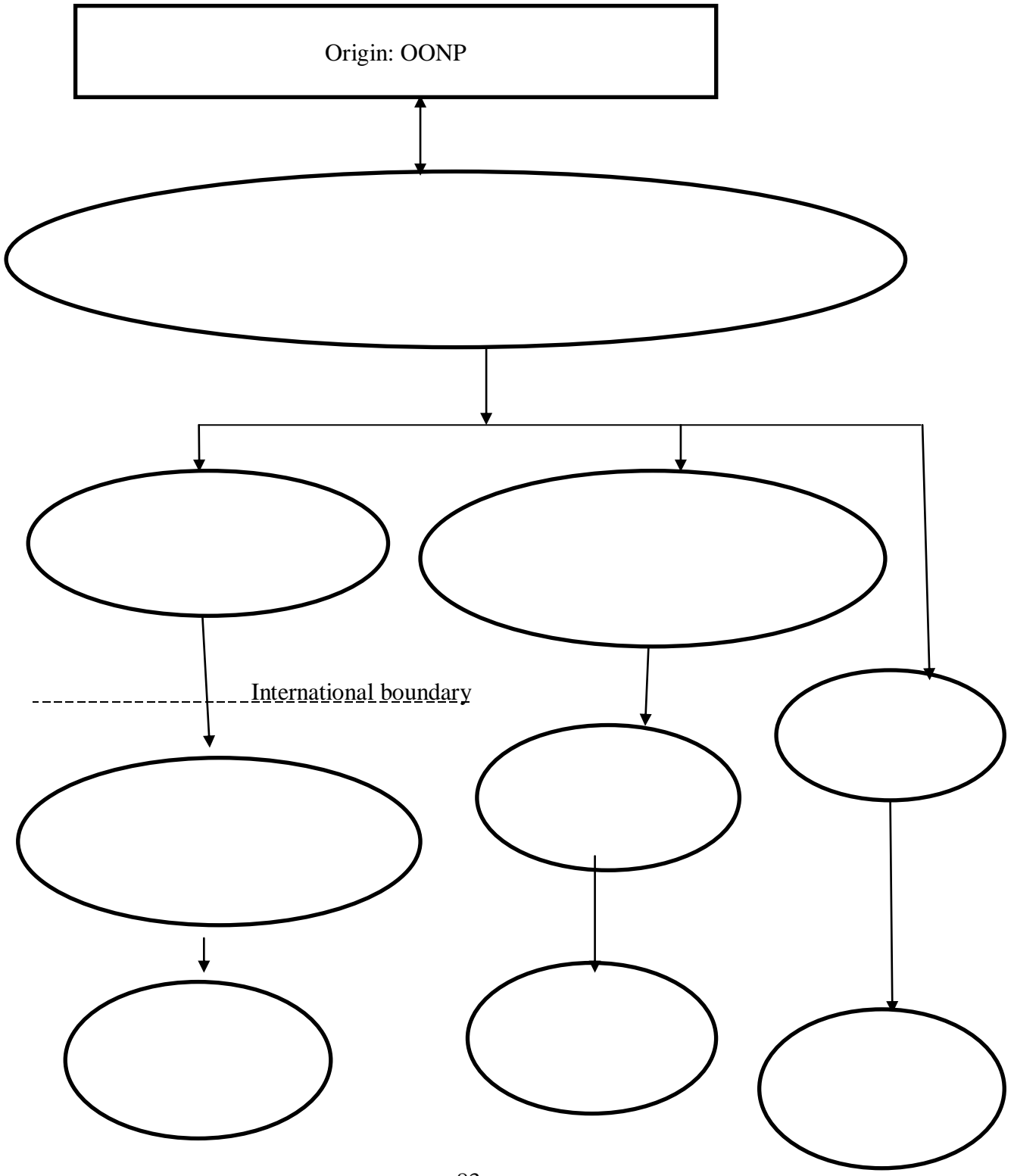
The common chase animals consisted mainly of the less wild animals, particularly the herbivorous animals, such as bush baby, water buck, roan antelope, warthog, bush buck, cane rats, giant rats, squirrels, a variety of ducker, monkeys, bush cows, porcupine, tree hyrax and large birds. The rarely hunted animals were the wild animals, such as buffalos, lions, leopards, wild dogs and elephants. Recently, however, hunting became more of a hobby than an occupation. Double barreled shotguns were acquired by some hunters.

#### **4.3.5 The structure of the supply-chain offorest products exploitation in the OONP**

The research has revealed that the structure of supply-chain process of forest products exploitation in the OONP has its starting point of the resources exploitation and consumption fundamentally from the OONP area. The process starts with acquisition of forest products as raw materials for production of goods to be delivered to the end users such as Ogboro, Irawo, Budo-Alhaji, Soro and Oyo-Ile constitute sources of raw material for the sawmills located in Saki. On the other hand, Iseyin sawmills depend on Ikere-George, Owe, Ajaku and Ajibandele for supply of logs. The market for timbers produced includes Oyo, Ibadan, Lagos, Sokoto, Europe, Togo, Parakou, Safe, and Niki, in Republic of Benin. Table 4.9 shows the selected sawmills and the quantity of logs used by each of them.

The focus group discussions also corroborated the facts revealed by the survey data as shown in Table 4.9 above. For example, it was revealed that there is an association of timber dealers known as the Ifesowapo Plank Market Gedu area. From among the members of the association, the following Plank Market in Gedu area. From among the members of the association, the following remark was made: "it was difficult to be a successful timbers dealer without receiving the necessary training from experienced members of the association..." " members also informed that the main functions performed by the association are, helping any member financially on the occasion of any social ceremony that involves members... ...the association serves as a lobbying group that protects the interest of its members and their business; "the amount being paid to the government as levy is usually negotiated through the union, while the association liaised with government agents to ensure smooth running of their business".

FGD participants also confirmed that the starting point of timber supply chain is the loggers. As many as six participants may be involved in the supply chain and movement of timbers from the producer to the consumer. That is the forest area where the loggers exploit trees and convey its logs to the saw-mills or the timbers are processed on the spot (*Alamole*). The timber usually purchased by the timber wholesalers and sold to the timber retailers and the end users. Alternatively, the loggers can sell processed timbers to bulking agents or wholesalers or (exporters) who in turn buy only the processed timbers in the area or at specialized timbers markets. However, the export aspect involves a certain level of specialized skill of the timber marketing techniques, and this places the local timber dealers at a great disadvantage end compared with the experienced exporters or wholesalers in the timber market (see Figure 4.1).



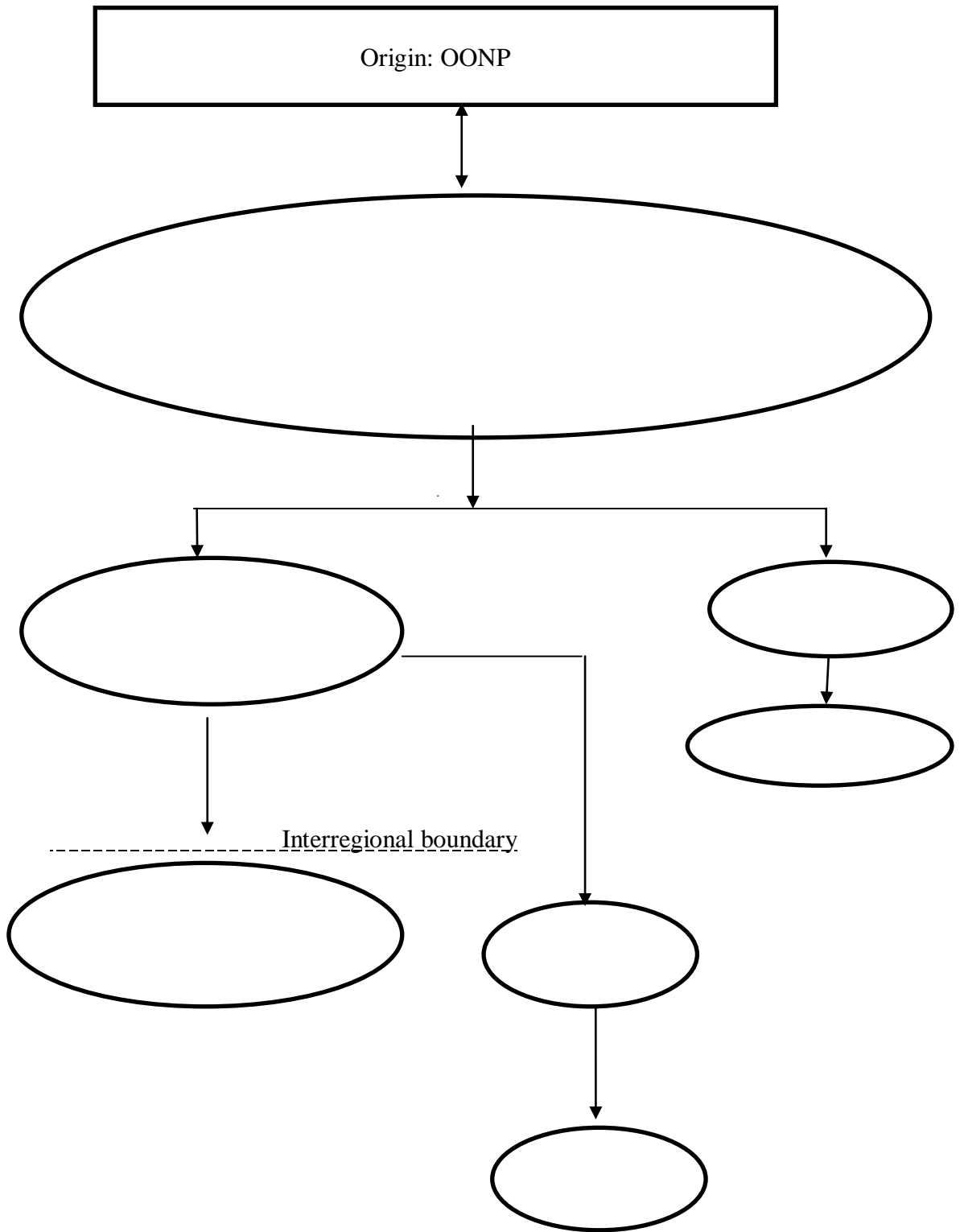


*Source: Field Survey, 2015*

Figure 4.1: Supply-chain of Logging in OONP

As can be seen in figure Fig.4.1 above, the timber products are provided not just for the settlements around the park area, but for people living in other areas. Since settlements area separated one from another, linkages between them are essential and one framework for this explanation is to view their interconnectedness as a supply chain.

The name of association of charcoal dealer in the study area is Surulere Association of Charcoal Dealers. It is an unregistered association of people that involved in charcoal business. The association has about 120 members. From the FGDs session, members revealed that the starting point of supply chain of charcoal is the forest area, that is, the park or free access forest area which provide raw material for charcoal production. The charcoal producers usually convey their product to the final consumers or sell it to the charcoal wholesalers and the wholesaler's resells to the charcoal retailers, who would then sell the product to the final consumers. Alternatively, the charcoal producer sells processed charcoal to bulking purchase agents or wholesalers or exporters that specialized in charcoal export. The participants in the business at this stage constitute an essential link in supplying charcoal to other countries and they helped in meeting demand for the product Figure 4.2 illustrate the process discussed above.



*Source: Field Survey, 2015*

Figure 4.2: Supply Chain of charcoal from OONP

As reported by the respondents from Saki and Iseyin, the market in the urban centres provides opportunity for local people in OONP area to benefit from charcoal business as people from the cities usually visit the region on daily basis to purchase charcoal in large quantity for commercial purposes. The respondents also claimed that their charcoal product usually export to different parts of the world due to the high demand for the product especially from Asia and European countries such as China, Germany, Belgium, United Kingdom, Spain, Netherland, and Greece.

Many young men that participated in the discussion revealed that hunting was part of their cultural practice some of them engaged in this for fun, while others considered it as a major occupation. The latter category of people hunted animals for commercial purpose, as they sold in large quantity to the buyers in the towns like Saki, Ogbomoso, Iseyin. They indicated that customers from major towns in the OONP area usually purchased most of their products. They narrated that their customers usually visited their villages and, at times, they took the bush meat to the towns (see Plate IV – VII and Figure 4.3).



**Plate IV: Bush-meat processing unit in Ibadan**

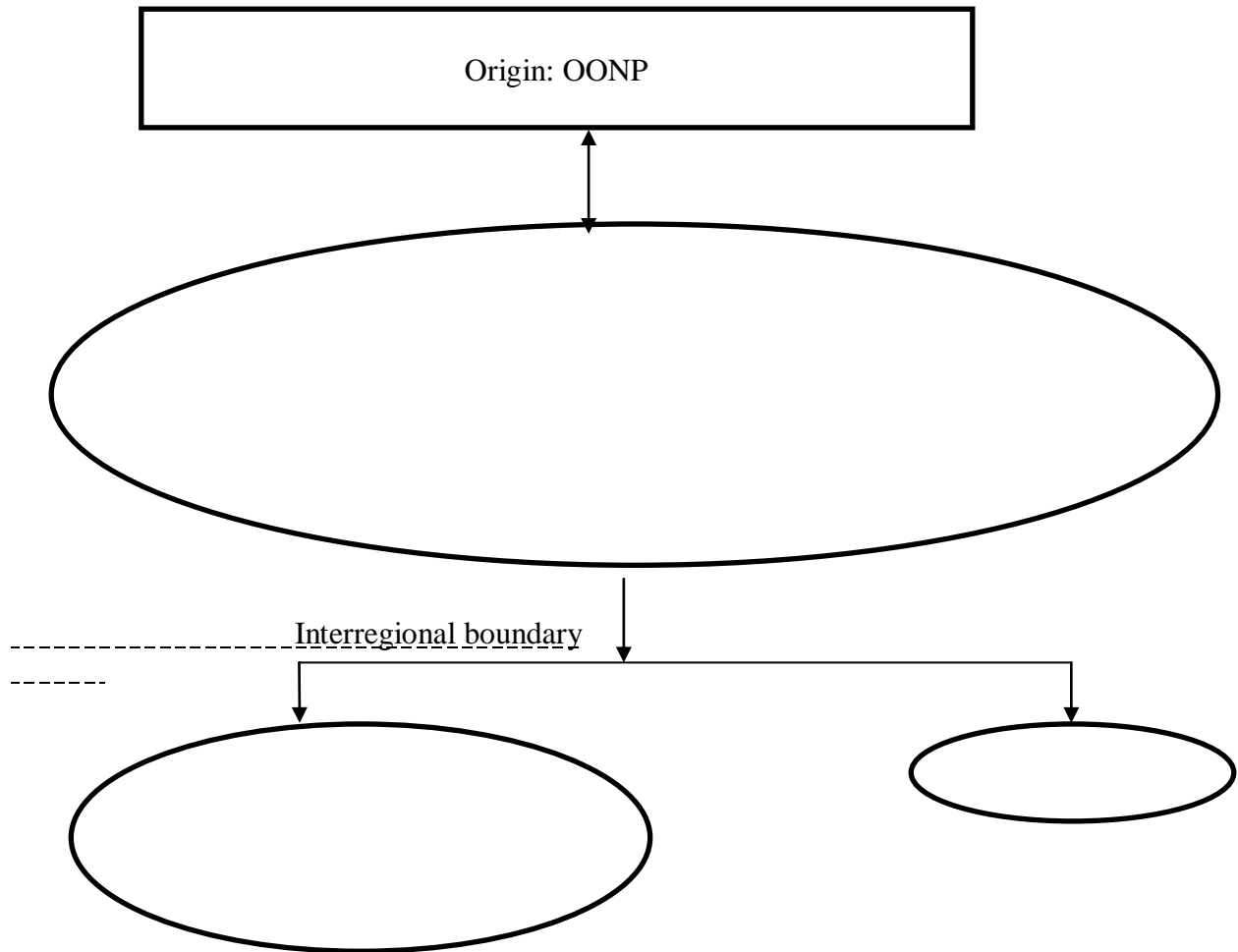


**Plate V: Grass-cutter displayed in Iseyin – Oyo road**



Plate VI: Bush-meat processing unit in Ibadan

Plate VII: Assorted bush-meat exhibited in Ibadan



Source: Field Survey, 2015

Figure 4.3: Supply-chain of bush meat from OONP.

They also claimed to be aware of the OONP official activities in the park region, and the officials were just disturbing them unnecessarily and posed threat to their means of

livelihood by discouraging them from taking from the pool of resources available in their area. When asked about their assessment of the quantity of the available Park resources, they noted that most of the animals that used to be very common in the area were now very scarce and so they linked this to the fact that the environment had changed drastically in recent times.

To verify the submission of the respondents, a survey was undertaken targeting the hunter families in Saki and Iseyin. Through the exercise, we realized that almost all the male members of these families engaged in hunting. Those that did not take it as their major occupation considered it as a second alternative to their main employment. They revealed that the OONP land was a common point for their hunting expedition.

Survey conducted on the catering/restaurants outfits or establishment in Saki, Igboho, Iseyin, Oyo, Ogbomoso, Kisi and Ibadan reveals that over 80 per cent of them sells bush meat, they informed that they received regular supply of the product from the surrounding villages. When asked about the methods of receiving the bush meats, most of them said that the hunter use to bring the product to them and occasionally they too use to travelled to the villages and buy the bush meats, they claimed that there is always ready made market for the product because their customers like eating bush meats and due to this factor the price use to be relatively higher than the price of other meat products such as cow meat, goat and fish. The demand for food products varied with the population, the higher the population, the higher the demand for food items. The supply and demand for food products adjust to the prevailing situation in any given location or region and are in constant interaction with one another. However, the Park area form the pool of natural

resources in the OONP area, the presence of this Park land directly or indirectly affects the quality of life of people in this region.

In conclusion, it is pertinent to say that the whole supply chain process occurred at three distinct levels, at local, regional, national and international levels. However, within interstices of these levels, it is possible that the chain could take directly to the internal outlet, for instant, from the buck purchasers at the local level or from the wholesalers at the national level to the international outlet, this implies that entire process has diverse exit points.

#### **4.4 PHYSICAL DEVELOPMENT IN OONP REGION**

##### **4.4.1 Human Settlement Growth**

Human activities related processes, such as converting of natural environment for anthropogenic use or change in land resources management strategies would definitely have transformation effects on the earth surface. About 18 per cent of the total number of the respondents' settlement expansion and other associated activities affected the OONP environmental conditions. Over the past few decades, landscapes in the OONP region had rapidly growing human populations and associated human activities. The satellite image taken in 1990 revealed that there was high level of human settlement expansion within the northern part of the OONP. Increase in human population led to a corresponding increase in the demand for housing and its other related facilities and services to cater for the needs of the ever-growing population. The agglomeration of the population in urban settlements has been posing great challenges to the park environmental conditions. Therefore, it was imperative to determine the relationship between the population and settlements in the OONP region. In the year 1972, the population of Saki, Iseyin and Kisi were 52,234,

46545 and 20,597, respectively (giving a total population of 119,376). The settlement sizes were 6.456 km<sup>2</sup>, 11.132 km<sup>2</sup> and 6.25 km<sup>2</sup>, respectively.

The projected population size of Saki in the year 1996 was 103413, with a growth rate of 2.8 percent. The change in settlement size in 1991-2001 was 9.356 which was in line with the pattern of change in both population and settlement size recorded for other major towns in the OONP region. For instance, Iseyin with a population of 79,839 in 1991 had a settlement size of 13.606 km<sup>2</sup>. Its population increased to 92,153 in 1996 with a corresponding change in settlement size of 17.255 km<sup>2</sup> in 1991-2001. In 2015, Iseyin had a population of 155,733, with a corresponding settlement size of 36.643 km<sup>2</sup>.

Similarly, as revealed in Appendices VIII and IX, the population of Kisi was 20,597, with a corresponding settlement size of 6.25km<sup>2</sup>. The projected population size of Kisi in the year 1996 was 40,780, with a growth rate of 2.8 per cent and the change in settlement size in 1991-2001 was 4.731km<sup>2</sup>. This was in line with the pattern of change in both population and settlement size recorded for other major towns in the OONP region. The total population of the three settlements was 236,346, according to the projected population figure of 1996. The status of the park vegetation cover showed a declining trend in this period.

The projected population figures of the three sampled settlements- Saki, Iseyin, and Kisi in 2015 were 198,414, 155,733 and 68,915, totalling of 423,062. Population increase has led to an increase in the demand for shelter and this has imprint on the pattern of settlement expansion. In the year 1972 the population of Saki was 52,234, with settlement size of 6.456km<sup>2</sup>. In 1991 the population of Saki was 89591, with a settlement size of 19.455 km<sup>2</sup>. The projected population size of Saki in the year 1996 was 103,413, with a

growth rate of 2.8 per cent. The change in settlement size between 1991 and 2001 was 9.356 km<sup>2</sup>. While the projected population figures for the year 2015 was 198,414 and the settlement size expanded to cover an area of about 38.621km<sup>2</sup> in 2015. This is in line with the pattern of change in both population and settlement size recorded for other major towns in the OONP area. For instance, Iseyin with a population of 79,839 in the year 1991 had a corresponding settlement size of 13.606 km<sup>2</sup>, its population increased to 92,153 in the year 1996, with a change in settlement size of 17.255 km<sup>2</sup> between 1991 and 2001. Iseyin had a population of 151,491, with a settlement size of 32.215 km<sup>2</sup> in the year 2015 (see Table 4.12).

**Table 4.12 Patterns of Settlements and Population Growth in the OONP area**

S/N	Settlement	Area (Km <sup>2</sup> )				Population			
		1972	1991	2000	2015	1972	1991	2000	2015
1	Saki	6.456	13.189	17.92	38.621	52,234	89,595	114,997	198,414
2	Iseyin	11.132	19.454	28.81	36.643	46,545	79,838	102,474	155,733
3	Kisi	6.25	13.606	17.26	24.36	20,597	40,780	45,347	68,915
4	Tede	3.125	10.371	12.778	17.323	8,557	14,687	18,851	24,820
5	Sepeteri	0.761	1.032	1.5555	3.614	7,196	12,317	14,615	24,025
6	Out	0.976	1.951	2.70	3.63	5,830	11,203	14,379	21,852
7	Tessi-Apata	0.127	0.492	0.648	-	205	386	429	653
8	Ogunlere	-	0.04	0.062	-	173	299	384	583

*Source: Field Survey, 2015*

Similarly, as revealed in Appendices VIII-X, the population of Kisi was 35,330, with a settlement size of 13.183 km<sup>2</sup>. The projected population size of Saki in the year 1996 was 40,780, with a growth rate of 2.8 per cent. The change in settlement size between 1991 and 2001 was 2.731 km<sup>2</sup>. This was in line with the pattern of change in both population and settlement size recorded for other major towns in the OONP area. The projected population



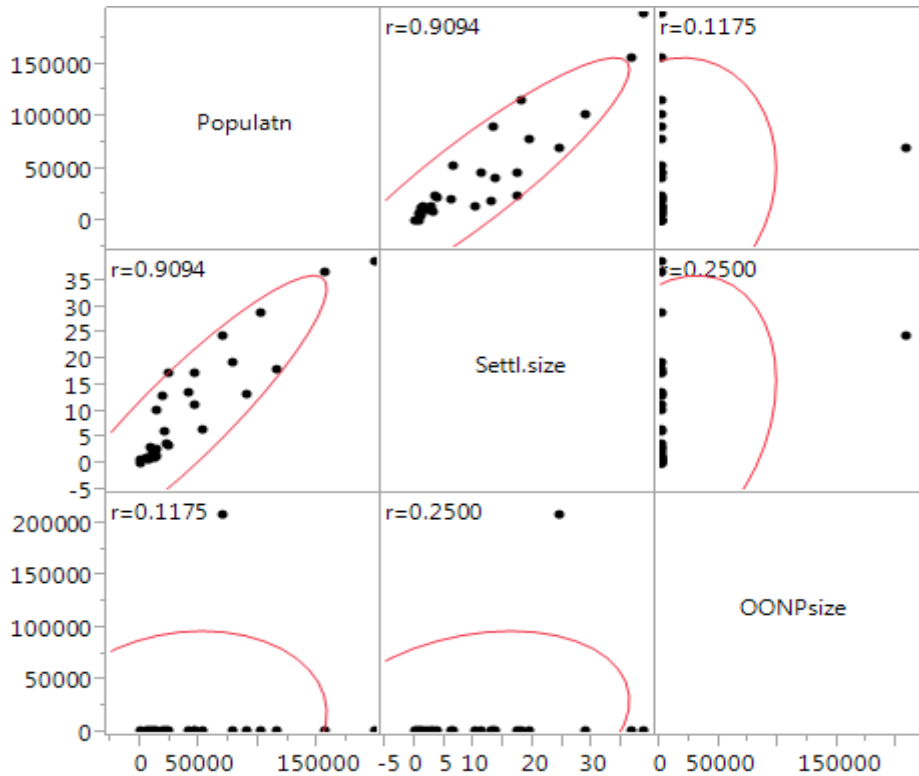
of Kisi in 2014 was 67,038 and the town had a settlement size of 29.764km.<sup>2</sup> These settlements fall in the distance of about 30 km from the edge of the OONP area.

To find out whether or not there is significant correlation between the size of settlements, size of population and size of OONP. Correlation analysis was carried out using spearman correlation analysis. Table 4.14 shows the correlation among the population, settlement size and OONP size (see Figure 4.5 and Appendix X). The results showed that there is a strong positive relationship between population and size of settlement with a correlation coefficient of 0.91. There is weak relationship between population and vegetation cover in OONP with correlation coefficient of 0.12. There is moderate relationship between size of settlement and vegetation cover in OONP with correlation coefficient of 0.25.

Table 4.14: Correlation between population size, settlement size and vegetation cover in OONP

	Population	Settlement Size	OONP Size
Population	1		
Settlement Size	0.9094	1	
OONP Size	0.1175	0.2500	1

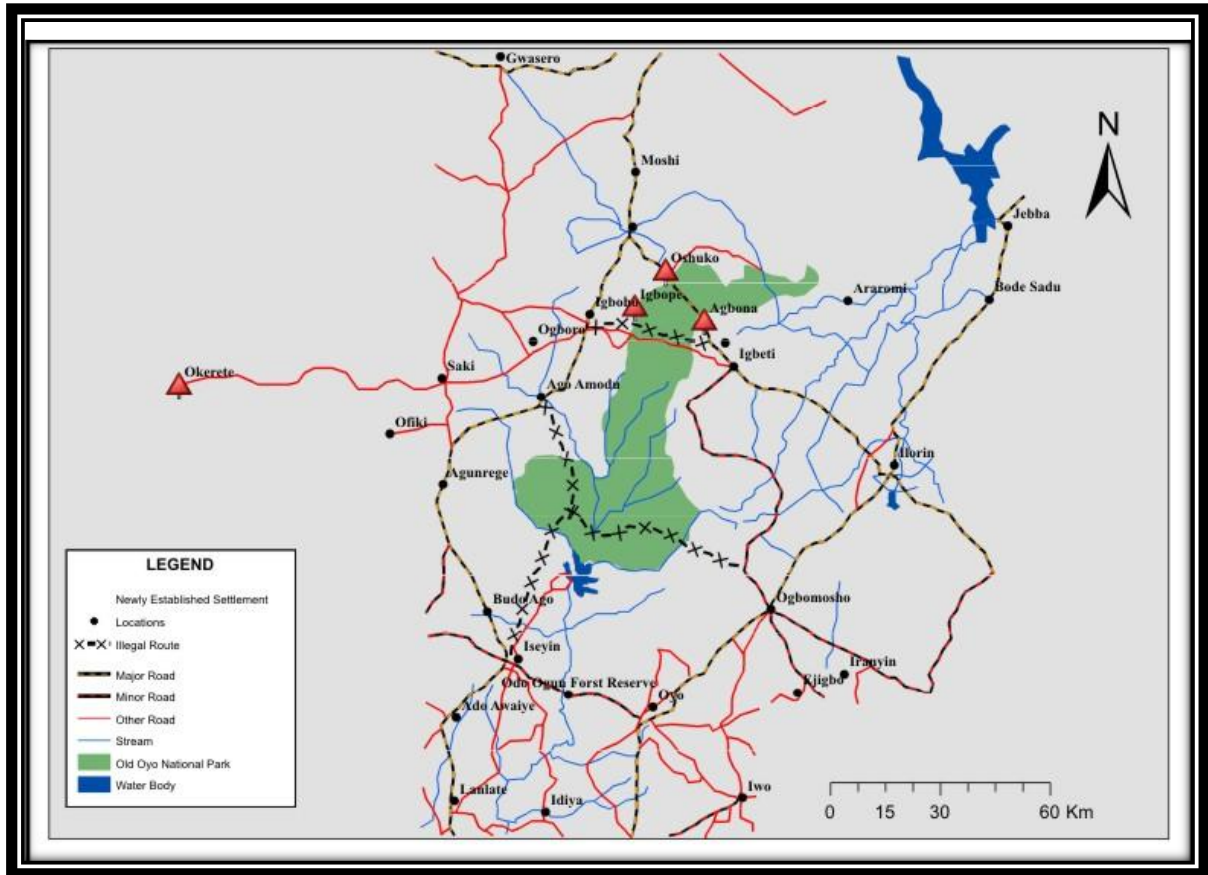
Source: Field Survey, 2005



Source: Field Survey, 2015

**Figure 4.5: Correlation between population size, settlement size and size of OONP**

The park resources are not immune to the effects of the activities of people further away from the park area. For instance, Okerete settlement is about 150km far away from the park area but is connected by road to the park. This chain of relationship could be situated within a parallel form of relation, in which two elements are affected by each other. The group of household heads that participated in the focus group discussion reported that the people viewed their closeness to Benin Republic as an opportunity for cross-border commercial activities. This was reported to be a major factor for the establishment of Okerete settlement (Fig.4.6). The settlement sprung up with a unit of warehouse but today there are hundreds of units of houses in the settlement.



*After Google Earth (2015) & Field Survey, 2015*

**Figure 4.6: OONP Roads and Newly Emerged Settlements**

In Okerete community, people are randomly clustered to facilitate easy contact among traders from Nigeria and Benin Republic. The settlement is connected to Saki through a laterite road. The route bypasses Opara Game Reserve through Saki via Sepeteri, Kisi, and Ilorin. Although the settlement is located outside the park area, it has effects on the OONP wildlife resources in terms of quality and quantity of park resources and vegetation cover in particular, and the wildlife species that depend on large corridor/partch land.



*Source: Field Survey, 2014*

**Plate IV: Okerete Newly Emerged Border Settlement**

The settlement activities depend heavily on infrastructure such as water supply, roads, power, market, and health care services. These impose heavy burden on the wildlife resources, especially where there is direct links between wildlife and human consumption of the same resources. The results showed that there is a strong positive relationship between population of people in the park region and the exploitation of the park resources with a correlation coefficient of 0.986 (Appendix XXI). Development and population exert pressures on the park, leading to degradation of the park environmental conditions.

**4.5 THE ENVIRONMENTAL CONDITIONS OF THE OONP 1972-2015**

The environmental conditions of the OONP can be described under the following major elements; vegetation, wildlife species, hydrological system, and lithosphere. The

discussion of environmental conditions in this study is to focus purely on land cover change and wildlife species analysis.

The changes in environmental conditions in the park are shown in the images (Fig.4.7). The images were displayed in false colour composite for better visualization and feature identification. Various themes, which include built-up areas or settlements; bare surfaces or rocks; forest, fallow land, shrub and farmlands and water bodies, were generated from the classification. The result of classified satellite images showed a variation in the spatial extent of each land use and land cover type through the period 1972-2015. During the last 43 years, the vegetation cover of the OONP decreased in size from 2526.31km<sup>2</sup> in 1972 to 2077.85km<sup>2</sup> in 2014. The bare surface increased in size from 345.12km<sup>2</sup> to 607.63km<sup>2</sup>.

In 1972, forest and vegetation cover occupied the largest proportion of the area, this covered an area of about 463763.25 hectares. The proportion of land area covered by forest and vegetation in the year 2000 was about 434182.59 hectares. This figure showed decrease of about 29580.66 hectares with a percentage change of forest and vegetation cover of -6.38 per cent.

The dynamism of land use and land cover is noticed in the proportion of land that had been converted to agricultural, settlement and built-up areas. The proportion of land use and land cover under forest and vegetation cover was 406,481.74 hectares in the year 2010. This figure depicted a decline of the forest and vegetation cover by 6.38 % between 2000 and 2010. Also, the proportion of land use and land cover under forest and vegetation cover in year 2015 was 375,995.74 hectares. It showed a downward change by 7.5%

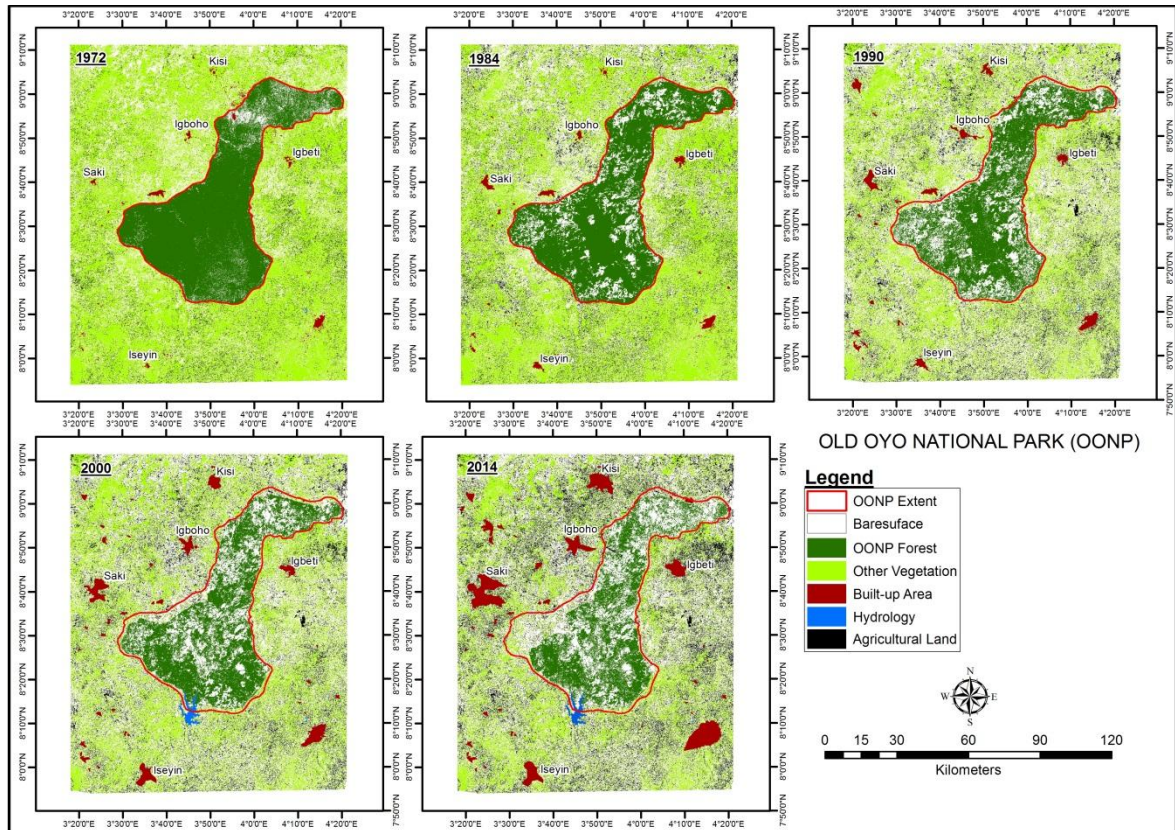
between 2010 and 2015 (see Table 4.14). It also revealed that the vegetation cover in the OONP was continuously reducing.

The area of coverage by settlement cover has also increased. The extent of settlement covers from 1972 to 2000 increased by 1936.08 hectares 0.45%, that is, from 432,637.65 hectare to 434,573.37 hectares. And between 2010 and 2015, it increased by 8,250 hectares, that is, about 1.88 per cent of the area cover in 2010. The result showed that settlement cover was on the increasing trend. In other words, the population was increasing and more people were settling within the park region. According to the field survey, some of these people were engaging in activities that required raw materials sourced from the park land. Some engaged in illegal activities, such as poaching, logging from the park area, and even illegal farming within the park land, which had been prohibited. The trend revealed by this analysis showed that there was encroachment into the park area. As revealed in Table 4.14 below, the area of farmland during the period under study covered 351,110 hectare in 1972. It increased to 406,910.1 in 2000. The percentage change between 1972 and 2010 was 10.6 per cent. The quantity of land under crop production in 2010 was 438,048.95. This figure increased to 454,466.84, and the percentage of change during the period was about 3.75 per cent. These figures were on the increase as a result of intensification of human activities in the study area. Population increased and so was people's demand for more land for crop production.



S/N	Land use	1972 (Hectare)	2000 (Hectare)	Percentage change	2010 (Hectare)	2015 (Hectare)	Percentage change
1	Forest	463,763.25	434,182.59	-6.38%	406,481.74	375,995.74	-7.50%
2	Farmland	351,110	406,910.1	10.6%	438,048.95	454,466.84	3.75%
3	Settlement	432,637.65	434,573.37	0.45%	436,528.95	444,778.95	1.88%
4	Rocks	433,554.39	433,554.39	0.00%	433,554.39	433,554.39	0.00%
5	Shrub	39,898.9	10,433.6	-73.8%	7,424.6	6,141.44	-17.28%

Source: Field Survey, 2015



Source: GLCF Landsat Imagery, 2015

Figure 4.7: OONP Land Use Change and Characteristics Between 1972 and 2015

The results from the classified imagery showed that there was either an increase or a decrease of the various land uses during the period of study. There was an increase in the proportion of land converted to human settlement, farmland, fallow land and shrubs, and bare surfaces, while the proportion of land covered by forests declined. This change can be

observed in Tables 4.14. It shows an increase of 6.74 percent in the proportion of land covered by shrubs, fallow land and farmland; an increase of 0.45 per cent in settlement and built up area coverage, an increase of 0.3 percent in rocks and bare surfaces and a decrease of 6.38 percent in forest coverage.

The satellite images reveal that the dominant land cover in the OONP was vegetation, with a small proportion of human settlement and high road network in the southern part of the park. It also shows that there is high level of human activities in the northern part of the park compared to the southern part. The predominant landscape is human settlement. This constituted about two-thirds of the park regional landscape. Pockets of small farm land and farm settlements dotted the landscape. The major crops being cultivated in the area were maize, yam, cassava, guinea corn.

There has been a change in landscape across the northern part of the park which is seemingly in favour of the vegetation cover regeneration. That is, much of the landscape which originally harboured human settlement has been released. Presently, the area has been recovering, as shown in the 2000 satellite image. In all, there was a slight decrease in human settlement activities in the northern part of the park area and corresponding slight increase in vegetation cover but the reverse was the case in the south. In the park region, human activities and ecological systems were tightly linked. The region had limited infrastructure and services and the use of land and resources inside the park was prohibited. Households in the region, therefore, secured their livelihoods in other spheres of life, such as trading/smuggling activities using the park land area for such engagement (see Table 4.15).



**Table 4.15: OONP Land Use Change and Characteristics in 1972-2015**

<b>Year</b>	<b>Water surface (km.sq)</b>	<b>Bare surface (km.sq)</b>	<b>Vegetation cover (km.sq)</b>
1972	32.06	458.11	2216.27
1995	31.02	475.35	2200.07
<b>Change percentage</b>	<b>3.2%</b>	<b>3.2%</b>	<b>3.2%</b>
2000	28.19	494.92	2183.33
2005	25.98	525.82	2154.64
<b>Change percentage</b>	<b>5.4%</b>	<b>5.2%</b>	<b>5.2%</b>
2010	23.02	559.05	2124.37
2015	21.18	607.63	2077.63
<b>Change percentage</b>	<b>7.9%</b>	<b>7.4%</b>	<b>7.4%</b>

*Source: Field Survey, 2015*

The OONP is drained mainly by the tributaries of River Ogun. The tributaries include: River Owe that drains the east-central part of the park; while River Oppo, which traverses the southern part of the park area; and River Owu, which forms the eastern boundary of the park. The hydrological system in the park has been negatively affected by human activities in the region of the park. Farmers, loggers, charcoal producers, and transporters of illegal products demand for land for transport routes, cropping, animal grazing and trees prompting encroachment upon the park area. The resultant effect was degradation of the environmental conditions of the park, such as physical degradation of the hydrological system in the form of streams and river siltation, and erosion. Information gathered from focus group discussion revealed that formerly, there were ponds along the rivers and streams inside the park area but now those points have silted up.

#### 4.5.1 Vegetation

In 1972, the area that is currently OONP was made up of two contiguous forest cover zones of Oyo-Ile and the southern sector of Borgu Game Reserves. The vegetation of the area was mainly Southern Guinea Savanna. It consists of dense woodlands and forest in the south and central areas; the north and northern parts are typically open savannah woodlands (see Satellite imagery 1972 in Fig. 4.7).

The game reserve vegetation is categorized into four sub-vegetation zones: the forest and dense savanna mosaic woodland along Sepeteri: Tede axis, the dense and open savanna woodland mosaic in the central axis of the park along the Igbeti-Igboho portion; dense savanna woodland north of the Igbeti-Kisi axis; and the open savanna woodland, northeastern portion of the park along the Oyo-Ile sector (Keay, 1959). The last two zones contain the relics and ruins of the Old Oyo Empire. According to Adegbola *et al.* (1976), the quantity of the rainfall in this zone was about 1,800mm. The Sepeteri area has the high concentration of forest resources as a result of its ecosystem that is considered to be favoured biodiversity. The species of trees that are used for production of charcoal were very common in this axis in the period before the proliferation of charcoal business.

The OONP authority reported that a thorough inventory of the plant resources of the game reserve was carried out in 1972. This involved laying of quadrats in specific locations and total counting of the vegetation cover. Each quadrat carried about 239 individual trees made up of 27 different species (FMANR, 1997).

Table 4.16 below reveals the composition of the trees by taxonomy and local name, as reported in the previous studies on the OONP. Thirty-seven tree species were recorded

from different studies carried out by different researchers at various times. These studies covered the period of 1972, 1988, 1994/1996, 2002, and 2008/2009. Twenty-five tree species were recorded by Geerling in 1972, and nineteen tree species were recorded by Oladeji in 2008/2009 (Table 4.16).

**Table 4.16: Desk Review of Trees Resources Composition in the OONP**

S/N	Taxonomy of Plant	Family	Local Name	Geerling (1972)	Ayodele (1988)	Afolayan et al. (1994/96)	Alarape (2002)	Oladeji (2008/2009)
1	<i>Accia nilotica</i>	Mimosoideae	Booni	+	+	+	+	-
2	<i>Adasonia digitata</i>	Obmbacaceae	Igi-Ose	+	-	-	-	-
3	<i>Afzelia Africana</i>	Caesalpinioideae	Igi-Apa	+	+	+	+	-
4	<i>Anageissus leiocapus</i>	Combretaceae	Igi-Ayin	+	+	+	+	+
5	<i>Annona senegaiensis</i>	Annonaceae	Abo	-	+	+	+	+
6	<i>Borassus aeithopum</i>	Palmae	Agbon	+	+	+	+	+
7	<i>Bridelia ferruginea</i>	Euphorbiaceae	Ira	-	-	+	+	+
8	<i>Burkea Africana</i>	Caesalpinioideae	Asapa	+	+	+	+	-
9	<i>Combretum molee</i>	Combretaceae	Okuku	-	+	+	+	+
10	<i>Combretum nigricans</i>	Combretaceae	Igi-Aro	-	-	-	+	-
11	<i>Cussonia barteri</i>	Araciaceae	Sigo	-	-	+	+	-
12	<i>Daniella oliveri</i>	Caesalpinioideae	Igi-Iya	+	+	+	+	+

13	<i>Detarium macrocarpum</i>	Caesalpinioideae	Igi-Ogbogbo	+	+	+	+	+
14	<i>Diospyros soubreana</i>	Ebenaceae	-	+	-	+	+	-
15	<i>Entada Africana</i>	Leguminosae	Igbanso	-	+	-	-	+
16	<i>Gardenia aquala</i>	Rubiaceae	Oruwo-Abo	+	+	-	+	+
17	<i>Gmelina arborea</i>	Verbenaceae	Igi-Melani-	-	-	-	+	-
18	<i>Grewia molis</i>	Tiiaceae	Ora-Igbo	-	+	+	+	-
19	<i>Hymenocardia acida</i>	Hymenncadiaceae	-	-	+	+	+	-
20	<i>Isoberlinia</i>	Caesalpinioideae	Apabado	+	+	-	+	+
21	<i>Khaya senegalensis</i>	Meliaceae	Oganwo	+	-	+	+	+
22	<i>Kigelia africana</i>	Bignoniaceae	Pandoro	-	-	+	+	-
23	<i>Lannea acida</i>	Anarcadiaceae	N/A	+	-	-	+	-
24	<i>Lophira lanceolata</i>	Ochnaceae	Ponhun	+	-	+	-	+
25	<i>Mangifera indica</i>	Anarcadiaceae	Mangoro	+	-	+	-	+
26	<i>Maytenus senegalensis</i>	Celastraceae	Sepolohun	-	-	+	+	-
27	<i>Nauclea latifolia</i>	Rubiaceae	Egbesi	+	-	+	+	+
28	<i>Newbouldiala</i>	Bignoniaceae	Akoko	+	-	-	-	-
29	<i>Parinaricurate</i>	Rosaceae	Idofin	-	-	+	+	+
30	<i>Parkibiglobo</i>	Lemuminosae	Igi-igba	+	-	+	-	+
31	<i>Piliostigmatho nngi</i>	Caesalpiioideae	Igi- Abafe	+	-	+	+	+
32	<i>Prosopis African</i>	Mimosoidea	Ayan	+	-	+	+	-

33	<i>Pterocarpus arinaceus</i>	Papilionoideae	Igi-Apepe	+	+	+	+	-
34	<i>Terminalia macroptero</i>	Combretaceae	Idi	+	-	-	+	+
35	<i>Terminalia glaucescense</i>	Combretaceae	Idi-Odan	+	+	+	+	-
36	<i>Vitex doniana</i>	Sapotaceae	Oori-nla	+	-	+	+	-
37	<i>Vitelloria paradoxum</i>	Avicenniaceae	Igi-Emi	+	-	+	+	+
	Total observed present			25	16	28	31	19

Oladeji *et al.*, 2014 Note: + = Present - = Absent

Fifteen species of trees were identified and recorded in the quadrat used for this study. The study established that the trees species in the park area has reduced. A total of 37 trees species were identified and recorded through various previous studies. Species of trees such as *Adasonia digitata* (Obmbacaceae) Igi-Ose, *Anageissus leiocapus Combretaceae* Igi-Ayin, *Borassus aeithopum* Agbon and *Daniella oliveri* Caesalpinioideae Igi-Iya that were recorded by Olajide in 2008/2009 could not be found in the quadrats used for this study. This may not be unconnected to the decreasing vegetation cover and global change in climate.

Table 4.17 reveals the density of the common tree species in the OONP it is shown that the density of tree cover are generally higher for all the recorded tree species in 1972 than it was found by this study. As revealed in this study, each quadrat carried about an average of 176 individual trees and was made up of 15 different species (see Appendices XIV-XVIII). This report showed that there is a decrease in their number of standing trees in the park area. The absolute tree species density of *Bridelia ferruginea*, Euphorbiaceae Ira, was 106 in 1972 but it reduced to 72 in year 2015.

**Table 4.17: Comparative Analysis of the Density of Predominant Tree Species in OONP (1972 and 2015)**

S/N	Taxonomy of Plant	Family	Local Names	Species composition 1972	Species composition 2015	Absolute density 1972	Absolute density 2015
1	<i>Azelia Africana</i>	Caesalpinioideae	Igi-Apa	3.5	3	8	5
2	<i>Adansonia digitata</i>	Bombacaceae	Igi-Ose	3.3	3	8	5
3	<i>Anogissus leiocarpus</i>	Combretaceae	Igi-Ayin	3.5	3	8	5
4	<i>Bridelia ferruginea</i>	Euphorbiaceae	Ira	44	43	106	72
5	<i>Burkea Africana</i>	Caesalpinioideae	Asapa	10.5	7	25	12
6	<i>Pterocarpus erinaceus</i>	Papilionoideae	Igi-Apepe	12.5	8	30	14
7	<i>Piliostigmtho nngii</i>	Caesalpinioideae	Igi-Abafe	15.0	7	36	12
8	<i>Vitelloria faradoxum</i>	Avicenniaceae	Igi-Emi	4.5	2.5	11	4
9	<i>Daniella oliveri</i>	Caesalpinioideae	Igi-Iya	4.5	2.5	11	4

Source: Field Survey, 2015

Table 4.18 shows that there are twenty-five standing species within a quadrat used for the survey in 1972, while Table 4.18 below reveals that there is change in the quantity of standing tree species within a quadrat. It shows an average of fifteen standing tree species available in a quadrat in 2015.

**Table 4.18: Trees Resources Composition in the OONP in 1972**

S/N	Taxonomy of Plant	Family	Local Name	Geerling, 1972
1	<i>Accia nilotica</i>	Mimosoideae	Booni	+
2	<i>Adasonia digitata</i>	Obmbacaceae	Igi-Ose	+
3	<i>Afzelia Africana</i>	Caesalpinioideae	Igi-Apa	+
4	<i>Anageissus leiocapus</i>	Combretaceae	Igi-Ayin	+
5	<i>Borassus aeithopum</i>	Palmae	Agbon	+
6	<i>Burkea Africana</i>	Caesalpinioideae	Asapa	+
7	<i>Daniella oliveri</i>	Caesalpinioideae	Igi-Iya	+
8	<i>Detarium macrocarpum</i>	Caesalpinioideae	Igi-Ogbogbo	+
9	<i>Diospyros soubreana</i>	Ebenaceae	-	+
10	<i>Gardenia aquala</i>	Rubiaceae	Oruwo-Abo	+
11	<i>Isoberlinia</i>	Caesalpinioideae	Apabado	+
12	<i>Khaya senegalensis</i>	Meliaceae	Oganwo	+
13	<i>Lannea acida</i>	Anarcadiaceae	N/A	+
14	<i>Lophira lanceolata</i>	Ochnaceae	Ponhun	+
15	<i>Mangifera indica</i>	Anarcadiaceae	Mangoro	+
16	<i>Nauclea latifolia</i>	Rubiaceae	Egbesi	+
17	<i>Newbouldiala</i>	Bignoniaceae	Akoko	+
18	<i>Parkibiglobo</i>	Lemuminosae	Igi-igba	+
19	<i>Piliostigmatho nngi</i>	Caesalpipioideae	Igi- Abafe	+
20	<i>Prosopis African</i>	Mimosoidea	Ayan	+
21	<i>Pterocarpus arinaceus</i>	Papilionoideae	Igi-Apepe	+
22	<i>Terminalia macroptero</i>	Combretaceae	Idi	+
23	<i>Terminalia glaucescenese</i>	Combretaceae	Idi-Odan	+
24	<i>Vitex doniana</i>	Sapotaceae	Oori-nla	+
25	<i>Vitelloria paradoxum</i>	Avicenniaceae	Igi-Emi	+
Total observed				25

Source: Geerling, 1972

**Table 4.19: Trees Resources Composition in the OONP in 2015**

S/N	Taxonomy of Plant	Family	Local Names
1	<i>Annona senegaiensis</i>	Annonaceae	Abo
2	<i>Bridelia ferruginea</i>	Euphorbiaceae	Ira
3	<i>Combretum molee</i>	Combretaceae	Okuku
4	<i>Cussonia barteri</i>	Araciaceae	Sigo
5	<i>Detarium macrocarpum</i>	Caesalpinioideae	Igi-Ogbogbo
6	<i>Entada Africana</i>	Leguminosae	Igbanso
7	<i>Grewia molis</i>	Tiaceae	Ora-Igbo
8	<i>Isobertinia</i>	Caesalpinioideae	Apabado
9	<i>Khaya senegalensis</i>	Meliaceae	Oganwo
10	<i>Mangifera indica</i>	Anarcadiaceae	Mangoro
11	<i>Parinaricurate</i>	Rosaceae	Idofin
12	<i>Parkibiglobo</i>	Lemuminosae	Igi-igba
13	<i>Pterocarpus arinaceus</i>	Papilionoideae	Igi-Apepe
14	<i>Terminalia macroptero</i>	Combretaceae	Idi
15	<i>Vitelloria paradoxum</i>	Avicenniaceae	Igi-Emi
Total observed present standing trees in 2015			15

Source: Field Survey, 2015



#### 4.5.2 Wildlife Species

Ayodele in (1988) carried out a survey of ecological monitoring of the forest and wildlife species in the region before the establishment of the OONP the study revealed that there were about twenty-four species of animals, eleven species of birds and about ten species of reptiles (see Table 4.20). This was considered sufficient to justify the establishment of the Park.

**Table 4.20: Animals, Birds and Reptiles Commonly Found in the Old Oyo National Park in 1988**

<b>ANIMALS</b>	<b>SCIENTIFIC NAME</b>
Baboon	<i>Papio Anubis</i>
Buffalo	<i>Syncerus caffer</i>
Bush-buck	<i>Traquelaphus scritus</i>
Caracel	<i>Felis coreacel</i>
Civet	<i>Viverra civetta</i>
Elephant	<i>Loxodonta Africana</i>
Genet	<i>Genetta liqoina</i>
Grey duiker	<i>Sylcicarpra grimmia</i>
Hippopotamus	<i>Hippopotamus amphibious</i>
Hunting dog	<i>Lycaan pictus</i>
Kob	<i>Kolus kob</i>
Lion	<i>Panthere leo</i>
Oribi	<i>Ouerebia ourebi</i>
Patas monkey	<i>Erythrocebus patas</i>
Red-flanked duiker	<i>Erythrocebus patas</i>
Reed buck	<i>Redunca reduna</i>
Roan antelope	<i>Hippotragus equines</i>
Serval cat	<i>Felis serval</i>
Side-tripped jackal	<i>Canis adustus</i>
Tantalus monkey	<i>Cercopithecus aethios</i>
Warthog	<i>Phacochoerus aethipicus</i>
Waterbuck	<i>Kobus defassa</i>
Western hartebeest	<i>Alcelaphus briselaphus</i>
White-trailed mongoose	<i>Ichneumia albicanda</i>

<b>BIRDS: COMMON NAME</b>	<b>SCIENTIFIC NAME</b>
Black kite	<i>Milvus migrans</i>
Cattle egret	<i>Ardea ibis</i>
Doublblespurrees francolin	<i>Francolinus bicalcaratus</i>
Green pigeon	<i>Treron autralis</i>
Grey backed eremonmela	<i>Erekomela pusilla</i>
Guinea – fowl	<i>Humida Melegris</i>
Long crested hawk eagle	<i>Lophaetus accipitolis</i>
Langhin dove	<i>Stigmatopella senegalerises</i>
Purple heron	<i>Ardea ibis</i>
Osprey	<i>Pardian haliaetus</i>
<b>REPTILES: COMMON NAME</b>	<b>SCIENTIFIC NAME</b>
Nile crocodile	<i>Crocodulus nilolicu</i>
Nile monitor lizard	<i>Varanus nitticu</i>
Hihged tortoise	<i>Kinixy belliana</i>
Water terrapins	<i>Pelusios adanson</i>
Black cobra	<i>Naja melanonka</i>
Garbon viper	<i>Bitis gobonica</i>
Rock python	<i>Pathon sebae</i>
Royal python	<i>Python regins</i>
Agama python	<i>Agama sp.</i>
Chameleon	<i>Chamaelo gracilis</i>

*Source: Ayodele, 1988*

Alarape (2002), Haruna (2003), Tijani (2007), Oladeji (2008) and Oladeji *et al.*, (2014) assert that there is no information on some of the animals initially claimed to be available in the park. These species include; elephant, lion, mangabey, secretary bird, hunting dog, and fox.

**Table 4.21: Animals, Birds and Reptiles Species Sighted in the Ranges of OONP**

SCIENTIFIC NAME	COMMON NAME	TEDE RANGE	MARGUBA RANGE	SEPETERI RANGE	OYO-ILE RANGE	IKOYI RANGE	TOTAL
<b>Animals: Scientific Name</b>	<b>Common Name</b>						
<i>Kobus kob</i>	Kob	-	58	-	-	-	58
<i>Tragelaphus scriptus</i>	Bush buck	-	-	-	-	-	-
<i>Viverra civetta</i>	Civet cat	1	-	-	-	1	2
<i>Cephalophus rehilants</i>	Red flanked ducker	-	-	-	-	-	-
<i>Phonocroerus eathiopticus</i>	Warthog	*	-	-	-	-	-
<i>Erthercebus patas</i>	Red patas monkey	16	-	2	-	-	18
<i>Hippotragus equines</i>	Roan antelope	-	-	-	-	-	-
<i>Cercopithecus tentalus</i>	Tantalus monkey	-	1	-	-	-	1
<i>Papio amubis</i>	Baboon	-	14	8	9	1	32
<i>Kobus defassa</i>	Water buck	-	-	-	-	2	2
<i>Alcepaphus buselaphus</i>	Western hartebeest	*	-	-	-	-	-
<i>Sylvicarpa grimmia</i>	Grimm's duiker	1	-	-	-	-	1
<i>Cercopithecus aethiops</i>	Green monkey	-	4	-	-	-	4
<i>Ourebia ourebi</i>	Oribi	1	-	-	-	-	1
<i>Synercus caffer</i>	Buffalo	-	-	-	-	-	-
<i>Philatomba maxwelli</i>	Maxwell's duiker	-	-	1	2	-	3
<i>Procavia ruficeps</i>	Tree hyrax	1	-	-	-	-	1
<i>Anomalurus beecrofti</i>	Flying squirrel	-	-	-	10	-	10
<i>Thrynomys swinderiansnus</i>	Grass cutter	2	15	-	1	-	18
<i>Heliosciuru gambianus</i>	Ground squirrel	5	1	-	2	-	8
<i>Lepus capensis</i>	Hare	-	1	-	-	-	1
<i>Atilas paludinosus</i>	Mongoose	-	-	-	1	-	1
<b>Birds: Scientific Name</b>	<b>Common Name</b>						
<i>Francolinus bicalcaratus</i>	Bush fowl	8	-	2	6	-	16
<i>Numida meleagris</i>	Guinea fowl	-	-	-	23	-	23
<i>Columba guinea</i>	Speckied pigeon	2	1	-	-	-	3
<i>Tochus nasutus</i>	Grey hornbill	1	-	-	-	-	1
<i>Bubo africanus</i>	Owl	1	-	-	-	1	1
<b>Reptile: Scientific Name</b>	<b>Common Name</b>						
<i>Gopherus agassiji</i>	Tortoise	-	-	-	-	1	1
<b>Totals</b>		41	95		13	59	206

Source: Field Survey, 2015

The protection of forest and wildlife was emphasized in the establishment of OONP on the platform of the agro-forestry contiguous landscape of Old Oyo Game Reserve and the Borgu sector of Kainji Lake Game Reserve. This indicated that the establishment of the park would greatly impact on the environmental conditions. Linkage between city and the hinterland that affect park environmental conditions should not be neglected because this factor has been playing important roles in changing the environmental conditions of the park. There is demographic interaction between city and the hinterland, such as rural - urban migration and flow of goods in order to meet local and urban demands and to provide raw materials for the processing of commodities for exports. Materials are taken from the park to supply basic raw materials for producing final products for consumption by the people in urban and rural areas.

As seen in the aim and objectives of establishing the parks, they serve as a sanctuary for forest and wildlife. They provide a pool of both forest and wildlife resources that usually are exploited and supplied as raw materials to take care of the shortfall being experienced in the urban centres. The supply helps in increasing production to meet up with the high consumption level of the people living in urban centres. Globally, mitigating the challenge posed by rapidly increasing population growth and expansion of human settlements, coupled with the corresponding increase in human activities, requires supply of raw materials from the hinterland to the urban centres. The pressure exerted on the forest and wildlife resources, not envisaged when establishing the park, the recent modernized way of park resources exploitation and mass consumption of natural resources facilitate foreign penetration and introduction of new technologies into the exploitation of

the park materials, which, in turn, have adverse effects on the environmental condition of the park.

#### **4.6 EFFECTS OF HUMAN ACTIVITIES ON THE OONP ENVIRONMENTAL CONDITIONS 1972 - 2015.**

Despite the increasing control and management of the park resources, much of the vegetation cover has been on the decline across the study period. This may be an indicator of change in the park environment, which makes it non-sustainable. The pressure exerted by the rising size of human population and the resulting intensification of farming activities are impacting on the park vegetation cover. The people needs shelter, hence the demand for timber, which is processed and used for construction and fuel material. Widespread logging and felling of trees, as well as poaching of animals, have been carried out in order to cater for the increasing population. The landscapes inside the park area which is supposed to be conserved and protected against human activities, have been subjected to man exploitation of important materials like timber, fuel wood, and building materials. These activities seem to lower the plants' species richness, especially woody pioneer species. In some cases, the juvenile classes have been completely removed by over-exploitation and tend to cause a degraded vegetation pattern.

Habitat disturbance became prominent from the late 1990s to date as a result of proliferation of cross-border trading of fairly used vehicles, cloth, fuel, rice, cashew nut, and timber products, like planks, in the OONP area. Illegal smuggling routes were opened up within the park land; this development gave way to increased number of patches of habitat vegetation, which created more edges, smaller patches and negative consequence on park wildlife that required wide land area for their habitation.

4.6.1 *Transport*: These human activities generate substantial and growing volume of traffic when transporting goods across the park area. This study revealed that fairly use vehicle (popular called Tokunbo) has been smuggling into the country from Benin Republic and Togo through Saki by vehicle crossers from the OONP. On the average, a total of 196 motorcycles, 65 trucks, 245 buses and 465 cars passed through the park area per week. The total number of traffic flow in the park area per week is 726. The average monthly total traffic flow is 2904, and 34,848 per annum (see Appendices XIX and XX)

High levels of traffic flow cause noise pollution and this is often a deterrent and danger to the park wildlife resources because noise pollution usually drives animals away from their habitats and this leads to a decline in wildlife resources of the OONP.

4.6.2 *Economic activities*: in Okerete community facilitate the use of natural resources and discharge waste in ways not conducive to environmental quality. These activities have short-and long-term effects on the OONP leading to rapid depletion of park resources. The strong dependence of the community on firewood and charcoal has been economically costly. It worsens air pollution from automobiles, which contribute to human and wildlife health problems. The contact creates a favourable condition for rapid spread of a variety of infectious diseases, which leads to depletion of wildlife population. The settlement is denied possibilities of exchange of animals between sites.

4.6.3 *Crop production*: During the last 43 years, the vegetation cover of OONP decreased in size from 2526.31km<sup>2</sup> in 1972 to 2077.85km<sup>2</sup> in 2014. The bare surface increased in size from 345.12km<sup>2</sup> to 607.63km<sup>2</sup>. The changes in environmental conditions in the park are shown in the images (Fig.4.7).The trend of change in size of land use for crop production is show in Table 4.23. As revealed in the table, the size of land taken from the

park area and used for crop production in 1972 was about 0.93 per cent(which is about 13.83 hectares) of the total land area used for crop production in that period. This should be considered to be insignificant in relation to 1990, 2000, and 2014, with 2.78 per cent, 4.00 per cent, and 5.25 per cent, respectively.

**Table 4.23: Encroachment on OONP Land 1972-2015**

Year	Park Area	Non-Forest Land Use (ha)	Difference	Percentage (Cumulative)
1972	2526.31	23.49	2502.82	0.93
1984	2526.31	41.43	2484.88	1.64
1990	2526.31	70.22	2456.09	2.78
2000	2526.31	101.04	2425.27	4.0
2014	2526.31	132.62	2393.69	5.25

*Source: Field Survey, 2015*

The cultivated area steadily increased from 1972 to 2014 (see Fig. 4.1). The demand for more resources from the park area to meet both subsistence and commercial needs increased due to increase in human population. Vegetation cover reduced and protected fewer habitats for wildlife resources.

Much of the park area, once dominated by evergreen canopy forest, later succumbed to agricultural expansion shortly after the establishment of the OONP. This was matched up with the presence of the Oyo North Agricultural Development Project (ONADEP) headquarters in the region. Human population in the region continuously increased due to natural increase and migration. In this period, more land was put into intensive cultivation to supply food for the ever-expanding population in the region and beyond. The population figure of the sampled settlements was 141,337 in 1972 and the size of farmland during the period was 351,110 hectares. The population has increased to 297,097 and the farmland

increased to 4,069,101 hectares in 2000. The newly created local government areas and agricultural development projects were a catalyst that pulled people into the region because of tremendous in-flow of revenue to the region from the regional infrastructure and this facilitated incursion of human settlement into the park area.

Although modern farming has been successful in boosting crop production, it has also facilitated high degree of environmental degradation. The farming activities primarily for crop production, caused loss of vegetation cover (Fig.4.7). Farm land and farm settlement also replaced natural forest and vegetation cover. The natural ecosystem inside the park land in the period prior to farming encroachment was relatively stable. The vegetation cover was 2216.27km<sup>2</sup> in 1972 but, at present, the vegetation cover has declined to 2077.85km<sup>2</sup>. This human activity alone could be responsible for great loss of park resources and portends negative park environmental conditions. The activities of the settlers in this region are not compatible with natural resources conservation and positive park environmental conditions.

4.6.4 *Logging*: This activity is affecting the environmental conditions of the park negatively. People in the park region depended on the parks' resources for their livelihood. The impact of logging on the park environment was significant. Logging led to loss of plants and animals and influenced the composition, diversity and resource richness of the park. The park vegetation cover was negatively affected through cutting of trees for timber. The richness and diversity of biological materials in the park changed with pressure exerted on the park from logging. Logging in the OONP reduced woody canopy cover, and altered the composition of woody plant species. Animal species depend on the disturbed habitat for food and shelter. Reduction or alteration in their habitats, therefore, forced the



species to migrate to other areas. The exploitation of logs and wood from the park area was the driving force behind destruction of the park resources such as vegetation and animal species. Deforestation leads to destruction of wildlife habitat and dwindling of wildlife resources. This study revealed that important animals like lion, elephant and buffalo were no longer available in the park.

The ability of the park to sustainably supply these forest products has been threatened by the change in environmental conditions inside the park area. The vegetation cover inside the park area has been continuously declining; it reduced from 2216.27 km<sup>2</sup> in 1972 to 2077.63 km<sup>2</sup> in 2014. By implication, if this trend continues, there is going to be total loss of vegetation cover within the park area in the nearest future.

4.6.5 *Charcoal business*: The study revealed that there was constant percentage increase in the tonnage of the charcoal produced and sold in the cities. The revenue generated from the charcoal export from Saki, Iseyin and Kisi, amounted to about ₦12,960,000:00, ₦8,640,000:00 and ₦6,480,000:00, respectively in 2014. Charcoal demand continues to increase with the demand pressures exerted by the growing settlement expansion and, consequently, urbanization. Sustainable production of wood-based fuel can assist rural area development through the small-scale enterprises' segmentation of charcoal production and distribution systems. Overall, the result from this survey showed the dynamics of land use related to the loss of forests and wildlife species environmental elements of the OONP. An estimate of about 486 tons of tree forest canopy was lost in the process of producing about 37.6 tons of charcoal. Much of the park vegetation cover and evergreen trees canopy forest succumbed to the pressure being exerted on the park resources. The decline in vegetation and wildlife species in the park area has important ecological and social implications. It

determines the ability of the park to fulfil important ecological processes like provision of favourable habitat for wildlife species.

4.6.6 *Hunting*: This activity has caused decline in biodiversity through loss, modification, and overexploitation of wildlife species. The spatial distribution of many animal species in the park area has been reduced due to hunting. It was reported that most of the animals that had commonly been found in the park area were very scarce. The decline in wildlife resources was linked to the fact that the park environmental conditions changed drastically in recent times.

The local community members' right to commercial exploitation of wildlife and several other forest resources has been extinguished. This unfortunately encourages illegal poaching. However, the respondents revealed that hunting and logging activities were not limited to the villagers alone; hunters and loggers would come from places like Saki, Iseyin, and Ogbomoso to hunt in the park area. The activities of the people from those towns were reported to even be more pronounced than the villagers' because they normally came for hunting with sophisticated hunting implements.

Hunting of wildlife provides products and income to the people. It has pronounced effects on land use and the habitat of wildlife in the OONP area and, in some cases; some animal species face local and global extinction. Between 1972 and 2015, the population of animals in the OONP drastically decreased. The important animal species affected included the African forest elephants and lion.

About 47 per cent of the respondents sampled reported that the resources were very difficult to find in the park area. Out of the remaining 53 per cent of the respondents, 35 per cent claimed that restriction by government officials was one of the factors responsible

for difficulty in having access to the park resources. About 15 per cent of the respondents attributed the challenges in accessing the park resources to the problem of transportation. The remaining 3 per cent of the respondents claimed that they were aware of punishment awaiting trespassers (Table 4.24)

**Table 4.24: Factors Responsible for OONP Resources Accessibility**

S/N	Factors	Frequency	Percentage
1	Very scarce to find within the park area	567	47
2	Denying of access by the government agents	422	35
3	Problem of transportation	181	15
4	Awareness of punishment awaiting the offender	36	3
	Total	1206	100

*Source: Field Survey, 2015*

As shown in the satellite image of 2000, this area became nearly a complete island of forested land cover surrounded by intensive small-scale agriculture along with a small degree of road network which might have led to a kind of habitat fragmentation for the presence of wildlife resources in this area.

4.6.7 *Settlement:* Areas that were covered by forest in the past have been encroached upon by human settlement and farmlands. More roads have been constructed, and more areas have been laid bare through man's quest for sustenance. This change in human activities during the period under study is captured in Table 4.19. The expected human activity system with its corresponding land use change for year 2010 is also projected based on the change between 1990 and 2000. This projected change would only come up,

if the situation and circumstances that were attainable during the period of the study remain constant, a slight change in the factors would give a different land use for 2010.

The exploitation of wood and construction of roads have greatly reduced the forest in the park area. In the process, the large, mature and premature as well as important seed trees have been reduced, especially to meet fuel wood needs. Hardwood species became scarce due to their economic value; they were over-exploited to produce charcoal, and used as building materials. The expansion of this settlement led to increase in demand for land and its resources, thus resulting in reduction in both quality and quantity of wildlife habitat, and aggravating negative park environmental conditions. The development of farms, ranches, communication routes, and commercial centres have markedly altered the landscape of the region. These alterations may exert lasting effects on the quality of life of the habitat and biodiversity in the region.

#### **4.7 CONCLUSION**

The OONP, which is claimed to be one of the leading hot spots of tropical region ecotourism circuit, has not been performing well owing to the change in park environmental conditions this, in turn, affects the amount of revenue realized from the ecotourism activities in the park area. If this trend of deforestation is not curtailed, the OONP may likely be faced with desertification problem and biological species extinction sooner than can be imagined.

## **CHAPTER FIVE**

### **SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS**

#### **5.1 SUMMARY OF FINDINGS**

This study showed that the ongoing human activities in the OONP area have effects on the park environmental conditions. Excessive demand for housing and livelihood means are part of the resultant effects of rapid population, settlement expansion in the region and external markets for forest and wildlife products. The human activities identified in this study were; crop production, logging, hunting, charcoal business, animal grazing, firewood collection, settlement development, regional infrastructure, and bush burning. The study also revealed that crop production was the main occupation of the people in all the settlements in the park region but the extent of people engagement is differed from community to community.

The research also revealed that 1486.56 km<sup>2</sup> of the region land area was used for farming in 1972. It increased to 3811.85 in the year 1990 and also increased to 5014.89 km<sup>2</sup> in 2014. The average farm size in the OONP area ranged from 0.8 to 4 hectares. The area of farmland within the study area covered 351,110 hectares for crop cultivation.

Farming encroachment into the park accounted for about 3.75 per cent of the land area in 1978. This increased to 454,466.84 hectares in 2015. Clearing of the natural forest in the area for crop production led to destruction of park environmental conditions.

There was proliferation of sawmills in the OONP area and logging activity supported the business favourably. The activities of illegal loggers are rampant till date. This leads to the depletion of the forest/vegetation cover within the study area. The market

threshold of timber products covered both local and international markets, that is, Oyo, Ibadan, Lagos, Sokoto, Europe, Togo, Parakou, Safe, and Niki, in Republic of Benin. The wood products commonly traded in the study area included Mahogany, Iroko, Obeche, Sapale-wood, Araba soft-wood, and Teak wood (Gedu).

The research showed that the market demand for charcoal has been continuously decimating the park resources because vegetation cover has been destroyed to get logs and wood for charcoal production. Increase in population and settlement size and their distribution are always a reflection of the historical connection of the urban space. The Saki, Iseyin, and Kisi people that specialized in this business are not in the immediate park host community but owing to the strong supply chain that exists products come from the park forest resource base. The major market for this product is the major towns and cities in the south west, Nigeria, complemented with export to European countries.

The study also revealed that the activities of hunters from towns and cities are more pronounced than those of their villagers' counterpart; they often entered the Park area at night with sophisticated weapons. The catering/restaurant outfits in Saki, Igboho, Iseyin, Oyo, Ogbomoso, Kisi and Ibadan revealed that, over 80 per cent of them sold bush meat. They asserted that they received regular supply of the product from the surrounding villages.

The proportion of land use and land cover under forest and vegetation cover was 406481.74 hectares in the year 2010. This figure depicted a decline of the forest and vegetation cover by 6.38 % between 2000 and 2010. Also, the proportion of land use and land cover under forest and vegetation cover in 2015 was 375,995.74 hectares. This showed a downward change by 7.5% between 2010 and 2015.

As revealed in the 1972 survey, there were about 239 individual trees, made up of 27 different species in each quadrat used for the survey (OONP, 1995). The survey conducted in 2015 showed that each quadrat carried about 176 individual trees, made up of 15 different species. This report showed that there was decrease in the number of standing trees in the park area. The absolute tree species density of *Bridelia ferruginea*, Euphorbiaceae, was 106 in 1972; but it reduced to 72 in 2015.

The study found that habitat disturbance became prominent in the late 1990s, and continues to date, as a result of proliferation of cross-border trading of fairly used vehicle, cloths, fuel, rice, cashew nut, and timber products, like planks, in the OONP area. This implies that the urban-based human activities outside the park land, like housing development and its corresponding demand for forest products, especially wood/planks for construction work, is on the increase in the OONP area. Most of these settlements are expanding and their expansion results in intensification of deforestation of the park area, which depicts a negative consequence on park environmental conditions. The activities of the park host communities, such as farming, poaching, illegal bush burning, fetching of firewood, were at a subsistence level, therefore, they had minimal adverse effect on the park.

The satellite imagery revealed that the dominant land cover in the OONP is vegetation, with a small proportion of human settlement and high density of road network in the southern part of the park. It shows that there has been an increase of 6.74 per cent in the proportion of vegetation cover that has been converted to shrubs, fallow land and farmlands and an increase of 0.45 per cent in human settlement or built up area coverage, and yet an increase of 0.3 per cent in bare surface and a decrease of 6.38 per cent in forest

coverage. As the population increased, so was the demand for more resources from the park to meet both subsistence and commercial needs, thereby leading to reduction in vegetation cover.

## **5.2 ANSWERS TO THE RESEARCH QUESTIONS**

### **5.2.1 Types and patterns of human activities in the OONP region between 1972-2015**

The human activities in OONP area include: crop production, logging, charcoal business, animal grazing, firewood collection, settlement development, regional infrastructure, hunting, and bush burning.

People from major settlements are intensively involved in charcoal business, while people from smaller settlements are involved in crop production for subsistence. The farm lands are irregular both in size and shape. The average farm holding was 2.0 hectares in 1972.

Most of the farms in the southern part of the park region are below 0.8 hectares (2 acres), while the sizes in the northern part of the park is 2 - 4 hectares (5-10 acres). About 1486.56 km<sup>2</sup> of land area was used for farming in 1972 and this land area was increased to 3811.85 by the year 1990 and also increased to 5124.49 km<sup>2</sup> in 2014.

### **5.2.2 The changes in environmental conditions of OONP between 1972 and 2015**

Forest cover of the park declined from 2526.31 km<sup>2</sup> in 1972 to 2077.85 km<sup>2</sup> in 2015. The density of the hitherto predominant tree species in 1972 was 106 but the figure decreased to 72 in 2015. Due to the reduction in wildlife resources, important animals, like lion, elephant, and mangabey, were no longer in the park in 2015.



### **5.2.3 The structure and the implications of the supply chain of forest products exploitation in OONP**

There is exploitation of logs and wood from the park area to meet the needs of people in the region and beyond. Expansion of human settlements and crop production increased demand for forest resources, such as logging, hunting, and encroachment on the park area.

The once time dominant forest cover gradually gave way to crop production owing to high demand for farm products. The OONP is suffering from the effect of the ever-growing demand for charcoal in the region and beyond.

### **5.2.4 The effects of human activities on the OONP**

Destruction of wildlife habitat through deforestation, as the settlement denied possibilities of exchange of animals between sites. Pollution, toxic emissions from the automobiles contribute to wildlife health problems, leads to dwindling of plant and animal species of the park; and degrading of the quality of the tourist attraction potential of the park.

## **5.3 IMPLICATIONS OF THE FINDINGS**

Deforestation leads to destruction of wildlife habitat and dwindling of wildlife resources. The richness and diversity of biological resources in the park has changed with the pressure exerted on it from farming, logging, charcoal production, animal grazing, settlement expansion, and hunting activities. One of the consequences of the OONP environmental degradation is that the park may likely be faced with the challenge of desertification if the pressures mounted on it is not promptly curtailed and biological species extinction would set in sooner than can be anticipated. The OONP, which was one

of the strongholds of wildlife in the tropical region, has gradually lost her glory in the ecotourism market system. Important animals, such as lion and elephant, that served as major tourist attraction, are no longer available in the park owing to negative changes in park environmental conditions.

The social implications of the changes in environmental conditions in the OONP include loss of revenue base of the park. Also, as the park environmental condition is degrading, the ability to manage its ecotourism potential becomes a challenge.

The OONP management and tourism promoters have been facing challenges of park environmental degradation as this park environmental conditions can to a large extent determine the success or failure of the park and its ecotourism development efforts. One of the fundamental requirements for ecotourism development in national parks is to show that the park possesses tourist attraction of higher tourist values when judged by comparative and competitive global standards in terms of the park environmental conditions. Adequate ecological information and management planning underlie successful park development. This would help in estimation of the carrying capacity of the park and determine its management strategies. It is far better to protect and conserve the park environment than to restore it, because some types of environmental damage are irreparable.

The ecosystem consequences of farming infiltration on the OONP area enhance the share of primary production of food and fibre for human consumption, but decrease the share available for other ecosystem functions. The farming activities reduce use of habitats by limiting wildlife movement because animals avoid areas with high level of human activities. This implies that farming activities cause habitat loss by forcing wildlife to abandon their habitat. Although farming is essential for human existence, the types of

farming and the methods adopted could pose a threat to people and the environment. Cutting and burning destroy wildlife and vegetation cover, and expose (the park area to direct sun) reducing the soil fertility and, consequently, soil erosion.

Park environmental degradation suggests that the park resources have been over-exploited through the rampant clearing of forest to cultivate crops without considering the effects of farming on the park environment. Park resources decline when the use of park area is converted from a relatively stable or undisturbed condition to more rigorous uses, like farming, logging, animal grazing, firewood collection, charcoal production and settlement expansion. These human activities alter the landscape and determine the ability of the park biological systems to support human population. It also affects the vulnerability of areas and its biodiversity to socio-economic, political and climatic challenges. As it is globally, the diversity of species and ecosystems is declining in the OONP. Environmental degradation is a major challenge facing the OONP. The loss of her once rich variety of vegetation cover and wildlife species diminishes the regional store of biodiversity. This poses an enormous threat to the nation's ecotourism development and undermines the livelihoods of those that rely on the local environment for their livelihoods.

#### **5.4 CONCLUSION**

The study commenced by identifying the human activities that are directly or indirectly linked to the OONP. This was followed by determining the environmental elements considered in the study. Two main groups of human activities were identified, namely, human activities and human-induced related activities. The environmental conditions considered in the study were vegetation and wildlife resources of the park.

The analysis showed that each of the human activities identified affects the park environmental conditions in different ways and at various magnitudes. The analysis revealed that the state of the park environmental elements has been deteriorating. Most of the activities in the park area and beyond have negative effects on the park.

It was also found from the study that park environmental degradation is a signal that human population is increasing. This has expanded the magnitude of the dependency of people on park resources to meet the needs to cater for people's shelter and other livelihood needs, which implies that park environmental degradation is an end product of the human activities.

In view of the above, one may conclude that the human activities in the park region have effect on the park environment conditions.

## **5.5 RECOMMENDATIONS**

Confronting the negative effects of human activities on the park environment will require the following policy steps:

- i. Recognising the fact that human population, settlement expansion, and meeting the need for personal development are the basis for sustainable park and sustaining the park environment. Therefore, there is need to assess and manage inherent trade-offs between meeting these needs and sustaining the park healthy environment. This can be done by identifying a wide range of human needs source as energy and protein which has been met through the exploitation of the resources of the park. Mapping of the quantity of particular resource is very important in regulating the exploitation of such resource. This exercise would

give a clear picture by which the availability and sustainability of meeting the human need and maintaining the park healthy environmental condition. People in OONP should be encouraged to share in responsibility on management of the resources of the park by enlightening them about the effects of their activities on the environmental condition of the park. Socio-economic incentives should be provided to local community members in order to gain their support for park resources protection and management and broader support from the society in necessary for a successful park development.

- ii. For the OONP to bounce back and regain its status of being one of the hot spots of biodiversity in Nigeria, proper management strategies have to be adopted to monitor and control the exploitation of resources from the park land. This strategy should seeks means to make people in the region of the park the beneficiaries and the custodians of the protection and conservation of park resources. This may reduce the rate of deforestation and habitat disturbances. This, in turn, may enhance the quality of park environment for sustainable ecotourism development.
- iii. The government and stakeholders should place emphasis on promoting, strengthening and sensitizing people on the need to protect and conserve park resources. This should be achieved through implementation of strategies on poverty alleviation, as this is tied with people's unsustainable consumption of resources, which leads to environment degradation. This can be done through organizing awareness campaign for the people in the region. The level of people awareness and understanding of the benefits of maintaining healthy

environmental conditions of the park will influence their attitude towards the resources of the park. When people are informed about the need to protect the environment they tend to support management programme aimed at protection and conservation of the resources.

- iv. A long-term strategy for national park management will have to address the need for forest resources and land for settlement and agriculture. Therefore, successful park management programmes that depend upon ecologically sound policy and regional development techniques that lessen the pressures for the destruction of the remaining park resources should be embarked upon. To achieve a sustainable park development, the acquisition of natural resources for immediate human needs, often at the expense of degrading the park environment should be strongly discouraged.
- v. Since the productive potential of the park land will best be realized under a system that can take care of the socio-economic interest of people, the establishment of a buffer zone around the park can serve as a sufficiently flexible planning approach. The idea of a buffer zone would militate against the traditional pattern of illegal farming, poaching, logging, charcoal business, and animal grazing on a large area of the park. The buffer zone provides opportunity for planning and regulation of human activities in the park area on the basis of mixed land use. It is a long term intervention programme that encourages a participatory and process approach which may require a cultural rethinking and attitudinal change of people in the park area. The overall

objective of a system being contemplated is to ensure an information-based natural resource conservation.

- vi. Human activity systems and their spatial components, such as settlement and transportation network in determining the outcome of national park development have opened a new ground in national park development, planning and management, particularly in developing countries of the world.
- vii. The use of some of the components of socio-spatial processes, such as change in population, settlement size and their corresponding human activities seems to leave out some other important elements of geography, such as drainage, sedimentation and siltation, the rate of water run-off, erosion and climate change. All these should be considered in another study on park development.
- viii. Also, ranking of the identified park resources depletion factors according to their contribution to park development is another researchable area that requires scholars' attention. This can help in making useful park management plan for development. Similar research in other parks should be carried out to establish the general trends and conduct comparison.

## **5.6 CONTRIBUTION TO KNOWLEDGE**

The study established that:

1. The demand and supply of parks resources in a global context have the potentials to affect the efficiency of the OONP in realizing its establishment goals as a contributor to national development. The practical implication of this is that, although, the human activities within the parks and their host communities usual affect the park environmental conditions, but in reality what is happening in the

park region is a beginning of a global supply-chain of the parks flora and fauna resources.

2. The high level of deterioration in environmental conditions of the park suggests that human activities in the park region have reached levels that are detrimental to the park. The vegetation cover of OONP declined from 2526.31 km<sup>2</sup> in 1972 to 2077.85 km<sup>2</sup> in 2015. The density of the hitherto predominant tree species in 1972 was 106 but the figure diminished to 72 in 2015.
3. Usually, there is strong relationship between population of people in the park host communities and the national park resources exploitation, while this study revealed a weak relationship between the population of people in the park host communities and the vegetal cover of the park. This further attests to the strong external linkage created by the extended demand and supply chain associated with the park resources.

On the whole, the attempt which this study made in resolving the environmental problems which resulted from the effects of human activities on the park which past studies did not focus on, is an important gap in knowledge filled by this study. This study therefore, provides the explanations required to understand the dynamics of changes to parks environmental conditions. It also suggests ways of managing human activities that affect parks. It helps to fashion out effective planning and policy responses to the park management and development.



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**APPENDIX I**

**Department of Urban and Regional Planning, Faculty of Environmental Design,  
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**Questionnaire for the Old Oyo National Park Community Members.**

This questionnaire is a survey instrument designed to generate data for a Ph.D study entitled ‘Effects of Human Activities on the Environmental Conditions in Old Oyo National Park (OONP) 1972 – 2015’. Data generated, shall be used strictly for that purpose and all information supplied shall be handled with utmost confidentiality.

1. Respondent’s Gender: (1) Male [ ] (2) Female [ ]
2. Respondent’s age bracket: (1) 25 – 34 [ ] (2) 35 - 44 [ ] (3) 45 – 54 [ ]  
(5) 55 and above [ ].
3. Respondent’s tribe identification.....
4. Respondent’s family size:.....
5. Types of education received by the respondent.....
6. Name of the community: .....
7. Occupation: (1) Trader [ ] (2) Farming [ ] (3) Hunting [ ] (4) Student [ ]  
(5) Civil servant [ ] Others (specify).....
8. Are you aware of a national park in this area? (1) Yes [ ] (2) No [ ]
9. What were the uses of the area before the creation of the park? (A)  
Farming.....(B) Hunting.....C. Logging activities(Timber).....  
.....
10. What were the common livelihood activities of the community members who are associated with the park land? A.) Farming B. Hunting.

11. What happened to these activities when people were stopped from entering the land?.....

12. Were local people compensated for releasing the land? (1) Yes [ ] (2) No [ ] If Yes, how? ?.....

13. Name and describe the park resources that adjoining community members use?.....

14. What particular needs of community members does each of the identified resources meet?.....  
.....

15. What are the impacts of taking these resources by the Park management?.....

16. Now that local people have been stopped from taking these resources from the park area, have these needs been met?.(1)

Yes. (2) No . Tick as appropriate.

17. Do you benefit from the park? (1) Yes [ ] (2) No [ ]

18. If yes, how?  
.....  
.....

19. Are you aware of the following?	Yes	No
(a) Ban on bush burning in the park area	[ ]	[ ]
(b) Ban on hunting in the park area	[ ]	[ ]
(c) Ban on farming in the park area	[ ]	[ ]
(d) Ban on collection of firewood	[ ]	[ ]



- (e) Ban on logging in the park  [ ]  [ ]
20. Are people respecting the ban? Yes  [ ] No  [ ]
21. If No, why? .....
22. Which of the activities that is common in the park area?  
.....
23. Can you rate them according to their prevalence? For each of the following human activities that affecting the park resources, circle appropriate numbers 1 – 6 on the right to indicate its frequency of occurrence in your area. Note that 1= most frequent, 2 = frequent, 3 = occasional, 4 = rare, 5 = very rare, 6 = absent
- |                                 |   |   |   |   |   |   |
|---------------------------------|---|---|---|---|---|---|
| a) Illegal hunting (poaching)   | 1 | 2 | 3 | 4 | 5 | 6 |
| b) Illegal grazing of livestock | 1 | 2 | 3 | 4 | 5 | 6 |
| c) Cutting of fire wood         | 1 | 2 | 3 | 4 | 5 | 6 |
| d) Bush burning                 | 1 | 2 | 3 | 4 | 5 | 6 |
| e) Hunting                      | 1 | 2 | 3 | 4 | 5 | 6 |
| f) Charcoal production          | 1 | 2 | 3 | 4 | 5 | 6 |
| g) Vehicle movement             | 1 | 2 | 3 | 4 | 5 | 6 |
| h) Logging                      | 1 | 2 | 3 | 4 | 5 | 6 |
24. What are the problems facing the community as a result of the park?
- (a) Prostitution  [ ] (B) Rural Urban Migration  [ ] (c) Crime  [ ]
- (d) Gambling  [ ]
- (e) Loss of interest in farming  [ ]
- (f) Change in cultural behaviour  [ ]
- (g) Others (specify).....

25. Has there ever been any conflict between the management of the park and the adjoining communities of the park? Yes [ ] No [ ]

26. If Yes, explain the cause of the conflict.....

27. Is there any efforts by the government or Non-government organizations to make the local communities benefit from the park tourism receipt. Yes [ ] No [ ]

28. If yes, state those efforts of government or non-governmental organizations towards the development of the adjoining communities:.....

## APPENDIX II

### Animal Species Sighted in the Ranges of OONP

NO.	SCIENTIFIC NAME	COMMON NAME	TEDE RANGE	MARGUBA RANGE	SEPETERI RANGE	OYO-ILE RANGE	IKOYI RANGE	TOTAL
	<i>Kobus kob</i>	Kob	-	58	-	-	-	58
	<i>Tragelaphus scriptus</i>	Bush buck	-	-	-	-	-	-
	<i>Viverra civetta</i>	Civet cat	1	-	-	-	1	2
	<i>Cephalophus rehilants</i>	Red flanked ducker	-	-	-	-	-	-
	<i>Phonchoerus eathropicus</i>	Warthog	*	-	-	-	-	-
	<i>Erthercebus patas</i>	Red patas monkey	16	-	2	-	-	18
	<i>Hippotragus equines</i>	Roan antelope	-	-	-	-	-	-
	<i>Cercopithecus tantalus</i>	Tantalus monkey	-	1	-	-	-	1
	<i>Papio amubis</i>	Baboon	-	14	8	9	1	32
	<i>Kobus defassa</i>	Water buck	-	-	-	-	2	2
	<i>Alcepaphus buselaphus</i>	Western hartebeest	*	-	-	-	-	-
	<i>Sylvicarpra grimmia</i>	Grimm's duiker	1	-	-	-	-	1
	<i>Cercopthecus aethiops</i>	Green monkey	-	4	-	-	-	4
	<i>Ourebia ourebi</i>	Oribi	1	-	-	-	-	1
	<i>Synercus caffer</i>	Buffalo	-	-	-	-	-	-
	<i>Philatomba maxwelli</i>	Maxwell's duiker	-	-	1	2	-	3
	<i>Procavia ruficeps</i>	Tree hyrax	1	-	-	-	-	1
	<i>Anomalurus beecrofti</i>	Flying squirrel	-	-	-	10	-	10
	<i>Thrynomys swinderiansnus</i>	Grass cutter	2	15	-	1	-	18
	<i>Heliosciuru gambianus</i>	Ground squirrel	5	1	-	2	-	8
	<i>Lepus capensis</i>	Hare	-	1	-	-	-	1
	<i>Atilas paludinosi</i>	Mongoose	-	-	-	1	-	1
	<i>Francolinus bicalcaratus</i>	Bush fowl	8	-	2	6	-	16
	<i>Numida meleagris</i>	Guinea fowl	-	-	-	23	-	23
	<i>Columba guinea</i>	Speckied pigeon	2	1	-	-	-	3
	<i>Tochus nasutus</i>	Grey hornbill	1	-	-	-	-	1
	<i>Bubo africanus</i>	Owl	1	-	-	-	1	1
	<i>Gopherus agassiji</i>	Tortoise	-	-	-	-	1	1
	<b>Total</b>		41	95		13	59	206

**Source: Field Survey (2015)**

### APPENDIX III

#### CHECKLIST OF HUMAN ACTIVITIES COLLECTED AND RECORDED FOR THE REGION OF THE OONP

S/N	SETTLEMENT	1	2	3	4	5	6	7	8	9
1	Saki									
2	Ago Amodu									
3	Tede									
4	Oje – Owode									
5	Sepeteri									
6	Ofiki									
7	Alakuko									
8	Irawo Ile									
9	Owo									
10	Ago- Are									
11	Ogunlere									
12	Iseyin									
13	Out									
14	Okeho									
15	Ilero									
16	Aba Owode									
17	Ikere George									
18	Ipapo									
19	Bale Agba									
20	Alapa									
21	Okaka									
22	Alaga									
23	Igbojaye									
24	Aba Orisunmibare									
25	Oke Amu									
26	Kishi									
27	Igboho									
28	Igbeti									
29	Ogunle									
30	Otefon									
31	TessiApata									
32	TessiGaruba									
33	ApataAlaje									
34	Igbope									
35	Igbori									
36	Tewere-Iju									
37	Dogo									
38	Olokoto									
39	Baba Eko									

**Key:** (1) - Crop production, (2) - Animal grazing, (3) - logging, (4) - Fire wood, (4) - Charcoal business, (6) Settlement expansion (7) - Regional infrastructure, (8) - Bush burning; (9) Hunting, (A) - Very Large Extent, (B) - Large Extent, (C) - Limited Extent,(D) - Not at all

**APPENDIX IV**

**CHECKLIST OF ENVIRONMENTAL CONDITIONS AS OBSERVED AND  
RECORDED IN OONP**

Vegetation	Types and Density of trees
Wildlife	Types and Density of Wildlife

Key: A = Very large extent, B = Large extent, C = Limited extent, D = Not changed

## APPENDIX V

### Checklist of Human Activities Collected and Recorded for OONP area.

S/N	SETTLEMENT	1	2	3	4	5	6	7	6	8	9
1	Saki	C	C	A	A	A	C	D	C	D	C
2	Ago Amodu	A	C	B	A	C	A	D	C	C	C
3	Tede	A	C	B	A	C	A	D	C	C	C
4	Oje – Owode	A	C	B	A	C	A	D	C	C	B
5	Sepeteri	A	C	B	A	C	A	D	B	C	B
6	Ofiki	A	C	B	A	C	A	D	B	C	B
7	Alakuko	A	C	B	A	C	A	D	D	C	C
8	Irawo Ile	A	C	B	A	C	A	D	B	C	C
9	Owo	A	C	B	A	C	A	D	D	C	C
10	Ago- Are	A	C	B	A	C	A	D	D	C	C
11	Ogunlere	A	C	B	A	C	A	D	D	C	C
12	Iseyin	C	C	A	A	A	C	D	C	D	C
13	Out	A	C	B	A	C	A	D	D	C	C
14	Okeho	C	C	A	A	A	C	D	C	D	C
15	Ilero	C	C	A	A	A	C	D	C	D	C
16	Aba Owode	A	C	B	A	C	A	D	D	C	C
17	Ikere George	A	C	B	A	C	A	D	D	C	C
18	Ipapo	A	C	B	A	C	A	D	D	C	C
19	Bale Agba	A	C	B	A	C	A	D	D	C	C
20	Alapa	A	C	B	A	C	A	D	D	C	C
21	Okaka	A	C	B	A	C	A	D	D	C	C
22	Alaga	A	C	B	A	C	A	D	D	C	C
23	Igbojaye	A	C	B	A	C	A	D	D	C	C
24	Aba Orisunmibare	A	C	B	A	C	A	D	D	C	C
25	Oke Amu	A	C	A	A	C	A	D	D	C	C
26	Kishi	C	C	A	A	A	C	D	C	D	C
27	Igboho	B	C	A	A	A	B	D	D	C	C
28	Igbeti	B	C	A	A	A	B	D	A	D	C
29	Ogunle	A	C	B	A	C	A	D	D	C	C
30	Otefon	A	C	B	A	C	A	D	D	C	C
31	TessiApata	A	C	B	A	C	A	D	D	C	C
32	TessiGaruba	A	C	B	A	C	A	D	D	C	C
33	ApataAlaje	A	C	B	A	C	A	D	D	C	C
34	Igbope	B	C	A	A	A	B	D	D	C	C
35	Igbori	A	C	B	A	C	A	D	D	C	C
36	TewereIju	A	C	B	A	C	A	D	D	C	C
37	Dogo	A	C	B	A	C	A	D	D	C	C
38	Olokoto	A	C	B	A	C	A	D	D	C	C
39	Baba Eko	A	C	B	A	C	A	D	D	C	C

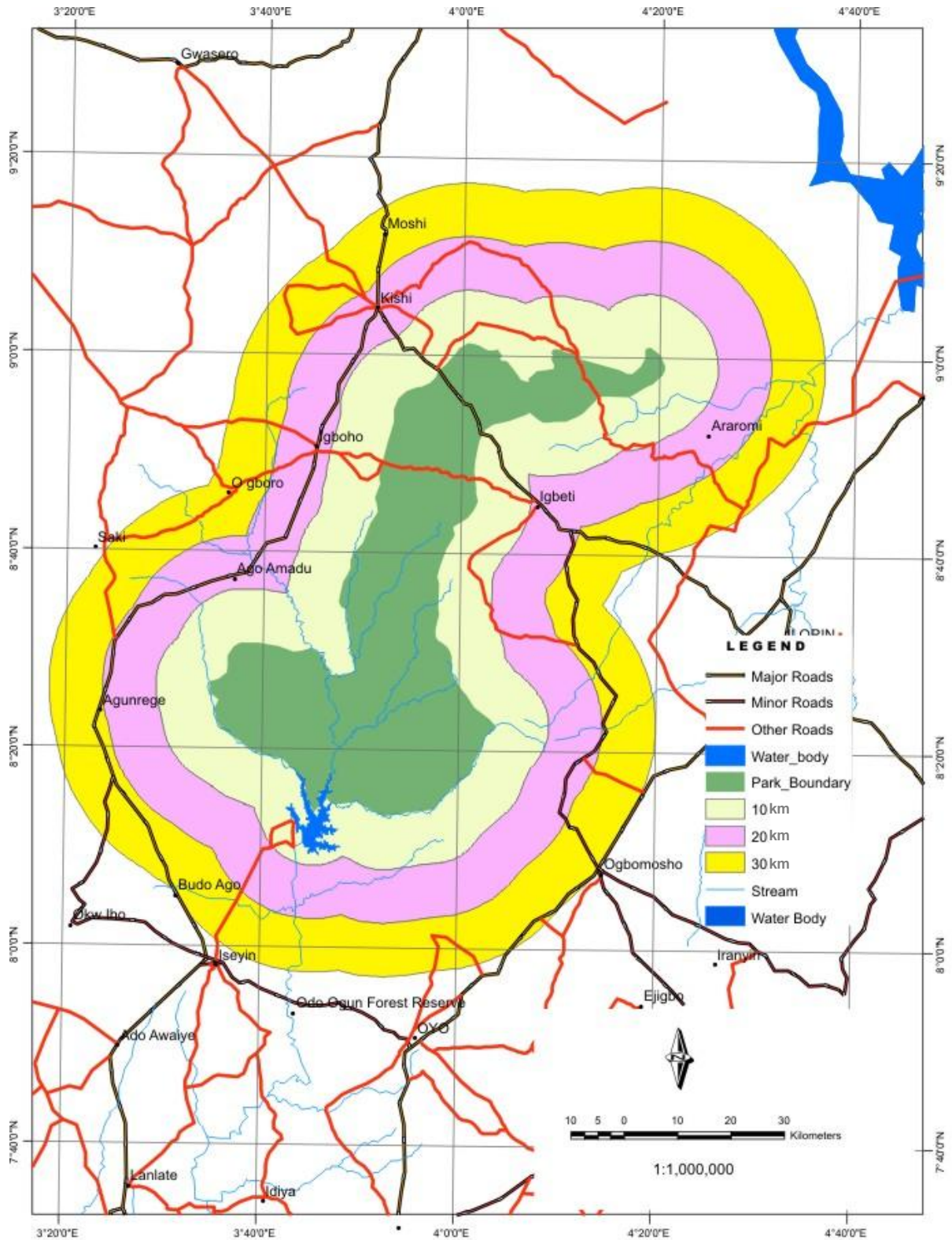
**Key:** (1) - Crop production, (2) - Animal grazing,(3) – logging, (4) - Fire wood, (5) - Charcoal business, (6) Settlement expansion, (7) –Illegal route, (8) - Bush burning; (9) Hunting,

(A) - Very Large Extent, (B) - Large Extent, (C) - Limited Extent,(D) - Not at all

APPENDIX VI										
Spatial Distribution of Human Activities in OONP										
S/N	SETTLEMENT	Crop production	Animal grazing	Logging	Firewood collection	Charcoal business	Settlement expansion	Bush burning	Hunting	
1	Saki	2	2	4	4	4	2	2	1	22
2	Ago Amodu	4	2	3	4	2	4	2	2	24
3	Tede	4	2	3	4	2	4	2	2	24
4	Oje – Owode	4	2	3	4	2	4	2	2	22
5	Sepeteri	4	2	3	4	2	4	3	2	25
6	Ofiki	4	2	3	4	2	4	3	2	25
7	Alakuko	4	2	3	4	2	4	1	2	23
8	Irawo Ile	4	2	3	4	2	4	3	2	25
9	Owo	4	2	3	4	2	4	1	2	23
10	Ago- Are	4	2	3	4	2	4	1	2	23
11	Ogunlere	4	2	3	4	2	4	1	2	23
12	Iseyin	2	2	4	4	4	2	2	1	22
13	Out	4	2	3	4	2	4	1	2	23
14	Okeho	2	2	4	4	4	2	2	1	22
15	Ilero	2	2	4	4	4	2	2	1	22
16	Aba Owode	4	2	3	4	2	4	1	2	23
17	Ikere George	4	2	3	4	2	4	1	2	23
18	Ipapo	4	2	3	4	2	4	1	2	25
19	Bale Agba	4	2	3	4	2	4	1	2	23
20	Alapa	4	2	3	4	2	4	1	2	23
21	Okaka	4	2	3	4	2	4	1	2	23
22	Alaga	4	2	3	4	2	4	1	2	23
23	Igbojaye	4	2	3	4	2	4	1	2	23
24	Aba Orisunmibare	4	2	3	4	2	4	1	2	23
25	Oke Amu	4	2	4	4	2	4	1	2	24
26	Kisi	2	2	4	4	4	2	2	1	22
27	Igboho	3	2	4	4	4	3	1	2	24
28	Igbeti	3	2	4	4	4	3	4	1	24
29	Ogunle	4	2	3	4	2	4	1	2	23
30	Otefon	4	2	3	4	2	4	1	2	23
31	TessiApata	4	2	3	4	2	4	1	2	23
32	TessiGaruba	4	2	3	4	2	4	1	2	23
33	ApataAlaje	4	2	3	4	2	4	1	2	23
34	Igbope	3	2	4	4	4	3	1	2	24
35	Igbori	4	2	3	4	2	4	1	2	23
36	TewereIju	4	2	3	4	2	4	1	2	23
37	Dogo	4	2	3	4	2	4	1	2	23
38	Olokoto	4	2	3	4	2	4	1	2	23
39	Baba Eko	4	2	3	4	2	4	1	2	23
	Total	143	78	126	156	94	143	45	52	

**Key:** (4) - Very Large Extent, (3) - Large Extent, (2) - Limited Extent, (1) - Not at all

## APPENDIX VII



Concentric Zone of Settlements in OONP



## APPENDIX VIII

### Population Figure of Settlements in the OONP

S/N	Name of Settlement	1972 Projected Population Figure	1981 Projected Population Figure	1984 Projected Population Figure	1991 Population Census	2000 Projected Population Figure	1996 Projected Population Figure	2014 Projected Population Figure	2015 Projected Population Figure (2.8%)
1	Saki	52234	67445	73443	89,595	114,997	103,415	193,010	198,414
2	Ago Amodu	1945	2508	2731	3,331	4,273	3,843	6,112	6,283
3	Tede	8557	11049	12031	14,687	18,851	16,952	24,144	24,820
4	Oje – Owode	6074	7843	8540	10,419	13,373	12,026	19,770	20,324
5	Sepeteri	7196	9291	10096	12,317	14,615	14,217	22,371	24,025
6	Ofiki	2915	3763	4098	4,999	6,416	5,770	9,485	9,751
7	Alakuko	148	220	244	297	376	341	561	578
8	Irawo Ile	1371	1772	1929	2,363	3,032	2,727	4,485	4,609
9	Owo	1308	1689	1839	2,243	2,879	2,589	4,256	4,375
10	Ago- Are	5909	7630	8309	10,136	13,009	11,699	19,232	19,770
11	Ogunlere	173	229	250	299	384	345	567	583
12	Iseyin	46545	60100	65444	79,838	102,474	92,153	151,491	155,733
13	Otu	5830	8433	9183	11,203	14,379	12,931	21,257	21,852
14	Okeho	19647	25367	27623	33,698	43,252	38,896	63,941	65,731

15	Ilero	21154	27315	29745	36,288	46,571	41,880	68,847	70,775
16	Aba Owode	255	303	331	404	518	466	766	787
17	Ikere George	99	128	140	170	218	196	322	331
18	Ipapo	3476	4488	4887	5962	7,653	6,882	11,313	11,630
19	Bale Agba	132	173	188	229	294	264	598	615
20	Alapa	111	145	157	192	247	222	327	330
21	Okaka	5816	7509	8177	9,974	12,801	11,512	18,926	19,456
22	Alaga	100	129	141	172	221	199	327	336
23	Igbojaye	1508	1946	2119	2,584	3,317	2,983	4,905	5,042
24	Aba Orisunmibare	33	50	56	70	101	91	149	153
25	Oke Amu	1881	2420	2636	3,216	4,128	3,712	6,102	6,273
26	Kishi	20597	26596	28961	35,330	45,347	40,780	67,038	68,915
27	Igboho	2268	29261	31863	38,871	49,914	44,887	73,757	75,822
28	Igbeti	15731	20225	22024	26,867	34,484	31,011	50,979	52,406
29	Ogunle	361	337	367	449	576	518	852	876
30	Otefon	823	1063	1158	1,411	1,811	1,629	2,678	27,53
31	Tessi Apata	205	264	288	352	429	386	635	653
32	Tessi Garuba	144	186	202	246	315	283	4658	478
33	Apata Alaje	137	177	190	235	301	271	445	457

34	Igbope	2123	2746	2990	3,648	6,883	4,211	6,922	7,116
35	Igbori	229	296	323	394	506	455	748	769
36	Tewere Iju	2121	2739	2983	3,639	4670	4,200	6,904	7,097
37	Dogo	118	154	168	205	264	237	390	401
38	Olokoto	275	355	387	471	605	544	894	919
39	Baba Eko	144	185	201	245	315	283	630	648

Source: NPC (1991)

## APPENDIX IX

### Change in Settlements Size in OONP area Between 1972 and 2015

S/N	Name of Settlement	Land Area (km <sup>2</sup> ) By Years				Change in Size	Land Area (km <sup>2</sup> ) By Years		Change in Size	Change in Size
		1972	1984	1991	2000	1991-2000	2011	2015	2001-2011	2011-2015
1	Aba Funwo	0.18	0.34	0.059	0.091	<b>0.032</b>	0.157	0.176	<b>0.066</b>	0.19
2	Abere Ijo	0.64	0.136	0.281	0.555	<b>0.274</b>	1.084	1.12	<b>0.529</b>	0.036
3	Abule Abasi	0.122	0.264	0.336	0.671	<b>0.335</b>	1.158	1.176	<b>0.487</b>	0.018
4	Agunrege	0.34	0.75	0.128	0.247	<b>0.119</b>	0.685	0.836	<b>0.438</b>	0.151
5	Agarodo	0.16	0.32	0.064	0.236	<b>0.172</b>	0.373	0.487	<b>0.137</b>	0.114
6	Ago	0.18	0.036	0.066	0.148	<b>0.082</b>	0.231	0.322	<b>0.083</b>	0.091
7	Ago Amodu	0.598	0.612	0.708	1.184	<b>0.476</b>	1.904	2.98	<b>0.72</b>	1.076
8	Ago Are	0.973	1.122	1.265	2.192	<b>0.927</b>	3.247	3.421	<b>1.055</b>	0.174
9	Akoto	0.312	0.523	0.949	0.071	<b>0.442</b>	0.168	0.192	<b>0.097</b>	0.024
10	Aladere	-	0.025	0.047	0.201	<b>0.154</b>	0.316	0.336	<b>0.115</b>	0.02
11	Apata Alaje	-	0.022	0.016	0.458	<b>0.442</b>	0.697	0.708	<b>0.239</b>	0.011
12	Ayetoro	0.12	0.032	0.042	1.534	<b>1.492</b>	2.614	2.732	<b>1.08</b>	0.118
13	Baba Ode	0.78	0.108	0.221	0.325	<b>0.104</b>	0.401	0.422	<b>0.076</b>	0.021
14	Budo Musa	-	0.016	0.045	0.082	<b>0.037</b>	0.121	0.121	<b>0.039</b>	-
15	Elesun	-	0.022	0.062	0.113	<b>0.051</b>	0.15	0.15	<b>0.037</b>	-
16	Ese Oke	-	0.020	0.047	0.194	<b>0.147</b>	0.251	0.273	<b>0.057</b>	0.022
17	Igbeti	5.04	7.322	11.432	16.48	<b>5.048</b>	21.715	21.924	<b>5.235</b>	0.209
18	Igbo Ologun	0.12	0.022	0.058	0.104	<b>0.046</b>	0.164	0.202	<b>0.06</b>	0.038
19	Igboho	3.26	3.102	4.107	6.038	<b>1.931</b>	8.548	8.831	<b>2.51</b>	0.247
20	Kisi	6.25	9.501	13.606	17.255	<b>3.649</b>	22.47	24.36	<b>5.215</b>	1.89
21	Iseyin	11.132	15.234	19.454	28.81	<b>9.356</b>	34.832	36.643	<b>6.022</b>	1.811
22	Ofiki	0.184	0.352	0.764	1.09	<b>0.326</b>	1.502	1.601	<b>0.412</b>	0.099
23	Ogbomoso	22.5	27.250	32.305	40.145	<b>7.84</b>	68.777	72.452	<b>28.632</b>	3.675
24	Ogboro	0.652	0.863	0.954	1.525	<b>0.571</b>	2.382	2.563	<b>0.857</b>	0.181
25	Okaka	0.784	1.37	1.117	1.691	<b>0.574</b>	2.189	2.472	<b>0.498</b>	0.283
26	Olola	-	0.022	0.049	0.076	<b>0.027</b>	0.16	-	<b>0.084</b>	-
27	Olopo	-	-	0.06	0.09	<b>0.03</b>	0.117	0.162	<b>0.027</b>	0.045
28	Out	0.976	1.642	1.951	2.692	<b>0.741</b>	3.425	3.634	<b>0.733</b>	0.209
29	Oyo Ile	0.412	0.614	0.755	1.301	<b>0.546</b>	2.538	2.563	<b>1.237</b>	0.025
30	Saki	6.456	9.122	13.189	17.92	<b>4.731</b>	35.803	38.621	<b>17.883</b>	2.818
31	Sepeteri	0.761	0.982	1.032	1.555	<b>0.523</b>	3.412	3.614	<b>1.857</b>	0.208

32	Suberu	0.22	0.65	0.115	0.16	<b>0.045</b>	0.183	-	<b>0.023</b>	0.183
33	Tede	3.125	6.232	10.371	12.778	<b>2.407</b>	15.356	17.323	<b>2.578</b>	1.967
34	Teshi	0.127	0.253	0.492	0.648	<b>0.156</b>	0.777	-	<b>0.129</b>	0.777
35	Irawo Ile	0.210	0.310	0.422	0.665	<b>0.243</b>	0.812	0.822	<b>0.147</b>	0.01
36	Aha	0.728	0.931	1.12	1.81	<b>0.69</b>	2.45	2.34	<b>0.64</b>	0.09
37	Irawo Owode	0.34	0.534	0.727	1.164	<b>0.437</b>	1.43	1.168	<b>0.266</b>	0.25
38	Owo Iwajowa	0.89	0.167	0.341	0.446	<b>0.105</b>	0.59	-	<b>0.144</b>	-
39	Owo Atisbo	0.32	0.78	0.186	0.234	<b>0.048</b>	0.29	-	<b>0.056</b>	-
40	Ogunlere	0.02	0.02	0.04	0.062	<b>0.022</b>	0.08	0.164	<b>0.018</b>	0.088
41	Okeho	0.764	0.983	1.612	2.54	<b>0.928</b>	3.5	3.92	<b>0.96</b>	0.42
42	Ilero	0.308	0.492	0.737	1.11	<b>0.373</b>	1.38	1.76	<b>0.27</b>	0.38
43	Ipapo	0.16	0.18	0.22	0.36	<b>0.14</b>	0.55	0.67	<b>0.41</b>	0.12
44	Alapa	0.22	0.87	0.133	0.207	<b>0.74</b>	0.254	-	<b>0.47</b>	0.254
45	Alaga	0.12	0.056	0.068	0.125	<b>0.57</b>	0.156	-	<b>0.31</b>	-
46	Igbo Ijaiye	0.16	0.28	0.33	0.406	<b>0.373</b>	0.51	0.67	<b>0.104</b>	0.16
47	Oke Amu	0.98	0.166	0.227	0.345	<b>0.118</b>	0.41	0.58	<b>0.065</b>	0.17
48	Otefon	0.32	0.065	0.081	0.109	<b>0.028</b>	0.14	-	<b>0.031</b>	-
49	Igbope	0.284	0.360	0.374	0.54	<b>0.166</b>	0.66	-	<b>0.12</b>	-
50	Igbori	0.32	0.84	0.125	0.211	<b>0.086</b>	0.26	-	<b>0.049</b>	-
51	Alaga	0.16	0.046	0.068	0.125	<b>0.057</b>	0.16	-	<b>0.035</b>	-
52	Bale Agbe	0.22	0.062	0.086	0.166	<b>0.08</b>	0.2	-	<b>0.034</b>	-
53	Olokolo	-	0.022	0.036	0.067	<b>0.031</b>	0.08	-	<b>0.013</b>	-
54	Baba Eko	0.104	0.213	0.274	0.044	<b>-0.23</b>	0.053	-	<b>0.009</b>	-

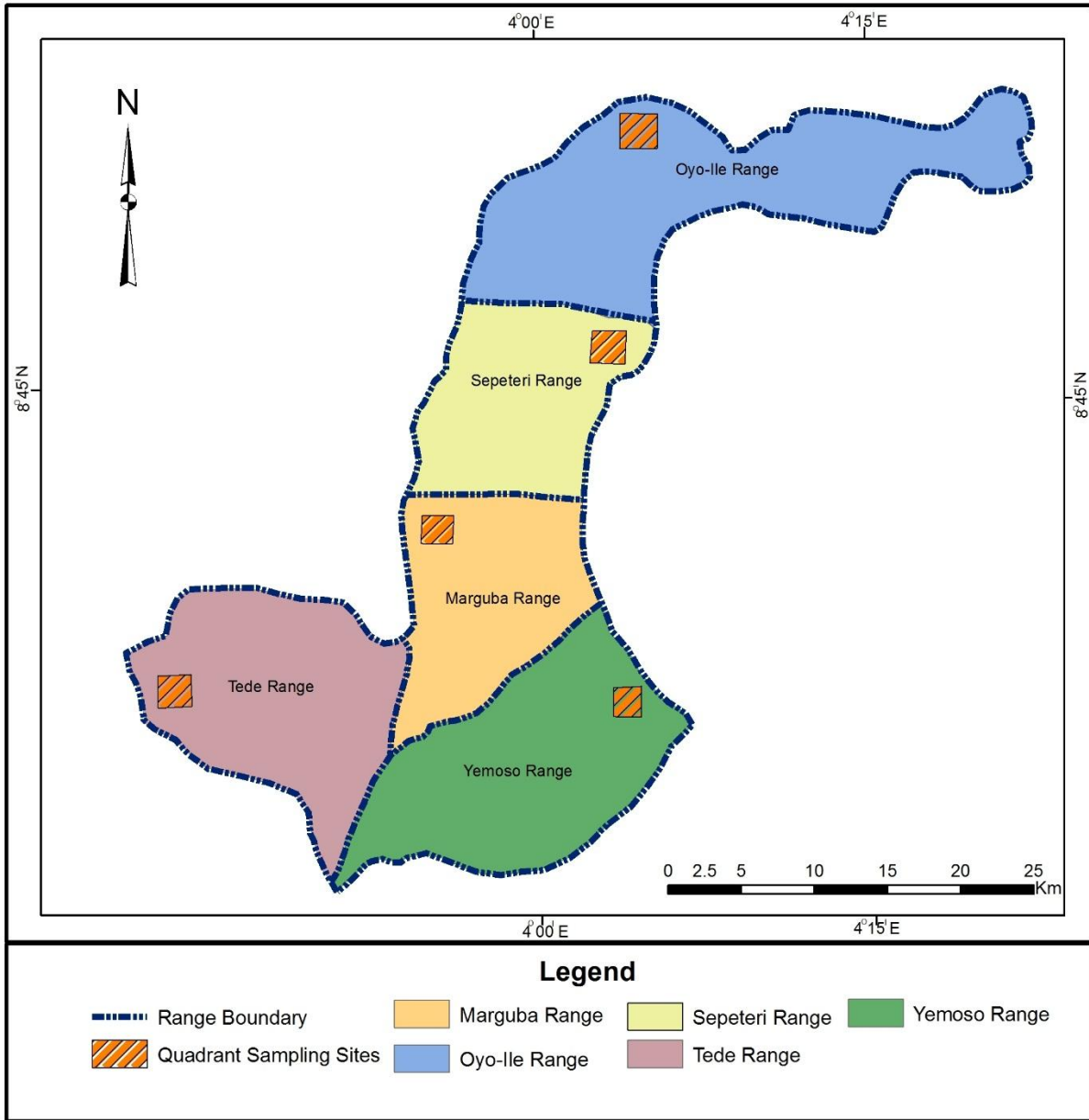
Source: Field Survey (2015)

Key: - No change

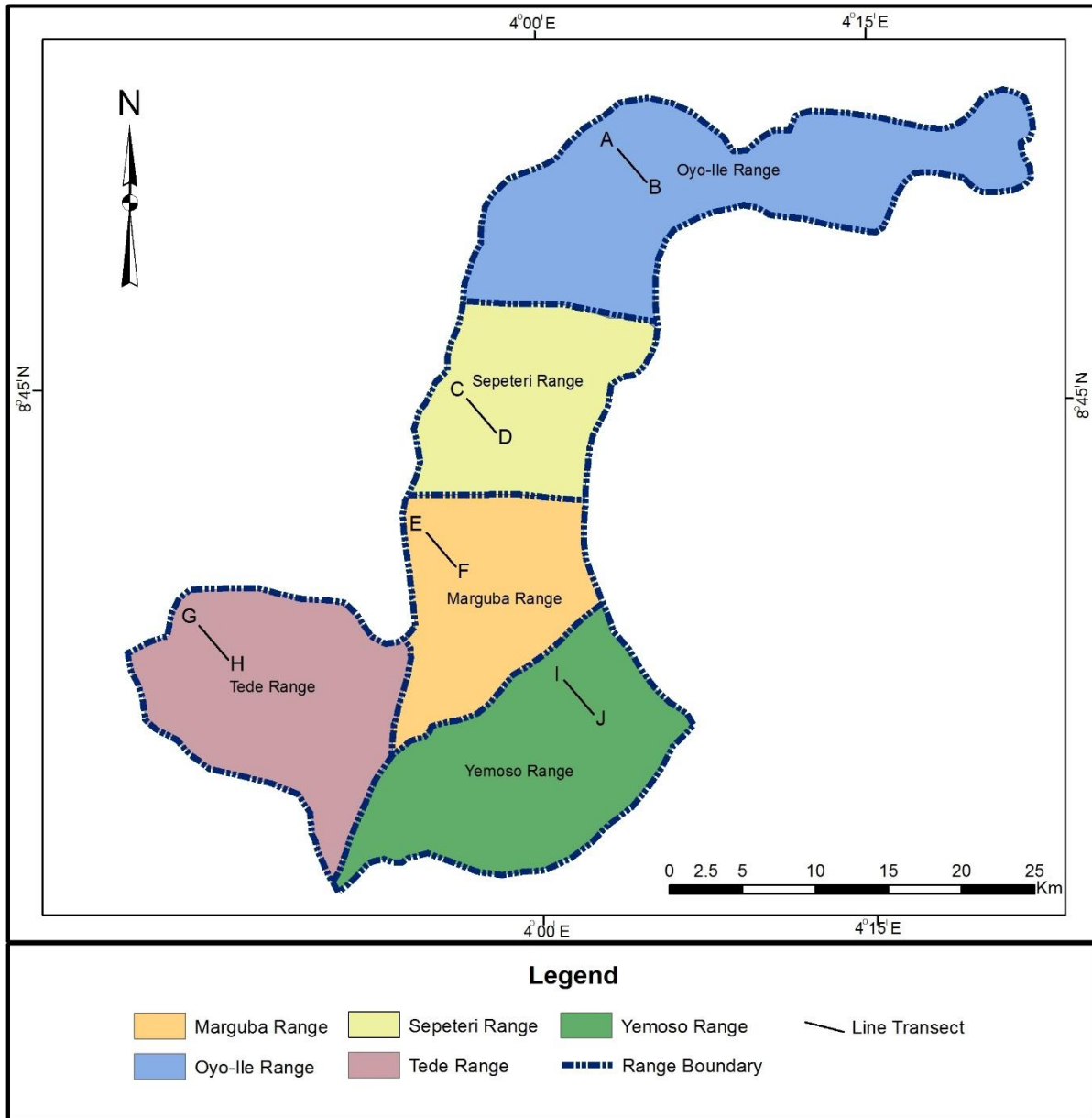
APPENDIX X

Name of Settlement	Year	Population	Size of Settlement	Size of OONP
Saki	1972	52,234	6.456	2216.27
	1990	89,595	13.189	2200.07
	2000	114,997	17.92	2183.33
	2014	198,414	38.621	2077.63
Iseyin	1972	46,545	11.132	2216.27
	1990	78,858	19.454	2200.07
	2000	102,474	28.81	2183.33
	2014	155,733	36.643	2077.63
Kisi	1972	20,597	6.25	2216.27
	1990	40,780	13.606	2200.07
	2000	45,377	17.26	2183.33
	2014	68,915	24.36	2077.63
Tede	1972	8,557	3.125	2216.27
	1990	14,687	10.371	2200.07
	2000	18,851	12.778	2183.33
	2014	24,820	17.323	2077.63
Sepeteri	1972	7,196	0.761	2216.27
	1990	12,317	1.032	2200.07
	2000	14,615	1.555	2183.33
	2014	24,025	3.614	2077.63
Out	1972	5,830	0.976	2216.27
	1990	11,203	1.951	2200.07
	2000	14,379	2.7	2183.33
	2014	21,852	3.63	2077.63
Tessi-Apata	1972	205	0.127	2216.27
	1990	386	0.492	2200.07
	2000	429	0.648	2183.33
	2014	653	0.16	2077.63
Ogunlere	1972	173	0.03	2216.27
	1990	299	0.04	2200.07
	2000	384	0.062	2183.33
	2014	583	0.16	2077.63

APPENDIX XI



APPENDIX XII



APPENDIX XIII



## QUADRAT SAMPLING TECHNIQUE

### FORMULAE

#### SAMPLING DATA

#### WOODY PLANT SAMPLING

Mean distance ( $\bar{d}$ )

$$\bar{d} = \frac{\sum d}{n}$$

Where d = distance in metre of the nearest woody plant in a quadrat from the sampling point.

n = number of distances measured in all quadrats per plot per block.

Woody Plant Density/Ha(D)

$$D = \frac{100}{(\bar{d})^2}$$

Where  $\bar{d}$  = mean distance of all the nearest woody plants from all sample points per plot per block.

#### PERCENTAGE CANOPY COVER (%C)

$$\% = \frac{\bar{c}}{\bar{d}} = \frac{100}{1}$$

$\bar{c}$  = mean canopy cover per plot.

$\bar{d}$  = mean distance of woody plants per plot.

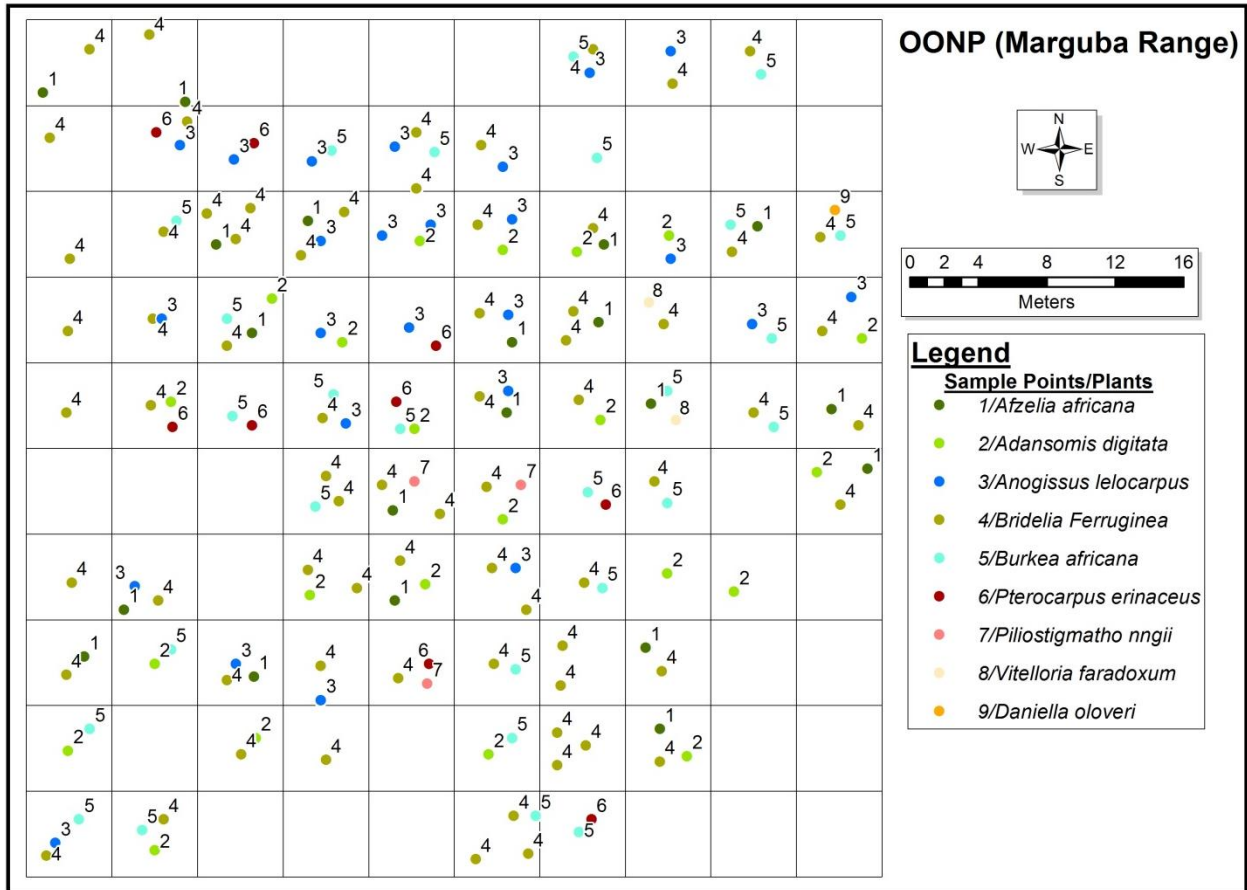
$$\% \text{ frequency (C)} = \frac{\text{No. of quadrat in which a species occurred}}{\text{Total No. of quadrats sampled}} \times \frac{100}{1}$$

$$\text{Density (d)} = \frac{\text{Total no. of individual of a species in all quadrats}}{\text{Total no. of quadrats sampled}}$$

The counts are averaged due to multiple numbers of quadrat sampling sites.

Quadrat	Oyo-Ile	Sepeteri	Marguba	Tede	Yemoso
Number of individual species	165	153	179	187	196

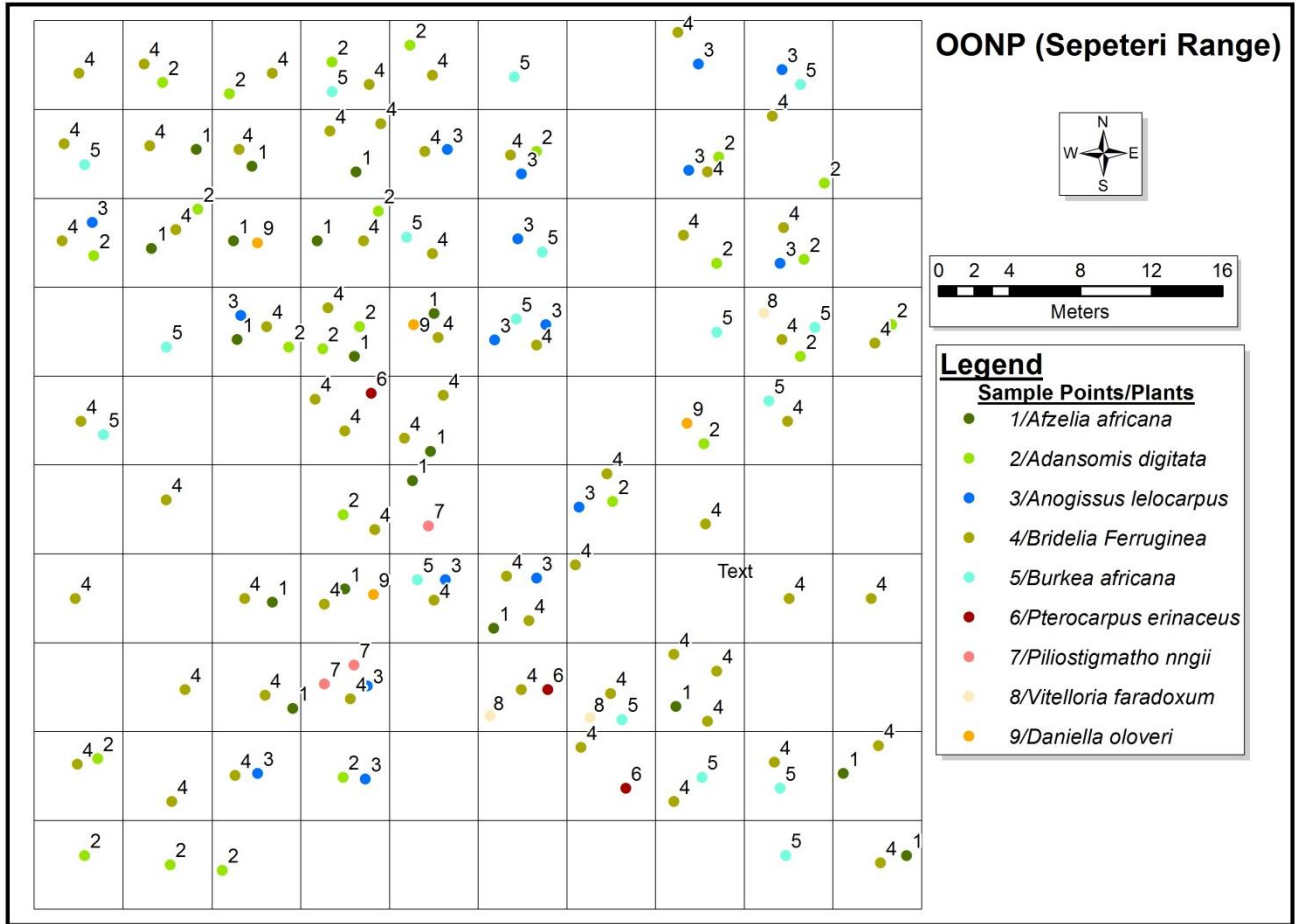
APPENDIX XIV



Source: Filed Survey, 2015

Figure: Location of the sample site in Marguba range

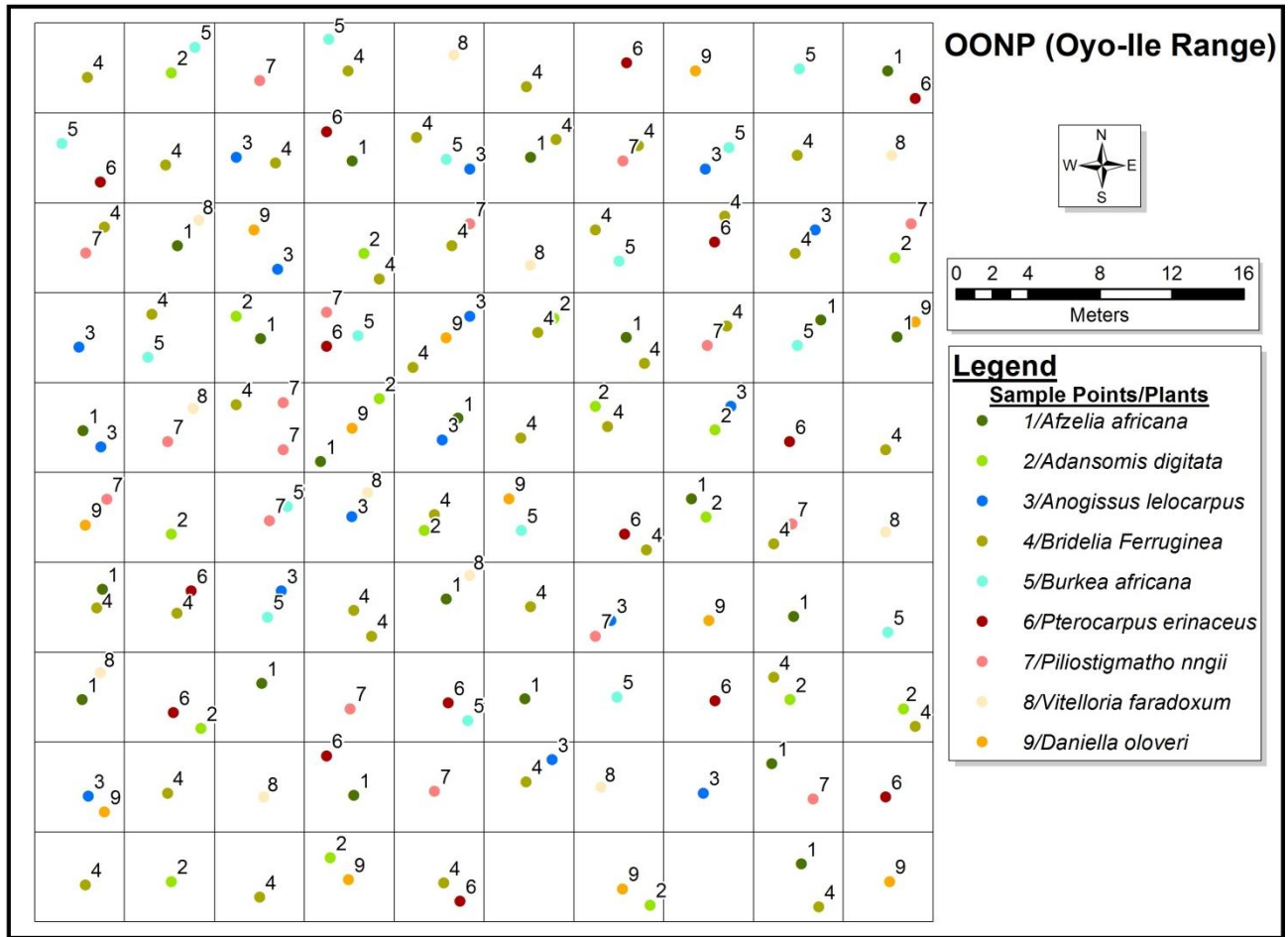
APPENDIX XV



Source: Field Survey, 2015

Location of the sample site in Sepeteri Range, OONP

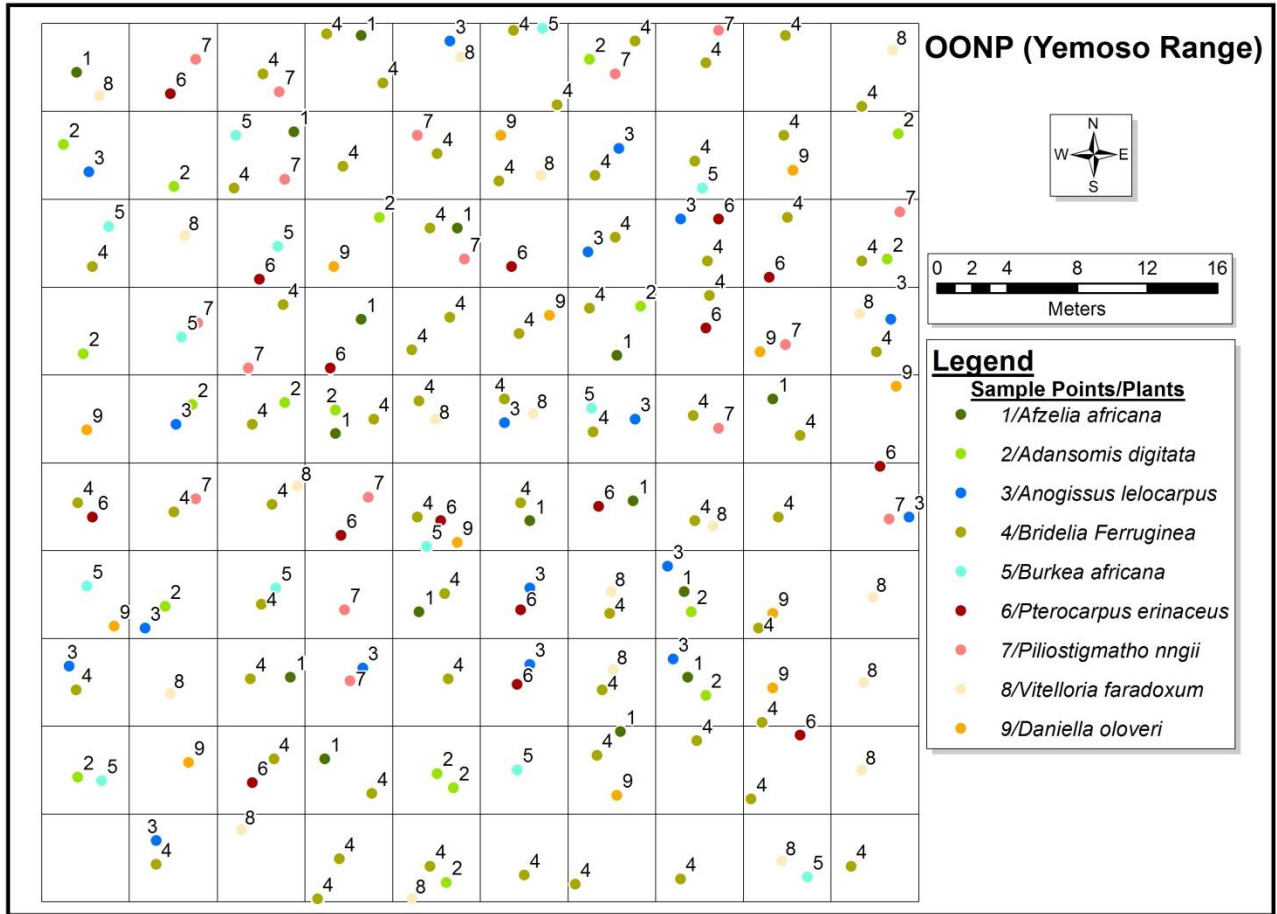
APPENDIX XVI



Source: Field Survey, 2015

Location of the sample site in Oyo-Ile Range, OONP

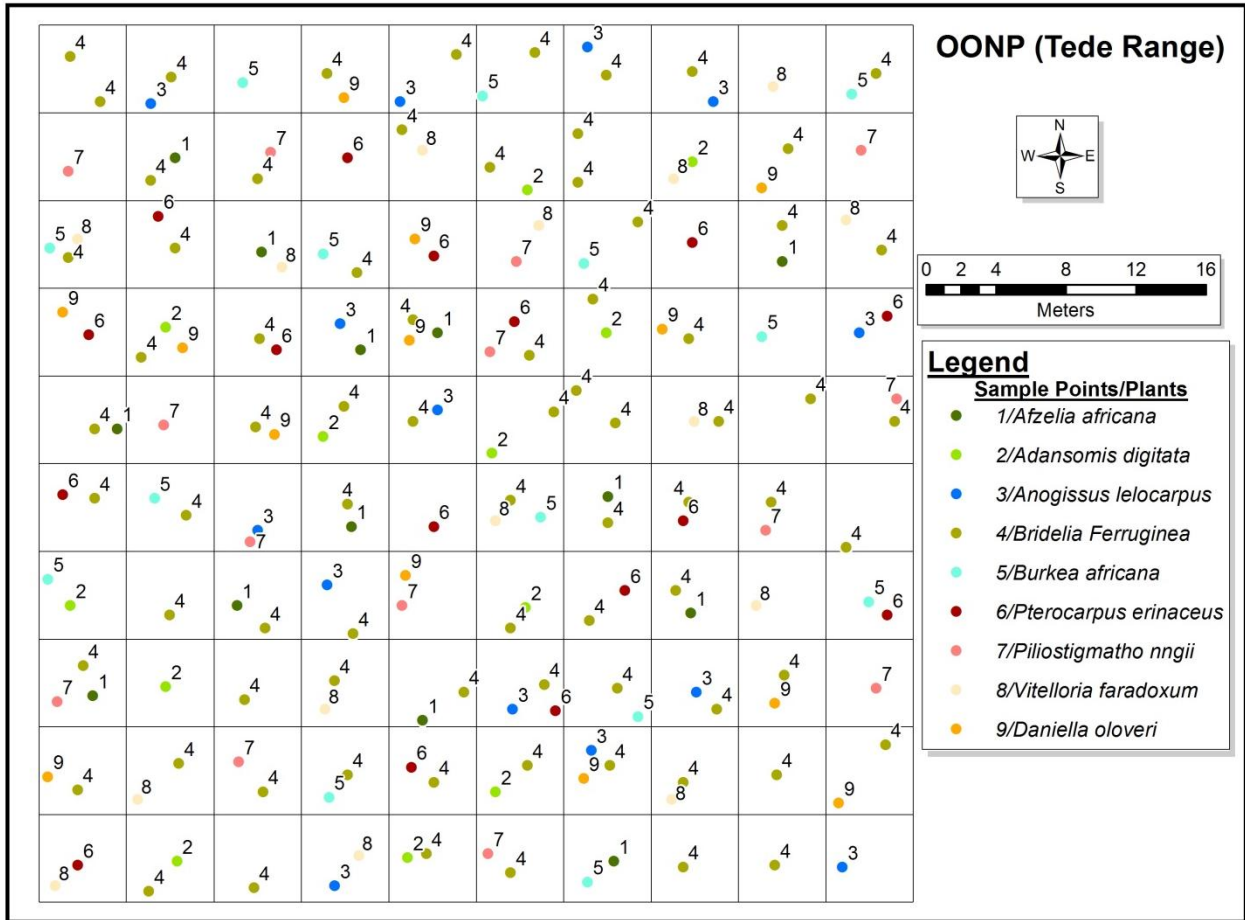
APPENDIX XVII



Source: Field Survey, 2015

Location of the sample site in Yemoso Range, OONP

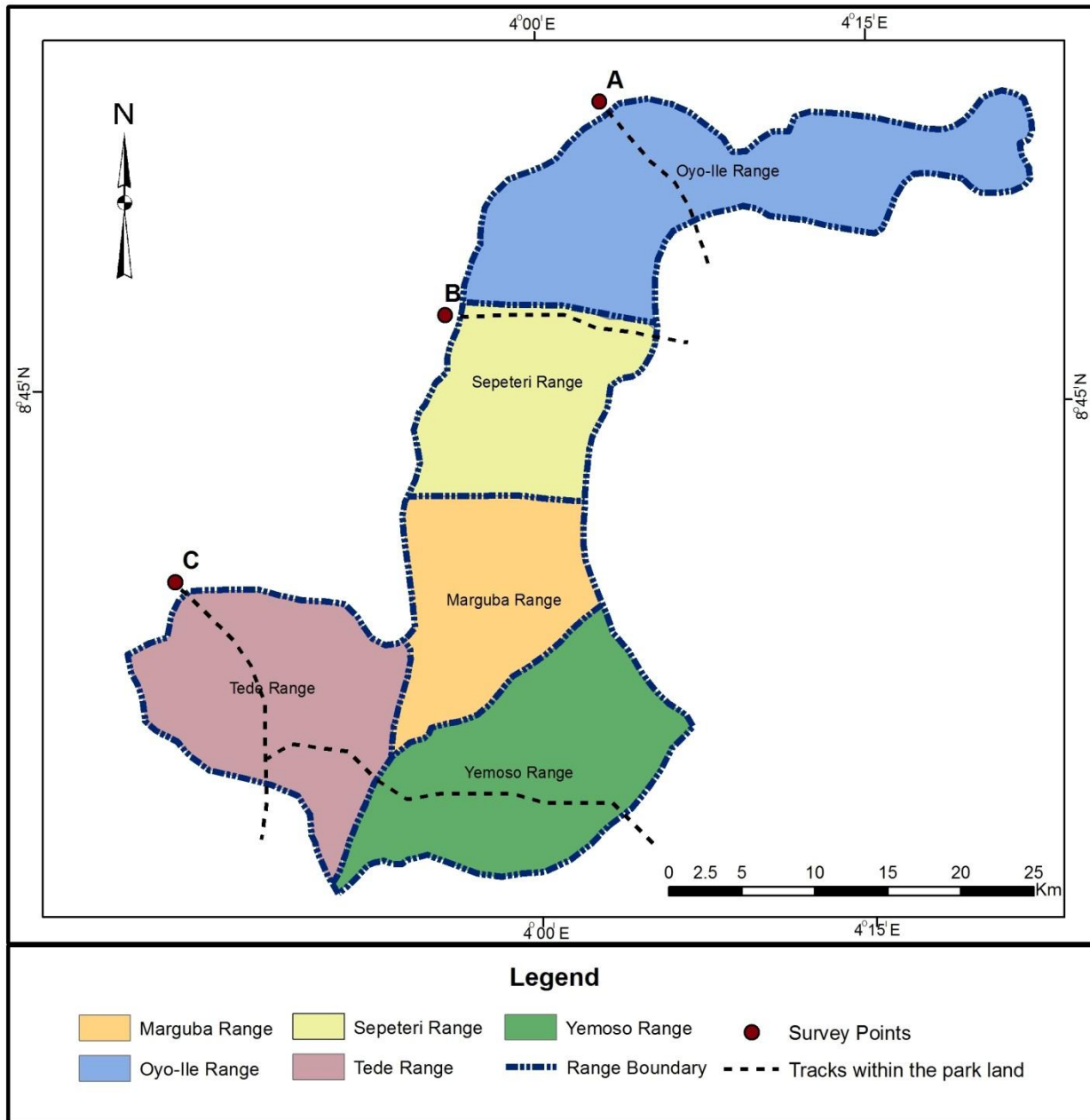
APPENDIX XVIII



Source: Field Survey, 2015

Location of the sample site in Tede Range, OONP

APPENDIX XIX



Manual Counting Method

Counting periods: 9:00 – 11:00am and 5:00 – 7:00pm

Equipment: Hand counter

Number of enumerators: Three (3)



APPENDIX XX

Data Analysis

TRAFFIC VOLUME COUNT IN OONP								
		Survey point A		Survey point B		Survey point C		
S/N		Morning (9 – 11)	Evening (5 - 7)	Morning (9 - 11)	Evening (5 - 7)	Morning (9 - 11)	Evening (5 - 7)	Total
1	Motorcycle	34	29	42	25	23	43	196
2	Truck	11	7	9	14	10	14	65
3	Bus	39	37	42	41	50	36	245
4	Car	96	59	89	76	102	43	465
	Total	180	132	182	156	185	136	971

Source: Field Survey, 2015

# APPENDIX XX1

## CORRELATION BETWEEN POPULATION SIZE AND DEGRADATION OF PARK RESOURCES

