GEOGRAPHIC INFORMATION SYSTEM (GIS) BASED ECOTOURISM PLANNING OF KAINJI LAKE NATIONAL PARK

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NOVEMBER 2005

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DISSERTATION SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF TECHNOLOGY IN REMOTE SENSING APPLICATIONS.

NOVEMBER, 2005

DECLARATION

I, Musa Haruna Danladi, hereby declare that, this thesis entitled: Geographic Information System (GIS) based Ecotourism Planning of Kainji Lake National Park (KLNP) is a product of my own research work under the strict supervision of Dr A.A.Okhimamhe.

Musa Haruna Danladi
M.Tech./SSSE/920/2003/2004

Signiture

29th – 05 – 2006

Date

DEDICATION

This dissertation is dedicated to the memory of my father. I miss you, dad.
To my Mother, who gave me a love of life.
To my fiancé, who gave me a life of love.
To ALLAH, who gave my life a meaning

CERTIFICATION

This is to certify that, this dissertation is an original work undertaken by **MUSA HARUNA DANLADI** (M.Tech./SSSE/920/2003/2004) under the supervision of Dr. A.A. Okhimamhe, and has been prepared in accordance with the regulations govern the preparation of thesis in the Department of Geography, Federal University of Technology Minna. The dissertation has been read and approved by:

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ACKNOWLEDGEMENT

Praises and eternal thanks to Allah almighty for HIS infinite mercy, blessing and protection bestowed me at this precious moment of my life, the strength with perseverance and all that is necessary to conquer the challenges for the attainment of my goal.

I wish to express my sincere appreciation to the many people who provided support, direction, and assistance toward the completion of this dissertation. Without their words of encouragement and contributions, this dissertation research would not have been finished.

First and foremost, a very special "thank you" should be extended to my lecturer, my role model and my supervisor, Dr.A.A.Okhimamhe, which through constant corrections, meaningful suggestions, and pain stakingly make this dissertation a very big success, sensible and interesting to read. Her support, guidelines, and instruction were invaluable to the completion of my thesis. To this, I say thank you, ma and more wishes to your glory (Amen). I would also like to thank Prof. .J .M. Baba for sharing his unlimited knowledge with me. I have gained unequaled inspiration, insights, and knowledge about tourism throughout my discussions with him. I am also grateful to Dr Halilu, Dr M.Ojigi, and Mr. Salihu for the troubles you all went through to provide me with instruction and guide through this dissertation. May Allah almighty rewards you all in abundant. My appreciation also goes to my HOD, Dr. M.T. Usman and other lecturers in the department.

My sincere expression of gratitude is also extended to my friends and fellow course mates, Mr.Otaifo A., Segun Owoyeye, Bitrus Dang A., Joseph Danboyi, Sim Haruna.and the host of others. You're genuinely good people and true friends.

I greatly acknowledge the effort of my dear brothers, and their continued support and encouragement during my graduate studies. My sincere thanks go to the entire family for their support and warmly advice and encouragement. To be remembered also are my Nephews; Sadiq Lanzema, Shuaib Majiyebo, Habibat Mafo, Suleiman Sokofa and Musa M. Musa(Jr) who always bid me farewell and welcome to and from school. May the blessings of Allahu ta, ala be upon them (Amin)

Lastly, appreciative thanks go to the Conservator General (CG), Nigerian National Parks, Alh. Lawan Marguba and the personnel manager, Mallam Yahaya Suleiman for the permission granted on me to carried out my research on the KLNP. Not forgotten the staff of the Kainji Lake National Park (KLNP), most especially, the Director, Mr. O.A.Okeyoyin, Mr. Obong (CPO), Mr S.O.Awosiyan (Ag.PPC Borgu Sector) and Mr. S.A. Bode(MIU) for their efforts. Though, the management needs to improve on their effort towards researchers (Students) in order to encourage them, most especially in providing them with necessary support as well as means (mobility) to access the park.

I thank you all and Wishing you the very best of things in this 21st Century.

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ABSTRACT

Decision-making in tourism development and planning is becoming increasingly complex as organisations and communities have to come to terms with the competing economic, social and environmental demands of sustainable development. Geographical Information Systems (GIS) can be regarded as providing a tool box of techniques and technologies of wide applicability to the achievement of sustainable tourism development. Spatial (environmental) data can be used to explore conflicts, examine impacts and assist decision-making.

This research therefore, demonstrated the importance of space information and technology in ecotourism planning and development. The main objective was to develop a simple Geographic Information System (GIS) that would serve as a Decision Support tool for ecotourism planning and development of Kainji Lake National Park (KLNP).

The paper also, examine the status of existing vegetation that sustained ecotourism activity at the park by assessing the degree and direction of change in vegetation through landuse/landcover assessment between 1975(before the park), 1986, (eleven years after the park establishment and 2001, fifteen years later (i.e.26 years later on establishment).Greenness distribution of vegetation for this period was calculated using NDVI generated from the satellite images. Satellite imageries covering the study area for these periods were used, a sub scene of a landsat MSS image acquired on 08th December 1975, a sub scene of landsat TM image taken on21st October 1986 and a sub scene of a landsat ETM image acquired on 22nd October 2001.The three images were georeferenced, resampled and subsequently analyzed using Idrisi 32, Surfer 8 and ArcView 3.2a software package. Supervised classification method was adopted using maximum likelihood technique.

The changing trends in landuse/landcover patterns revealed that, there is increase in bare/degraded area and agricultural field, whereas swampy canopy woodland open canopy woodland has reduced. The decrease in swampy areas and open canopy woodland were attributed to human factor (deforestation, grazing and agriculture) and probably reduction in precipitation. On the other hand, increase in bare/degraded area, and agriculture field could be associated with decrease in swampy areas and soil fertility, which allowed the use of hitherto inundated areas for agriculture. These changes have partially altered the land use of pre establishment period.

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ACRONYMES

DMO	Destination Management Organization
EIU	Economist Intelligent Unit
FCC	False Colour Composite
FEAP	Family Economic Advancement Programme
FTZ	Free Trade Zone
GIS	Geographic Information System
IMF	International Monetary Fund
IYE	International Year of Ecotourism
KLNP	Kainji Lake National Park
KTDC	Kenya Tourist Development Corporation
NEED	National Economic Empowerment Development Strategies
NPB	National Park Board
SAP	Structural Adjustment Programme
SATOUR	South Africa Tourism
SPV	Special Purpose Vehicle
VAT	Value Added Tax
UNCTAD	United Nation Center for Trade and Development
WTO	World Tourism Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

The success of tourism in any country depends on the ability of that country to sufficiently develop, manage and market the tourism facilities and activities in that country. Many developing countries depend mainly on tourism for economic growth and diversity.

Ecotourism has attracted increasing attention in the recent years, not only as an alternative to mass tourism, but also as a means of economic development and environmental conservation. Being a nature-based tourism, it takes into account the natural ecological attraction, their conservation and development. Their main aim is to safeguard the environment, making it beneficial to the local people by generating revenue and education and pleasure for the tourist.

Ecotourism activities include bird watching, trekking, mountaineering, horse riding and elephant riding within the forest wilderness trail, staying in natural caves, studying about flora and fauna, simple bush walking, fishing, animal behavior study, ecological studies (Ramaswami, 2000). Ecotourism is often more than just an organized tour of a natural areas to understand the cultural and natural history of the environment, taking care not alter the integrity of the ecosystem, while producing economic opportunities that make the conservation of natural resources beneficial to local people(Awake,2005). According to the Quebec Declaration on Ecotourism, ecotourism "*embraces the principles of sustainable tourism…… and the following principles*

which distinguish it from the wider concept of sustainable tourism: (a)Contributes actively to the conservation of natural and cultural heritage, (b) Includes local and indigenous communities in its planning, development and operation, contributing to their well-being,(c) Interprets the natural and cultural heritage of the destination to visitor, (d)Lends itself better to independent travelers, as well as to organized tours for small size groups"(UNEP,2000). Ecotourism therefore, is sustainable tourism, which follows clear processes that: Ensures prior informed participation of all stakeholders, Ensures equal, effective and active participation of all stakeholders, Acknowledges Indigenous Peoples communities' rights to say "no" to tourism development - and to be fully informed effective and active participants in the development of tourism activities within the communities, lands, and territories, and Promotes processes for Indigenous Peoples and local communities to control and maintain their resources.

Ecotourism is one of the fastest growing sectors in tourism industry at present. The market for nature holidays is certainly a growing one. In 1993, the World Tourism Organization (WTO) estimated that nature tourism generated 7 per cent of all international travel expenditure, where the total annual global earning from tourism is nearly $3 trillion and 212 million people are employed (Eagle, 1997). Year 2002 was declared as an International Year of Ecotourism (IYE) by the United Nations. This reflects its global importance.

Geographic Information System (GIS) and tourism share a common characteristic, that is, both cross the boundaries of disciplines and application areas. GIS has been applied in many disciplines - Geography, forestry, urban planning and environmental studies. Similarly, tourism has been a subject of interest to geographers, economists,

business, environmental planner, anthropologists, and archaeologists. As such, the potential for GIS applications in tourism is significant.

GIS is now recognized widely as a valuable tool for managing, analyzing, and displaying large volume of diverse data pertinent to many local and regional planning activities. Its use in environmental planning is rapidly increasing. Tourism is an activity highly dependent on environment resources (renewable resources). It is also a phenomenon, which in the event of a lack of planning and management is likely to erode its environmental base. Hence, the strength of tourism planning can be enhanced by GIS applications. GIS can be regarded as providing a toolbox of techniques and technologies of wide applicability to the achievement of sustainable tourism development. Sustainable tourism can be defined as "a process that allows development to take place without degrading or depleting the resources which made the development possible" (WTO 1999). Sustainability in tourism as a concept is what is often referred to as ecotourism, a "green tourism" or "responsible tourism" (Schaller 1999). Whatever its description, it is seen as a means of recognizing that the 'Earth-has finite resources and in tourism as in other sectors, there are limits to development, particularly in site-specific locations.

1.2 **Statement of the Problem**

Nigeria is today faced with serious economic problems and has therefore adopted series of economic measures such as Structural Adjustment Programme (SAP), Family Economic Advancement Programme (FEAP), and National Economic Empowerment Development Strategies (NEEDS) to solve such problems. The development of the petroleum industry in the late 1950s and the subsequent increase in oil prices in the 1970s

(oil boom) radically transformed Nigeria from an agriculture-based economy to a major crude oil exporter. Increased earnings from petroleum exports generated high levels of real economic growth, and by the mid-seventies, Nigeria ranked as the dominant economy in Sub-Sahara Africa and has the continent's major exporter of petroleum. Towards the end of the 70s, the economy was bad showing signs of depression, this was due largely to the global depression, more also, and the issue of 1981 oil glut whose genesis can be traced to Saudi Arabia over flooding the world market with excess crude oil at that time. By 1983, the economy was well deep into the depression. "Between 1980 and 1985 the gross domestic product was growing at a decline rate and the manifestation of the decline was seen in the per capita income of the citizens, confirmed by the falling standard of living. High rate of inflation, unemployment, disequilibria in the balance of payments that exacerbated the Nigerian debt crises and the deteriorating social services characterized the economy" (Ndebbio and Ekpo 1991: 4).

Nigeria's entire economy revolves around crude oil- with large reserves meaning that the country has, in theory, the potential to build a very prosperous economy. But despite Nigeria's rich natural resources, poverty is wide spread and Nigeria's basic social indicators place it among the 25 poorest countries in the world. Though, the country is said to have earned about $280b from oil during the past 30 years (in 1970s and 1990s)(Fig.1.1). According to the World Bank report, about 66% of the population now falls below the poverty line of about a dollar a day compared to 43% in 1985. This wealth oil has not fed through to the wider population, but has been squandered or lost through corruption/ mismanagement. That is why rises in fuel price cause such outrage amongst Nigerians

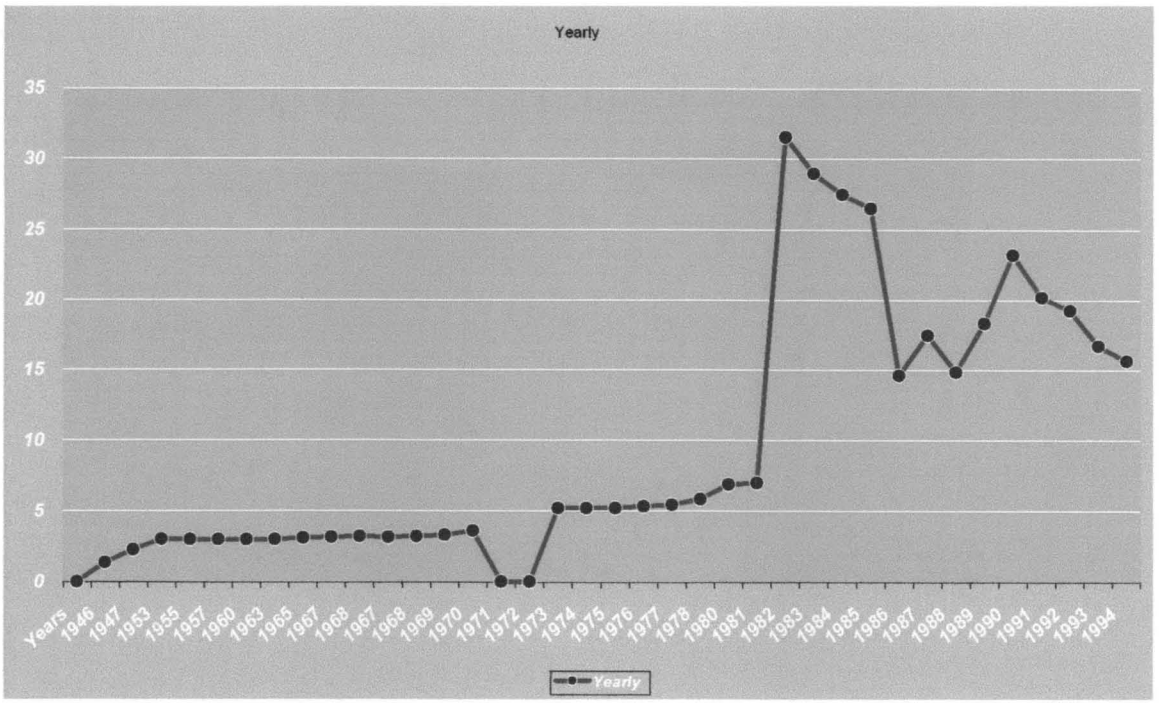


Fig.1.1: The Price of the Crude Oil (1946 – 2004)

Nigeria's economy is forecast to grow by 3.5% in 2002 according to the Economist Intelligence Unit (EIU) - a rate of growth that would be the envy of many Western nations. But the growth is primarily driven by the energy sectors and is unlikely to feed through the wider population. The industry is plague by problems ranging from averaged facilities to oil bunkering etc. For instance, while Nigeria has been pumping two million barrels of crude oil a day into the international oil markets, its own refineries are in a state of neglect and disrepair and the country has suffered a series of fuel shortages. Consequently, Nigeria is forced to import about 70% of its own fuel requirements. In the past, the Government heavily subsidized this effort. Currently, fuel hikes are moves towards the liberalization of its tightly controlled domestic markets. This is the reason

why Nigerian President, Chief Olusegun Aremu Obasanjo has insisted on the planned deregulation of the oil industry, the dominant economic sector of the country. Deregulation will mean the end to the existing subsidy system in the sector. Due to the non-competitiveness of the fuel prices in Nigeria, no investor is willing to establish a refinery in the country; instead, the government will subsidize the social services and improve public utilities like education, health, transport, power, and water services. Nigeria spends some billions of U.S. dollars on subsidization of oil products every year, but still experience fuel shortages from time to time. Deregulation and liberalization of oil sector is attempted to reform the falling economy. Deregulation is the lifting of certain government controls (such as price control) on several aspects of a specific industry, specifically the oil industry.

Nigeria's exports consist mainly of crude oil, accounting for over 75% of Government fiscal revenue and over 90% of total export earnings. Primarily agricultural exports contribute only about 3% to total foreign exchange earnings. Gross national savings and gross capital formation average 9% and 6% of the GDP respectively during 1997 to 2001. Low productivity, evidenced by high capital output ratios, explained by the low overall growth of the economy, in spite of the rates of saving and investment. In the longer term, Nigeria must reduce its dependence on oil.

Having said this much, abundance of natural and cultural resources in Nigeria has great potential to be a major tourist attraction. However, it is one of the least patronized sectors of the economy unlike the case in African countries such as Kenya, Tanzania, South Africa, Namibia, Zimbabwe, Egypt and Morocco. In 2001 for example, a total of 1,752,948 tourists visited Nigeria. This is a minuscule amount when compared to the six

million visitors to South Africa in the same year. South African Tourism (SATOUR) reports show that there's been average yearly increase of 10 per cent. Low tourist arrivals to Nigeria are primarily due to the neglect of tourism as an economic sector and negative perceptions of the country regarding safety. Jason (1984) comment on tourism in Nigeria wrote "Nigeria in the perverted name of security become too inhabited and in some case xenophobic for the tourism to thrive as an industry"

In an attempt to attract foreign investment to accelerate the pace of economic development, the government has liberalized foreign participation in businesses, including the granting of business permits, expatriate quota positions and work permit. Therefore, there is talk of diversification and development of alternative industries such as agriculture, manufacture, mining, and tourism that could bring additional foreign currency earnings. In attempted to focus attention on tourism development, President Olusegun Obasenjo has created Ministry of Culture and Tourism, and then created Tourism Board headed by a DG – Dr Omotayo Omotosho to implement. However, not much could be said to have achieved on tourism that is known for a great money-spinner and employer of diverse and specialized labour.

This project therefore, will seek to examine the concept of ecotourism in Nigeria, generated revenue, available potentials, management and environmental constraints, existing services and facilities, level of patronage, in Kainji Lake National Park (KLNP), the premier and the second largest national park in Nigeria as a case study

1.3 Aim and Objectives

1.3.1 Aim

The aim of this project is to examine the present level of ecotourism development in Kainji Lake National Park (KLNP), with a view to creating a comprehensive GIS database that would serve as decision support tool or system for managing the park, enhancing the planning and development of tourism in Nigeria's premier park.

1.3.2 Objectives:

The stated aim shall be achieved through the following specific objectives:

1. To evaluate the condition of ecosystem, identify and analyses the existing tourism potentials at the park.
2. To identify the slopes, cover type and vantage viewing points in the park.
3. To identify and assess the existing status of vegetation cover, water bodies (create buffer zones) and other natural resources that are capable of sustaining ecotourism activities in the park.
4. To identify the different habitats and associated fauna (distribution).
5. To provide broad recommendations to guide the management decision to ensure site preservation and interpretation of the park as well as the use of space technology (GPS, GIS and Remote Sensing).

1.4 Justification of the Study

Nigeria is endowed with enormous and awe-inspiring resources for tourism

development. The nation has a distinct and peculiar characteristic that stands it a pride among other tourism super powers in the world. For instance its, entire landscape, its suffusing and appealing population, climate, flora and fauna endowment, its diversified multi- ethnic regions with about 250 different languages, she is a force to be reckoned with in the area of cultural tourism, as several number of interesting and colourful cultural festivals are celebrated all year round throughout the country. These range through durbar, masquerades to cultural dances. Relatedly, the diverse traditional ethos and arts of the people, which come across in a very creative and colourful ambience also, lend credence to the fact of the latent potentials of the nation's tourism industry.

Nigeria's tourism potentials reflect the extraordinary diversity of the country: Lakes, waterfalls, dense grasslands, and woodland plains, forest and mountainous areas is owing to a variety of habitats with abundant grass and landscape, Nigeria supports an incredibly high species biodiversity with a high level of endemism. For instance, there are the six (6) parks designated as national parks - Chad Basin, Cross River, Yankari, Kainji Lake, Old - Oyo and Gashaka Gumpti, all under the National Parks Board (NPB).

Whilst it is true that Nigeria is tremendously and abundantly endowed, the same can not be said of the effort at exploring these potentials for the development and individuals. The present undeveloped and sorry state of the industry is a thing of concern and an irony on the state of Nigerian tourism industry. Tourism development as an economic venture has both regional and local physical planning implications. In fact, it owes its success largely to physical planning, since spatial structures have to be created. Lack of planning before the development of tourism is financially disastrous,

and can also hinder the realization of the buoyant benefits accruing from it. Therefore, there is need for planning before the development of tourism.

Nigeria's attitude to tourism unleashes an irony of want in abundance. She looks too far for development. The little things that require little effort elude planners for Nigeria. Tourism eluded the planners of the military era. It can only be hoped that it will not elude the planners in this democratic era. If it does, Nigeria may not be able, for a long time to come, to receive any respect whatsoever from her progeny. It is in her interest and in the interest of the generation yet unborn of this great country that a viable tourism industry be developed. This will not only afford us opportunity of reaping the aforementioned benefits but also pride us amongst the tourism super powers in the world. Countries like Kenya, Tanzania, South Africa, and United State among others whose tourism sector has been developed as achieved tremendously in economic development and appreciation of a country's heritage.

1.5 **Background of the Study Area**

1.5.1 **Borgu L.G.A. (Kainji) in State Setting**

The Borgu Emirate extends over an area of about 16, 20 square kilometers, the approximate territorial stretch of such modern day geo-political units. The Emirate lies between latitude 9°N and 11°N and longitudes 2°E and 4°E; Kaiama and Baruten Local Government Areas of Kwara State bound it to the north by Kebbi State; to the south, to the west by Benin Republic and to the east by the River Niger and Magama Local Government Area of Niger State (Fig.1.2).

1.5.2 **Relief:**

Borgu Local Government is located on a relatively flat land. The land is characterized by such a physical features as mountain, valley, rock outcrops etc. The land is also characterized by aquatic physical feature like that of the flood plain environment with patches of river's tributaries, and lakes. The topography of Borgu land is slightly sloping towards the bank of the Kainji Lake.

1.5.3 **Climate:**

Borgu like other parts of the country has two seasons - wet and dry seasons. It has a double maximum rainfall regime (1016 – 1270mm per annum), which commenced in April and last till November (fig.1.3) with a short dry season in August; the months with the heaviest rainfall is July and September. Strong winds, heavy torrential downpours and violent thunderstorm characterize the rainy season. The long dry harmmattan season that begins in November and continues till early April is a period of dry and chilly night winds, bright scorching sunshine, long days and short nights. Occasionally, however, the cool dry harmmattan weather ends abruptly around late February, ushering in a period of uncomfortable, intense damp heat accompanied by gust of hot air.

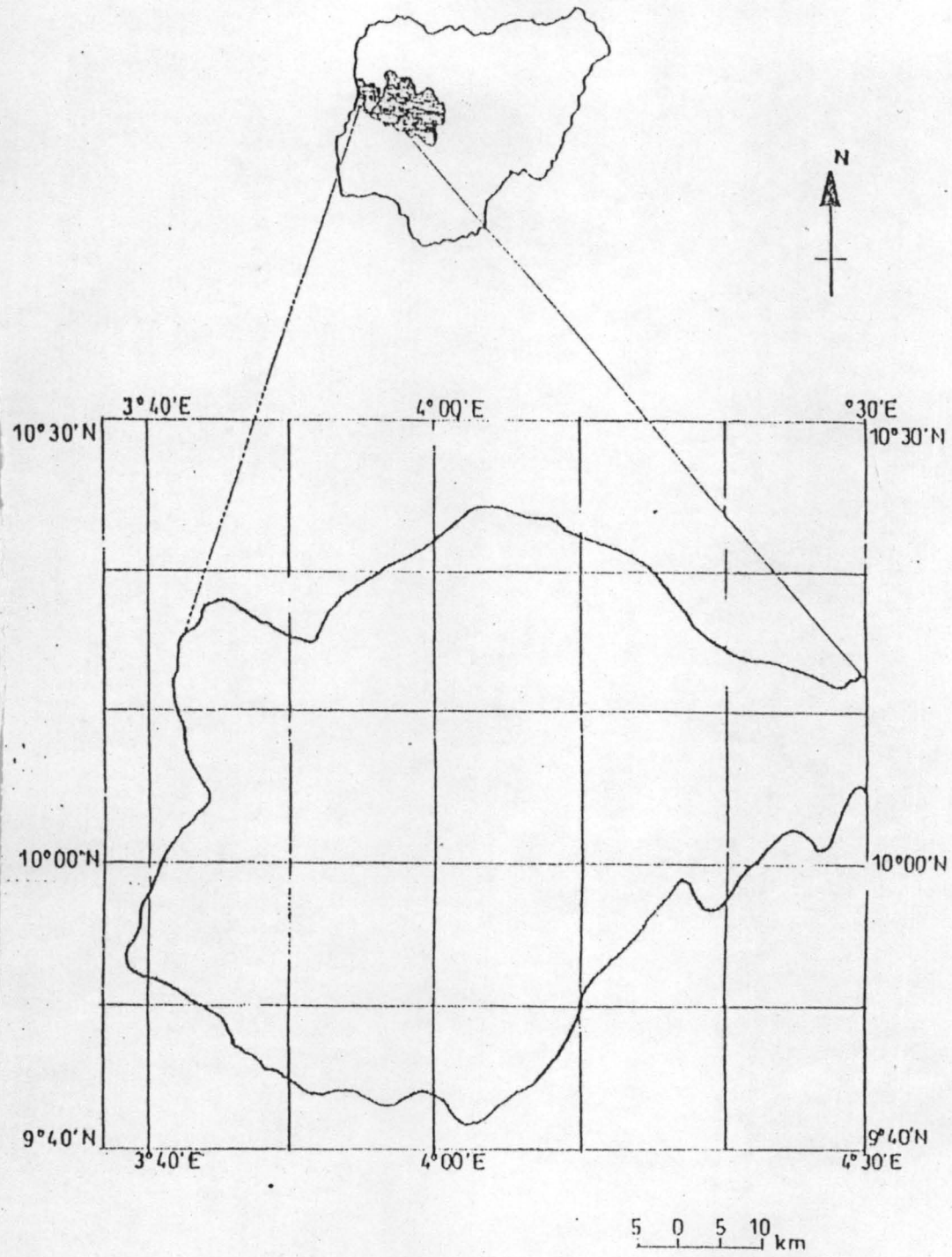


Figure 1.2: Location map of the study area.
(source: A.A. Okhimamhe)

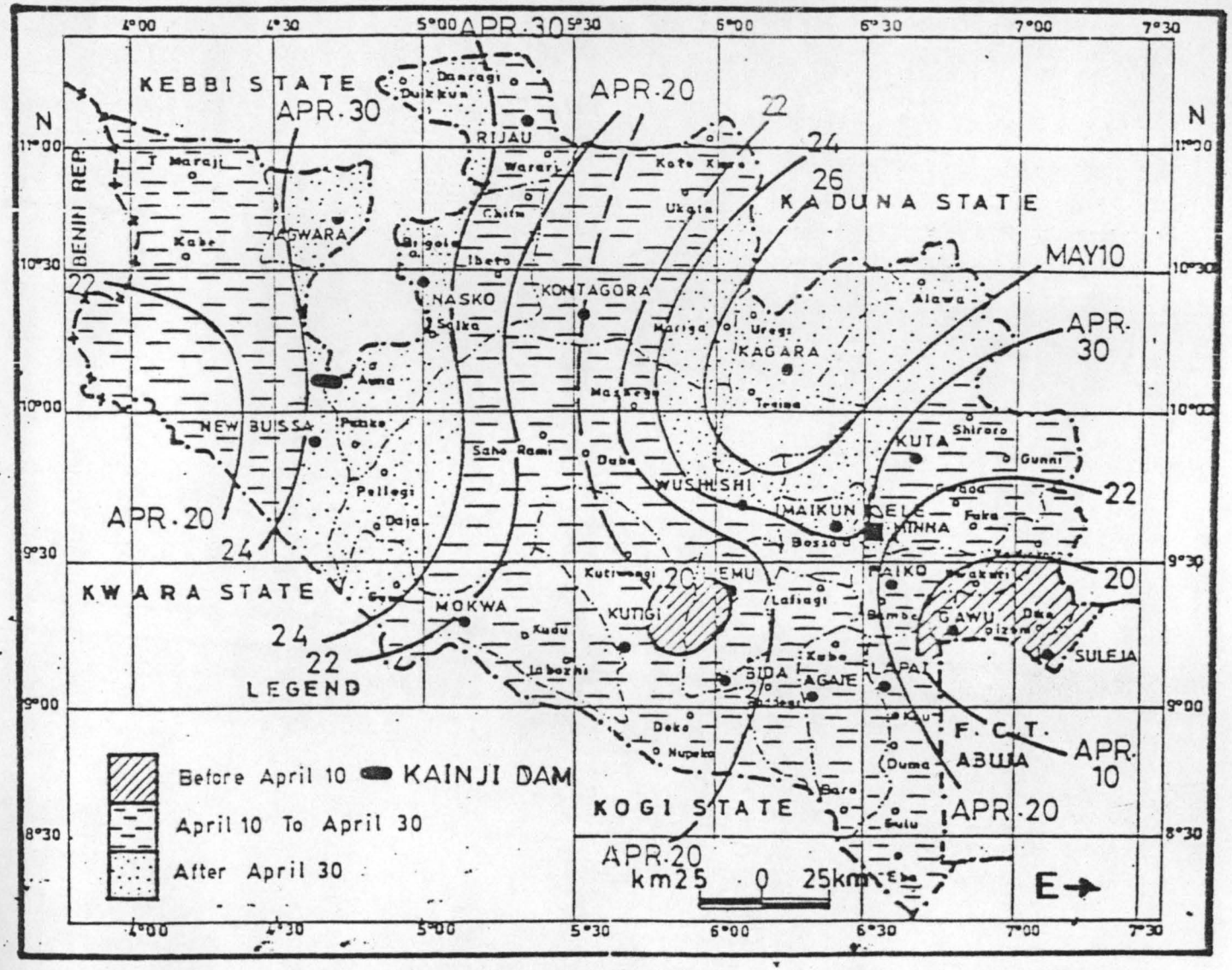


Fig. 1.3: Niger State Map Showing Mean Onset of the Rains

Source: Adapted from Adefolalu D.O; (1989)

1.5.4 **Vegetation**

Borgu is situated in-between the southern fringes of the Guinea Savanna (Northern Guinea) vegetation belt and the northern boarders of the Tropical forest (Southern Guinea) region, in the extreme western part of the Nigerian Middle Belt Zone (Fig.1.4). Borgu lies predominantly in the Guinea Savanna climate zone; here tall deciduous grasses and short scattered thick-barked trees typical of parklands characterize the vegetation.

1.5.5 **The People**

The indigenous people of Borgu are the Bussawa, Bakobar, Lavu, Kamberi, Gungawa and Nupawa. The major indigenous language is that of the Bussawa known as Bissan; other indigenous groups speak a variety of languages such as Kamberi, Boko and Gunganchi, which are linguistically similar to Bissan. The non-indigenous settlers of Borgu are drawn from several Nigerian Beninoice, Millian and even Nigerian ethnic groups who over years have left their traditional homelands to settle in the territories of Borgu. The major non-indigenous settles found in Borgu are the Hausas, Fulani's, Yoruba's and Nupes whose communities have existed in Borgu for considerable period of time, mingling and inter-marrying with the indigenous land owners.

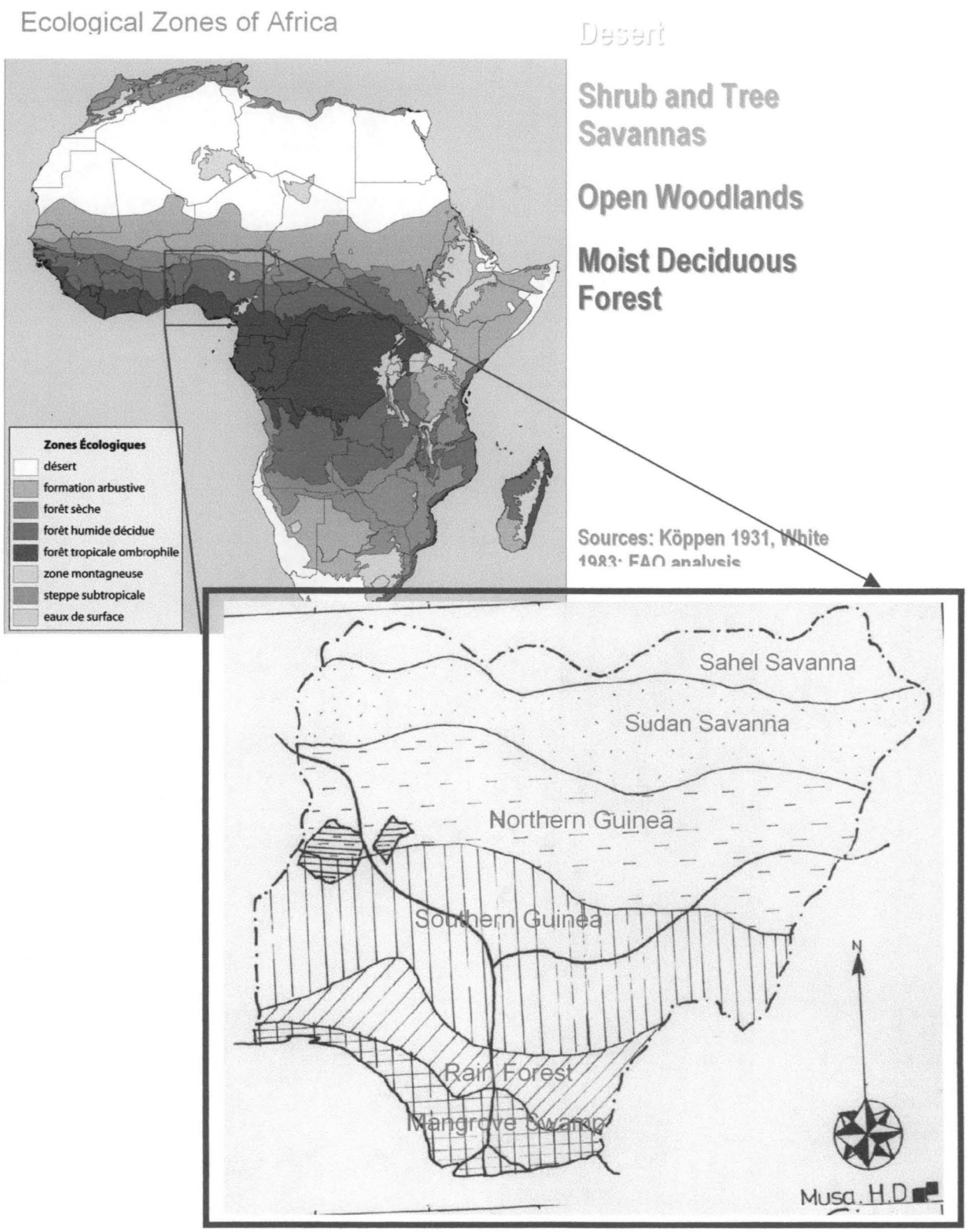


Fig.1. 4 Map Showing KLNP and Vegetal Zone

1.5.6 **Demography:**

The National Population Census report of 1991 put the population of Borgu LGA at 110,336 (57,484 Males and 52,852 Females) and 127,355 by 1996 projection. The population of New Bussa is put at 21,383 (10,868 males and 10,515 females) and 24,681 by 1996 projections. The Age distribution appears to follow the pattern of 0 - 15 years, 25%, 18 - 59 years; 65%; 60 years and above; 10% of the total indigenous population.

1.5.7 **Occupation:**

The major occupation of Borgu people is farming and fishing. Hunting used to be done in the dry season when farm products have been harvested but with the sittings of the Kainji Lake National Park in Borgu, it's now an offence punishable by law. Other activities include public works, research and civil services.

1.5.8 **Economic Base:**

Borgu Natures pride has it been called, has been of much value to the nation's economy. The pride are amongst others, the Hydro-Electric Power Generating Station, National Institute for Freshwater Fishery Research (NIFFR), Kainji Lake National Park (KLNP), Federal College of Wildlife Management (FCWM), the Nigerian Air force Advance Air Weapon School, the 221 - Light Tank Battalion of the Nigerian Army, Federal College of Freshwater Fishery Technology (FCFFT). Others are the Kuble and Kalli Hill, the Pissa Cave, Suwallah Kisra horse port, the National Fish Pond in Kabe

District, the wild water of Kainji Lake at Shagunu district. Borgu is endowed abundantly with economic trees and fishes.

1.5.8.1 **The Kainji Lake National Park**

The first real experiment at managing a conservation enclave by the highest authority in Nigeria was in April 1979. This was as a result of the creation of the Kainji Lake national Park (KLNP) in 1st April 1976, made up of two non-contiguous sectors via: the old Borgu Reserve and Zugurma Forest Reserves as they were then called. The amalgamation of the two reserves and signing into Law and enabling decree that backed up the creation (Decree 46 of 1979) gave birth to the pioneer conservation enclave the "Kainji Lake National Park" (Fig.1.5) Located some 560 kilometers north of Lagos and 385 kilometers north - west of Abuja and covering an area of 5,341 square kilometers, the park enjoys the special privilege and honour of being the first National Park in the country today. The park is smaller than Gashaka - Gunti (the largest National Park in Nigeria with an area of 6,402.48sq.km) in size and bigger than all other parks in the country.

Wildlife resources are managed among other reasons for recreation and tourism and its success has led to the creation of the other parks. The park is endowed with a rich and diverse population of wildlife, and a variety of ethno-historical and cultural sites. By February 1981, the park became a parastatal under the then Federal Ministry of Agriculture, Water Resources and Rural development.

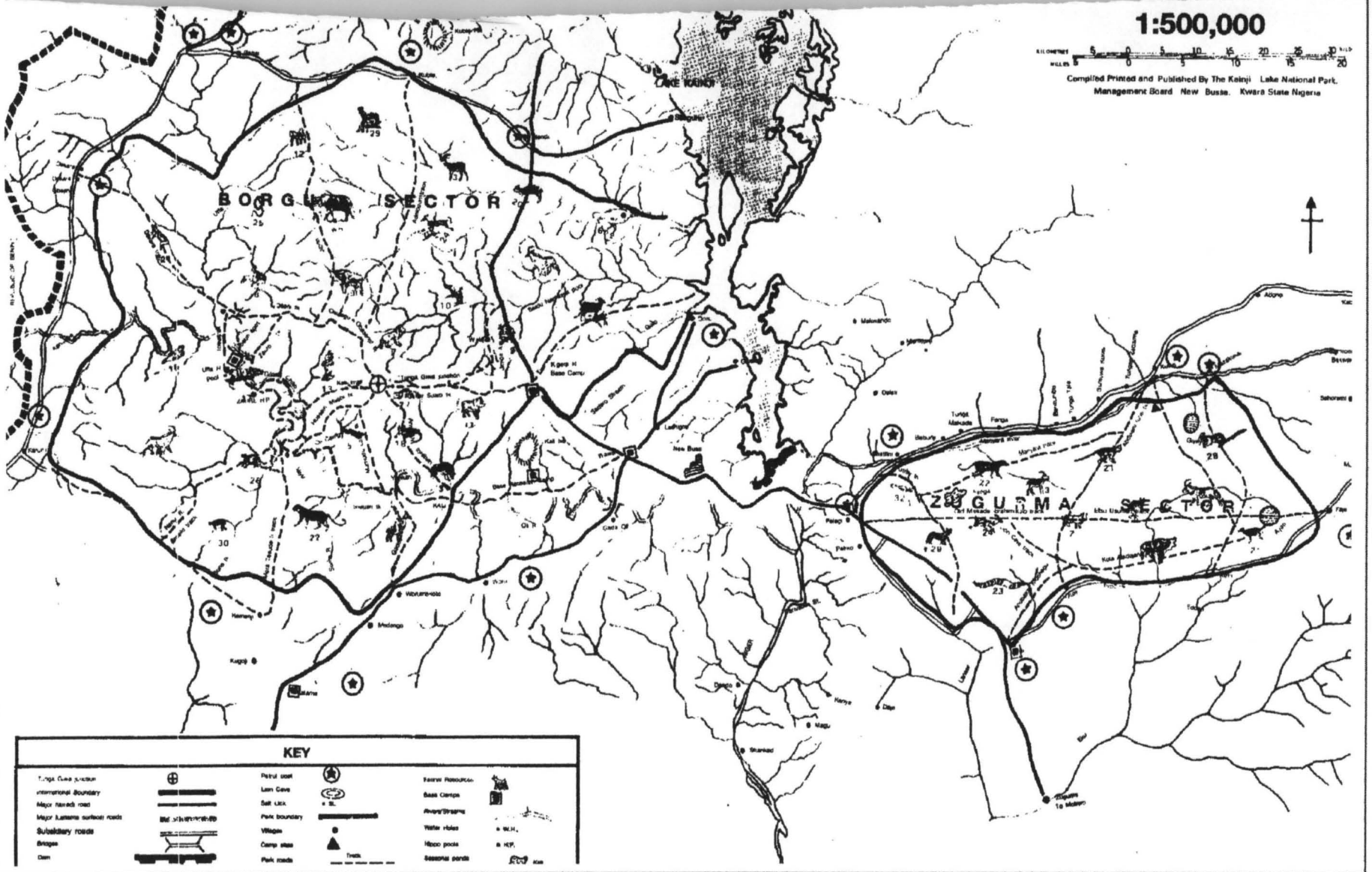


Fig.1.5: Map of Kainji Lake National Park showing the two Sectors (Borgu and Zugurma sectors)

1.5.8.1.1 **Borgu Sector:**

To the western end of the River Niger is the Borgu sector (Fig.1.6) formally known as the Borgu Game Reserve in 1960 when it was first conceived, the preliminary survey was conducted in 1961 while its administration commenced in 1964 by the then Game preservation unit of Kwara State. The sector boundary increased due to the construction of the Dam on the Lakeshore. It covers a land area of 3,970.02 square kilometer, with Republic of Benin as its western boundary. It stretched to Agwara and Borgu LGA of Niger State and Kaiama LGA in Kwara State.

1.5.8.1.2 **Zugurma Sector**

Formally known as Col. Hussey's Park (a colonial Army officer), Zugurma sector (Fig.1.7) of the park covers land area of 1370.89 square kilometers. Its administration started in February 1964 by the then Northern Regional Government and by June 1971, it was gazette as a Game Reserve with the sole aim of preserving the soil, conserving floral and faunal (i.e. plants and animals) species that the place is endowed with. It is situated in Mariga LGA of Niger State and has Manyara River, as its northern boarder while the Kontagora reserve is its northwestern boundary.

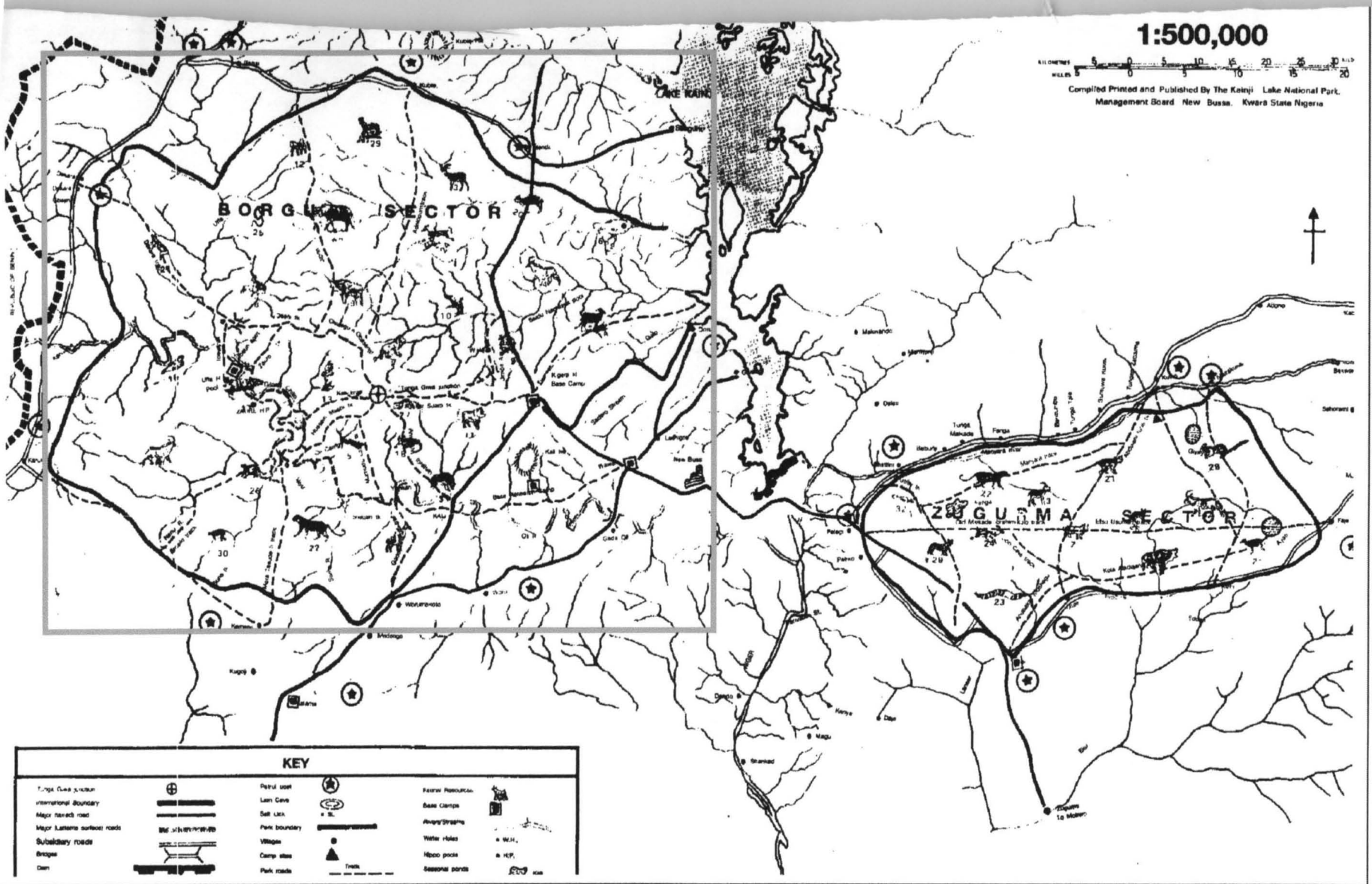


Fig.1.6: Map of Kainji Lake National Park showing the Borgu Sectors (size: 3,970.02 km^2)

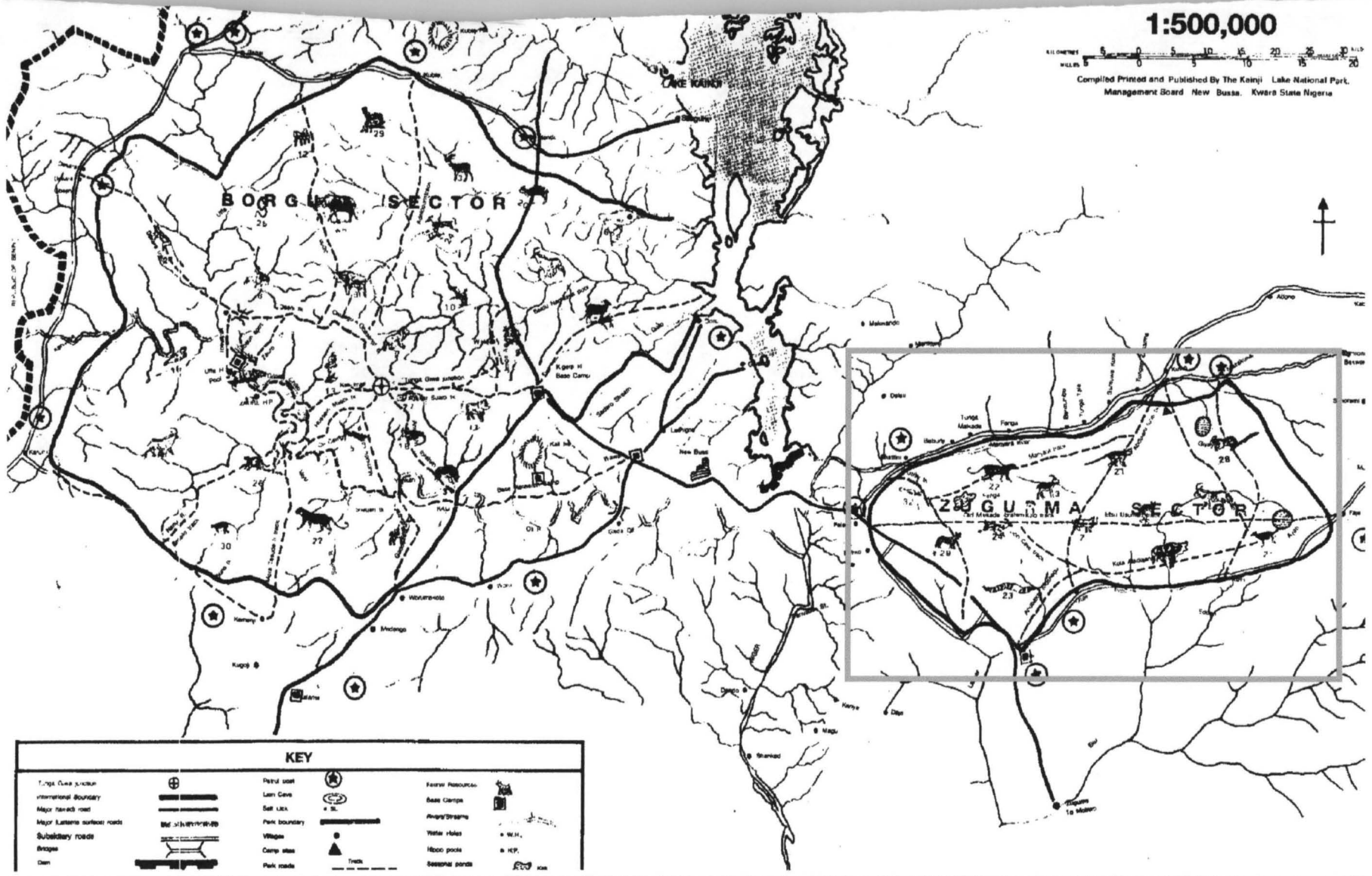


Fig.1.7: Map of Kainji Lake National Park showing the Zugurma Sectors (size: 1,370.83 km^2)

1.5.8.1.3 **Fauna Resource:**

The KLNP is endowed with rich potentials of fauna resources, either in terms of the wide range of animal populations. The animal species include Roan, Buffalo, and baboon, Hyenas, Hartebeest, Kob and Hippopotamus to mention but few. The populations of these various species are large and are on the increase, especially the baboons, Senegal Kob and buffalo. There is also a large avian presence in the parts and on the Lake Kainji. Variety of species available in the park, take the following order in terms of population: Mammals 50 species; Fishes 62 species from 18 families; and Birds 61 species. The rich fauna resources provide excellent leisure, game viewing, for both first time visitors, and those experienced in the fauna aspects of nature.

1.5.8.1.4 **Floral Resource:**

A variety of vegetation types are found in the parks and forms a mosaic of woodland Savanna interposed with patches of woodland and revering vegetation. The vegetation in KLNP is classified as Northern Guinea Savanna with several features. Two features stands our clearly as tourist features in respect of the vegetation. These are: (a) isoberlina woodland with woody species occurring in almost pure stands over a considerable area, thus, standing out clearly against surrounding vegetation; (b) diospyros (black ebony) forest, with an almost complete canopy, the occurrence of which is capable of stimulating scientific inquiry. Other features are pterocarpus/detarium woodland, Riparian forest, and acacia Savanna woodland, Burkea/deternium woodland Savanna etc.

1.5.8.1.5 **Potential Landmark Features:**

Within the KLNP, there are important Landmarks that are of great potential interest to the tourists. These include the Uffa, Zaure, Dekara and Kali Hippo pools, all in the Borgu sector of the park. Some of its ethno-historical and cultural sites include the Kubli Hill, Kali Hill, Manyara River; the lion caves of Zugurma sector etc.

1.5.8.1.6 **Scenic Beauty, Screen Surrounding and Relaxation:**

Beside the opportunities for game viewing that have been outlined above, excellent facilities exist for tourists/visitors wanting the park offer not only scenic beauty and comfort but also a pristine and screen environment which is an invaluable asset. Conference facilities are also available within the Oli River camp. Although some facilities such as - recreational facilities for both children and adult tourist, library and research facilities education tourist, car hiring services, shopping and communication facilities are lacking in the camp.

1.5.8.1.7 **Sport Fishing and Safari Hunting Facilities:**

There is sport fishing, under special arrangement on rivers Oli, Timo, Mane, and Manyara. There is also safari hunting as additional leisure activity for tourists at the park.

1.5.8.1.8 **Lake Cruising:**

The park extended to the lakeshore of the Kainji Dam, the first man-made lake in Nigeria. The Kainji Lake is a tourist asset and tourists to the site are also potential

visitors to the adjoining parks. Thus, Kainji dam is a 'natural' feeder to the KLNP. Although, the novelty of the Kainji dam may have waned, over the years, its attractive power is nonetheless important, given its 'newness' to first-time visitor

A motorized 20-seater boat "water bus" is available the park for Lake cruising. Tourist/visitors could cruise up to old Bussa town at N5, 000 for fare charred for group of 20 tourists per hour. Cruising on Lake Kainji provides visitors with the ample opportunity for viewing local as well as migratory birds and reptiles. Visitors can also enjoy the magnificent scenery of Lake Kainji and the ruins of old Bussa relics.

1.5.9 **Social Infrastructure:**

Basic social infrastructures and facilities such as motor able roads, health facilities, schools, electricity and pipe-borne water supply are enjoyed only in few towns such as New Bussa (Kainji), Dogon -geri, Wawa, Agwara, karabonde and Babanna. Most other towns and villages are yet to enjoy these infrastructures.

1.5.10 **Communication/Transportation:**

Borgu has a General Post Office at Kainji, which performs most of the functions and services rendered by modern post offices; mail movement is comparatively fast. There is also the Nigerian Telecommunications Ltd (NITEL) Telephone Exchange at Kainji, New Bussa which links up the residents of Kainji with the rest of the world, while Agwara has in place a rural telephone system. There are new Mobile Telecommunication outfits such as Glo and MTN communication Network and private ISPs that offer Internet services. The Nigerian Postal Services (NIPOST) and several

Courier companies also operate in New Bussa.

They also have Radio Niger, booster station at Koro, New Bussa, which broadcast on 981.306 meters Medium Wave (MW) Band. There are no local news dailies; the most widely read national dailies and magazines are punch, Guardian, weekly Trust, and the News.

Transportation system in Borgu is mainly intra-town services and motorcyclists popularly called 'Express', whose union is the Motor Cycle Express Service Development Association, provide the service. Transportation between towns is dominated by private commercial, which operates under the National Union of Road Transport Workers (NURTW), Borgu branch. There is also Niger State Transport Authority (N.S.T.A), Buses that regularly ply New Bussa - Minna route weekly basis with subsidized fares charged by the authority. The landing facilities at the N.A.F Base are complimentary to a chartered flight.

1.6 **Scope of the Study**

The study takes an overview of tourism development in Nigeria, both natural and man-made, with many emphases on eco-tourism (floral and fauna) development. Also to assess the present state of vegetation status (density) at the Kainji park, the species of floral and fauna, revenue generation, as well as the existing facilities and nature of services at the park for tourism development. In this project context, only the Borgu sector of the park will be considered.

1.7 **Approaches to the Study**

The approach to the study conceptually involves the definition of research problems. Two basic components, the theoretical and empirical components, were examined. The theoretical component involves primarily literature review and other secondary materials (internet) or related area under discussion. The empirical components were involved field studies and observations. The data and information collected were processed and used to generate GIS database for supportive decision making on appropriate tourism planning and development. This is conceptually illustrated with a chart (Fig. 1.8).

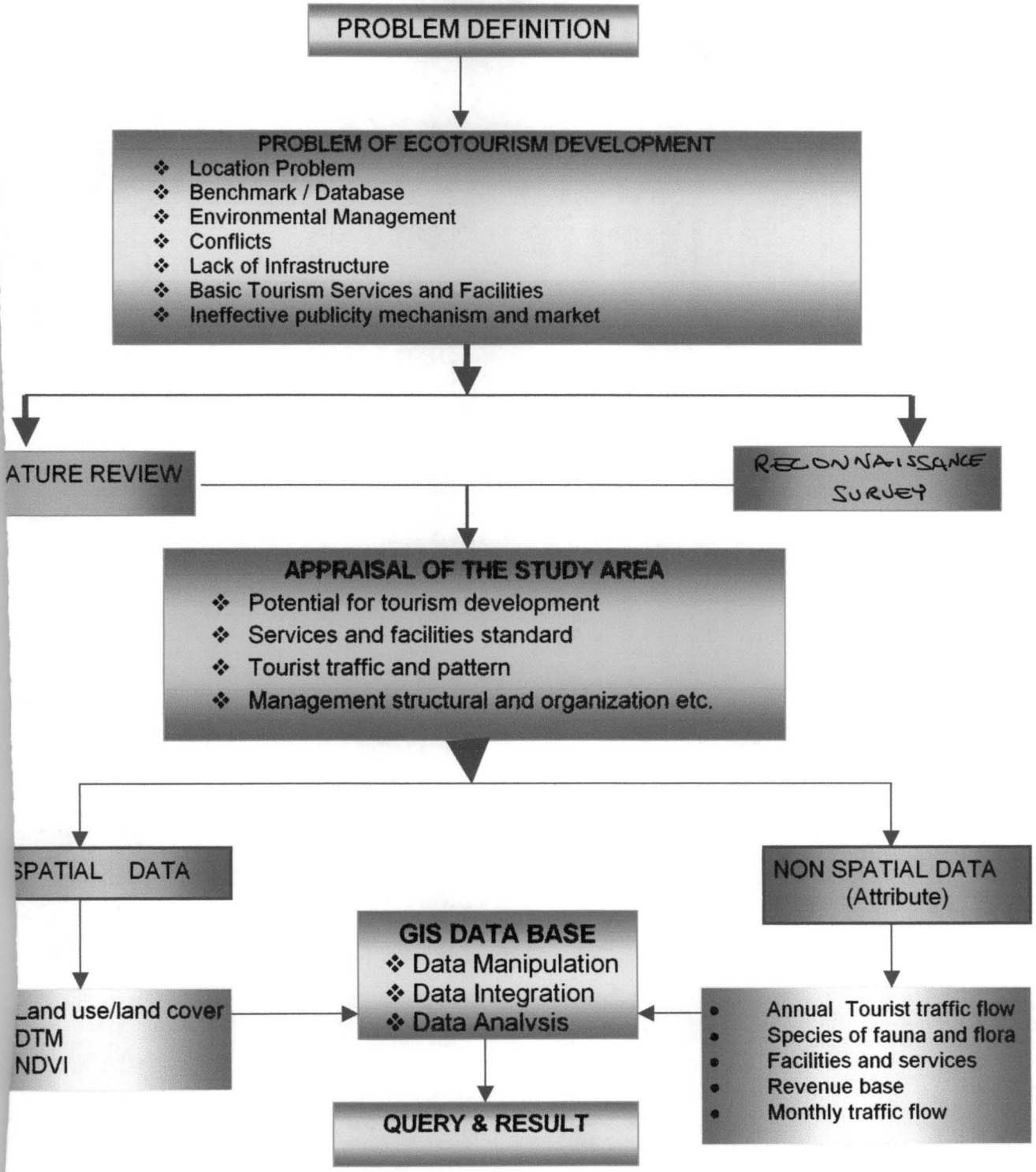


Fig.1.8: Approach to study

CHAPTER TWO

LITERATURE REVIEW AND RELAVANT CONCEPTS

2.0 Ecotourism Development

In recent years, attention as been drawn to examine how local population can direct tourism activities and benefit from it. In the 1980s, alternative form of tourism began attracting the interest of governments, communities and scholar alike. These were given a raft of names – "nature tourism", soft tourism", responsible tourism, 'green tourism', "ecotourism" (Schaller, 1999), but all were seen as alternatives to mass tourism. Among these various labels, the term "ecotourism" has become prominent, although a consistent definition is by no means found, even among scholars (Schaller, 1999). Most definitions do, however, incorporate concepts associated with sustainable development. For example, in sustainable development: Exploring the contradictions, Redclift (1987) attempted to integrate economic development with ecological sustainability, and his work has served as a conceptual basis for ecotourism. Researcher such as Zurick (1992), Hunter and Green (1995) use the definition espoused by the World Commission on Environment and Development: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987).

Ecotourism require a two-way link between tourism and environmental conservation (Cater, 1995).The growing understanding of this relationships between tourism and environmental conservation call fan the ecotourism industry to incorporate

economic development as a fundamental element of conservation (West and Brechin, 1991:392).These concerns highlight a critical difference between "nature tourism" and "ecotourism", at least as the latter term will be defined here. Nature tourism is "based directly on the use of natural resources in a relatively underdeveloped state, including scenery, topography, water features vegetation and wildlife" (Healy, 1988:1). Ecotourism activities include bird watching, trekking, mountaineering, horse riding and elephant riding within the forest wilderness trail, staying in natural caves, studying about flora and fauna, simple bush walking, fishing, animal behavior study, ecological studies (Ramaswami, 2000) It is also based upon the desire of people to experience nature in their leisure time. The growing levels of participation have led to the recognition of sub-markets. Eagles (1995a) proposed that nature-based tourism has at least four sub-markets (Nature - based tourism = Ecotourism, Adventure travel, Wilderness travel and Camping), differentiated according to the travel motives of the tourists.

Among these subdivisions ecotourism may be the fastest growing tourism sub-market. The number of eco-destinations expands with the increases in park numbers. There is now a worldwide nature travel market, with tourists from many countries traveling to destinations in many other countries (Zurick, 1992).Ecotourism has an idealistic agenda, defined by Drumm (1991:54) as "progressive, educational travel, which conserves the environment and benefits local communities". Because it is both succinct and sufficiently ambitious, this definition will be used here.

Tourism activity means a highly complex of relation's between factors that happen in the city. As Urban planning activity, ordering the tourism system implies the

management of a lot of information related to the cultural, social and economic context of each reality, and potential relations due to proximity or another location factors. Organizing and automating this amount of spatial data through GIS technology facilitate to planners, official employees and general public to use it in order to plan, development and marketing of tourism-activity. Three different landscape features usually characterize tourism destinations usually: points, lines, and polygons. Point features are individual tourist attractions, for example, a campground in a park, or a historic site along the highway. Coastal beaches and resort often follow a linear pattern, while big theme parks or natural parks are characteristics of a polygon feature. These location attributes are essential to a geographic information system.

It is apparent that GIS has tremendous potential application in tourism. However, due to the general lack of tourism databases and inconsistencies in data, their applications are limited. For example, there is very little site - specific information about sources of visitor's origin and destination, travel motivation, spatial patterns of recreation and tourism use, visitor expenditure patterns, level of use and impacts, and suitability of site for recreation/tourism development - all is which are suitable application areas of GIS.

So far, applications of GIS in tourism have been limited to recreational facility inventory (Nedovic –Budic et al, 1999), tourism -based land management (Feick and Hall, 2000) visitor impact assessment (Nepal, 1999), recreation— wildlife conflicts, mapping wildness perceptions (Carver, 1995), tourism information management system (Kilical, 2000) and decision support systems (Ministry of sustainable research management, 2002). The following tables illustrate the functional capabilities of GIS

and relevant application tourism (table 2.1); and the range of issue and potential applications of GIS (table 2.2).

Table 2.1: capabilities of a GIS

Functional capabilities	GIS Basic Question		Tourism Application
Data entry, storage and manipulation	Location	What is at?	Tourism resource inventories
Map production	Condition	Where is it?	Identify most suitable location for development
Database integration and management	Trend	What has changed?	Measure tourism impacts.
Data queries and searches	Routing	Which is the best route?	Visitors management/flows
Spatial analysis	Pattern	What is the pattern?	Analysis relationships associated with resource use.
Spatial modeling	Modeling	What if?	Assessing of potential impacts of tourism development.
Decision support			

Source: Adaption from Bahaire Elliott – White (1999, p.159)

Table 2.2: Common tourism – related issues and GIS application

Problem	GIS Application
Benchmark/ database	Systematic inventory of tourism resources.
Environment management	Facilitating monitoring of specific indicators.
Tourism behaviour	Wildness perceptions
Carrying capacity	Identify suitable locations for tourism or recreation development
Prediction	Simulating and modeling spatial outcomes of proposed tourism development

Source: Adapt ion from Butler 1993, p.33 (cited in Bahaire and Elliot -White (1999), p.162)

One of the earliest applications of GIS in tourism planning is discussed by Berry (1991) in U.S Virgin Island. GIS was used to conservation and recreation areas and determine the best locations for development. Best locations were determined according to engineering, aesthetics, and environmental constraints. Similarly, Boyd and Butler (1996) demonstrated the application of GIS in .the identification of areas suitable for ecotourism in Northern Ontario, Williams et al. (1996) also used GIS to record and analyse tourism resource inventory information in British Columbia. The GIS produce three different types of information: tourism resource maps, tourism use maps, tourism capability maps. Bahaire and Elliott (1999) provided a brief description of various applications of GIS in tourism planning in the United Kingdom. These applications included data integration and management (for example data on tourism destination

types and accommodation), landscape resource inventory, designation of tourist areas in terms of use levels, tourism suitability analysis, and pre - and post - tourism visual impact analysis.

For the purpose of this study, 'tourism will be seen as a way of improving upon the KLNP using the powerful analytical techniques of GIS to conduct macro-level analysis of spatial and temporal pattern of visitor use of park services and facilities, in order to boost the park function for effective tourism.

2.1 **Technical Definition of Ecotourism**

Within the broad concept outlined above, Ecotourism is variously interpreted for particular purposes and there are at least three particular aspects, which usually need to be defined.

1. Purposes of travel or visit that expresses a particular motivation. A technical definition of ecotourism must therefore, first define the categories of travel and visits which are, and those which are not included for a particular purpose.
2. It is usually necessary to define the time element. The minimum and maximum period in terms of length of stay away from home or in terms of length of stay at a particular destination may have to be established for a particular purpose.
3. The technical definition has to recognize particular situations which may be obtain for particular purposes and it has to be determined whether they are or not regarded as ecotourism for example sea cruises and wildlife.

2.2 Functional Definition of Terms

Tourism: Is the business of providing services for people on holiday for example hotels, travel arrangements, sight seeing trip, and leisure activities.

Tourist: This is used to describe all who travel for holiday, leisure, and recreational culture, ethnic, educational and sporting pulp.

Ecotourism: nature based tourism based upon the desire of the people to experience nature in their leisure time.

Domestic Tourism: People travel outside their normal domicile to other areas within the country.

International Tourism: People travel to a country other than that in which they normally live and which is a separate national unit with its own political and economic system, they are involved in international tourism.

Tourism Potentials: These potentials include only physical component within an area that has not been identified or exploited by the human component.

Tourism Planning: Succinctly, it's defined as a process, based on research and evaluation, which seeks to optimize the potential contribution of tourism to human welfare and environmental quality. Tourism planning must take account of conservation of the physical environment. The spatial planning of tourism can be very effective in this regard.

Tourism Development: Is concerned with a wide range of services-transport, accommodation, attractions and the infrastructure products can be developed for tourists and used by local people.

Accessibility: The tourist time of traveling, to reach the facilities.

2.3 Approach to Ecotourism Planning

Ecotourism planning requires certain systematic processes and approaches. Depending upon the types of planning and the specific forms of application, certain approaches could be taken, but conceptually, all of the approaches could be applied to any level and type of tourism planning. Inkeep (1991, p. 29) described several different approaches to tourism planning. Each approach emphases the concepts of planning as continuous and incremental, systems-oriented, comprehensive, integrated, involving environmental and sustainable development, and considering the community approach.

Particularly, systems, comprehensive, and integrated approaches are similar or related to each other in terms of a view of tourism. Ecotourism can be seen as interrelated elements, and environmental and socioeconomic aspects should be considered. The overall plan and development patterns of an area are integrated in tourism planning and development.

In a community approach, which is also frequently applied in tourism planning and development, the maximum involvement and participation of the local community in the ecotourism planning process is sought (Inkeep, 1991). Specifically, two different perspectives of community participation have been discussed, including the decision making process and the benefits of tourism development to the community (Timothy, 1999).

In conclusion, ecotourism planning can be seen as a systematic process to promote the tourism resources that the local community presents to the tourism markets. Accordingly, it deals with what resources are to be developed, how well they meet

market needs, how tourism resources are utilized, and how tourism resources can be expanded or newly developed (Gunn, 1994). Therefore, in order to create or enhance ecotourism development, an appropriate tourism planning procedure and approach should be selected.

2.4 Role of Tourism in the National Economy

The impact of tourism in the economy is felt mainly through forward and backward linkages expressed as demand for good and services in the agricultural, textiles, beverage, transportation, and entrainment sectors. Hence, the tourist dollar has such multiplier effects that its absence would affect-the general government revenue collection.

2.4.1 Employment in the Tourism Sector:

Since tourism is essentially a service industry it provides relatively more jobs than any other economic sector. The industry is labour. Intensive and, "consequently, its expansion generates more job opportunities than an equivalent expansion in other sectors of the economy (Teye, 1987). In addition, allied improvements in tourism infrastructure also catalyze other economic activities

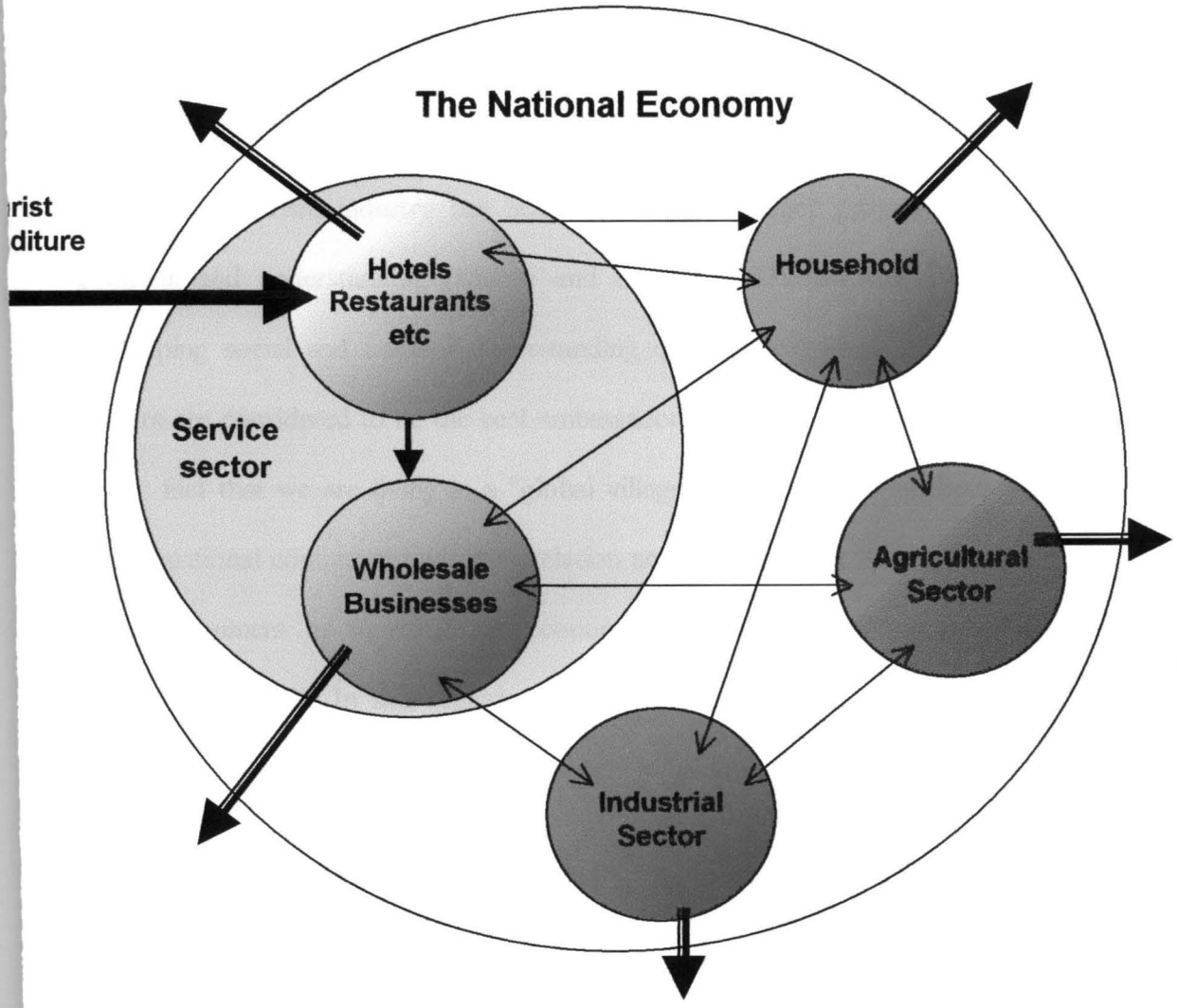
2.4.2 Tourism Earnings:

Tourism is sensitive to the level of economic activity in the country. It provides higher and stable earnings than those from primary products (Ringer, 1996a). Tourism earnings tend to increase at a higher rate than earnings from other export commodities. The earnings incurred are, in turn, used to offset shortfalls on the visible trading

account, financial reckoning. - Tourism contributes great to government, revenue through license fees, customs and exercise duty, Value Added Tax (VAT) to tourism services, landing fees, passenger service charge, and entry fees to game parks, as well as income tax levied on employees in the tourism industry. The (Fig.2.1) generated revenues play a pivotal role in the overall development of a country's economy (More and Carter, 1993).

2.4.3. **Tourism and Development of Infrastructure**

The benefits accruing from investments in infrastructure such as hotel and restaurants, road network and superstructure such as airports, communications, power and water supply as well as other related public utilities, are widely shared with other sectors of the economy. Their developments enhance the overall development at the local level and also encourage greater economic diversification. It has been argued by Schaller (1999), that tourism has larger multiplier effects than any other sectors, since every unit of tourist expenditure goes through several rounds of income creation and expenditure before its effect is exhausted. For instance, money spent by a tourist on hotel accommodation and beverages, shopping, entertainment and transportation, does not stagnate, but provides income to hotels staff, taxi operators, shopkeepers and supplier of goods and services. Part of this income spent on these individuals' daily requirements of goods and services. As a result, money accruing from tourism circulates through numerous segments of the economy through the multiplier process.



Source:After Gamble (1992, p.11)

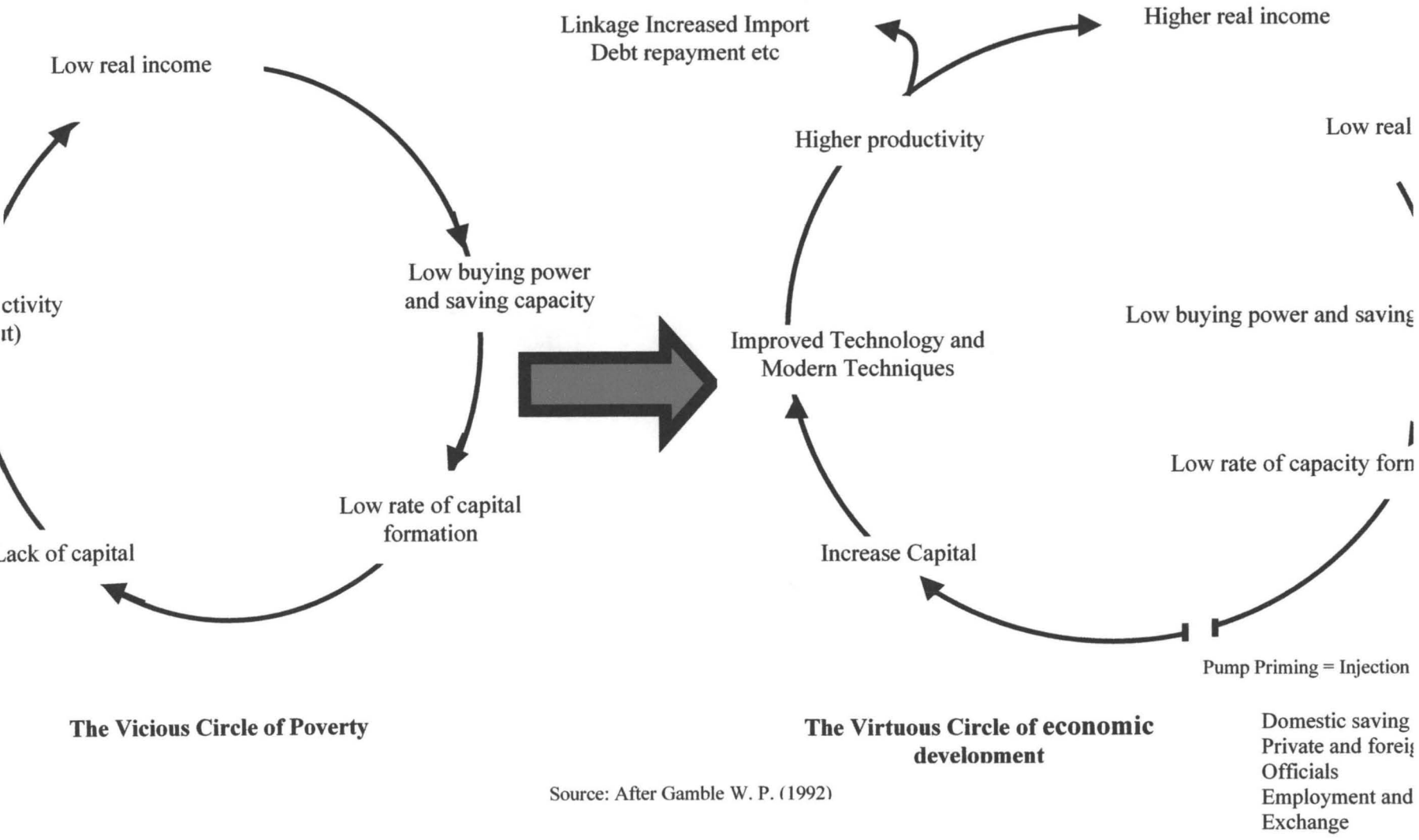
Fig. 2.1: The economic impact of tourist spending

Direct spending (via Hotel, Restaurants) in the national economy

Indirect spending (as above) to household and wholesale sector

Induced spending between various sectors

Leakage' of tourist income out of the economy.



Source: After Gamble W. P. (1992)

Fig. 2.3: International Tourism as a Strategy for Poverty Alleviation.

2.5 Evaluation of Ecotourism Industry in East Africa

For many of the world's poorest countries, tourism is seen as a means of obtaining foreign exchange and of developing infrastructure. A country promoting low-impact, ecological tourism may be able to better avoid the adverse environmental effects from traditional tourism and the sale of natural resources (Teye, 1987).The link between environmental protection, international tourism and economic development became widely recognized in eastern Africa in the early 1970(Thresher,1972). Kenya and Tanzania have well-documented example examples of ecotourism industries in eastern Africa. Starting with only a few thousand tourists in the early 1950s, Tanzania's tourism increased to 350,000 in 1995 (Friesen, 1995), and Kenya's to 865,300 in 1994(Anon, 1996). In both countries, the tourism industry is closely tied to world – class systems of national parks and game reserves. For instance, in Kenya the foreign exchange earnings from tourism rival sometimes exceed those of agriculture, the other important source of revenue (Western, 1997). Thus, throughout eastern and southern Africa, park-based tourism is a very important economic activity.

Kenya has been a successful leader in the development of ecotourism industries based upon a comprehensive structure of national legislation, policy planning and site management (Pigram, 1990). Furthermore, sine the sustainability of the ecotourism industry is dependent upon the preservation of environmental quality and biodiversity; policy makers feel that ecotourism can bolster conservation efforts (Division for Sustainable Development, 1998). Thus, while the potential for negative exploitation of this emerging industry exists, it is nevertheless seen by many as the lesser of many

much more harmful options to the world's struggling regions such as Africa (Eagle, 1997).

However, not all tourism development efforts in eastern Africa have been successful. Ankomah and Crompton (1990) identified five inhabiting these development efforts as negative market image, lack of foreign exchange for capital development, lack of trained personnel for tourism, weak institutional frameworks for planning and management and management and political instability. Sournia (1996) contrasts the management of the park tourism in western and eastern Africa. He points out that even with significant natural resources in western Africa, the tourism levels are well below those of eastern Africa. Sournia suggests that the reasons for the lower levels of use include less visible wildlife concentrations, weak national transportation networks, inefficient hotel facilities, poorly trained tourism staff, weak marketing and a lack of tourism infrastructure in the parks (Sournia, 1996).

2.6 **Case Study**

2.6.1 **Kenya: Case Study in Safari Tourism**

The Kenya Government according to Jomo Kenyatta (1973) "attaches great importance to tourism because it is an effective vehicle of economic development and an excellent way of bringing the peoples of the world closer together". At the time of independence in 1963, Kenya was confronted by difficult economic situation actively engaged in the initiation of tourism development project as one of the means of achieving economic development. Today, tourism as an industry is overtaking agriculture as the major foreign exchange earner. It is also the business with the fastest

rate of growth (25% per annum) and is all year round. Kenya has experienced an attracted tourist flow over the years. In 1994 Kenya attracted over 800,000 visitors annually, yielding revenue of more than US $421 million.

The development and distribution of tourist resources and attraction in Kenya have been possible because, its major touristy lives remains its captivating scenery and landscape, the eternal sunshine, and its riches of wildlife of secondary appeal are historical moments and antiquities, business prospects, potentials political innovations and the people themselves –with their array of multifarious culture (both indigenous and hybridized). The ministry of wildlife and tourism manages the wildlife being the main attraction for the majority of tourists.

The provision of infrastructure for tourism development has been the sole responsibility of government. Several kilometers of new roads and general improvement of existing one has been embarked upon. Others include the expansion of the Nairobi Airport, Mombasa Harbour (to handle Jumbo Jets and to receive tourist who travel by sea respectively) and many other landing strips at different location through out the country.

The bulk of investments in the provision of tourist facilities are from domestic and foreign private sources as stipulated by the Government policy for tourism in the 1970-1974 National development plans. Accommodation and other facilities are provided in all the National parks.

The responsibility of Government centre on policy formulation, provision of infrastructure and promotion of existing attraction, this is done through a tourist organization, Kenya Tourist Development Corporation (KTDC) established in 1969.

KTDC in conjunction with private sector participation achieved a lot in the provision of tourist facilities constructed a traditional village to facilitate contact between visitors and the people most especially the traditional craftsmen and dancers. Government derived its revenue from tourism through taxation of tour operators, sales of tourist information guide, hotel accommodation and Airport tax.

The private sectors, apart from the provision of tourist facilities render services. Several firms are involved in package tour operations, which often take to part of Uganda or Tanzania. They also render services such as car hiring (self –drive or chauffeur driven). Licensed professional hunter as government policy, thus creating a constant flow of income for the later must accompany tourists interested in game hunting .In summary, the expansion of tourist facilities in the wildlife parks, provision of infrastructure and services necessary for tourism have achieved success in tourism development in Kenya.

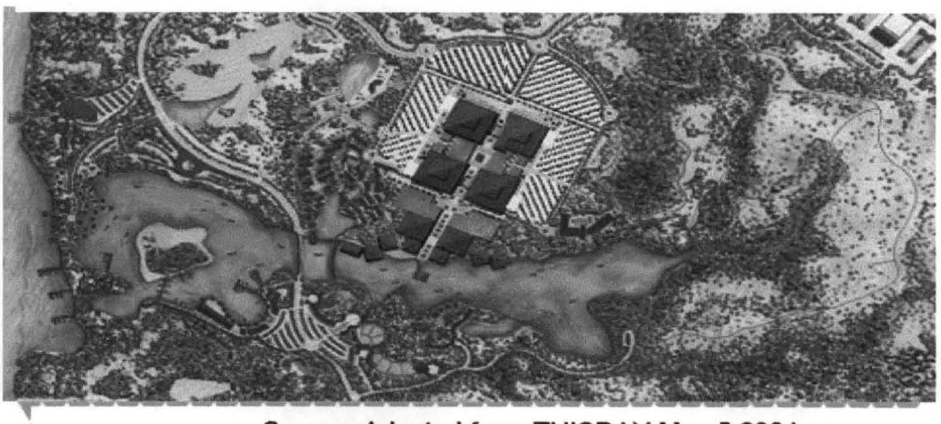
2.6.2 **Tinapa Project: Case Study of proposed and Well-Articulated Ecotourism Planning for Economic Diversification**

Tinapa is Africa's premier business resort project currently going on at Calabar, Cross River state capital. It is indeed the largest project on the continent presently (Fig.2.4).

Nigeria tourism sector is faced with number of factors, which make it difficult to fully exploit and harness her awesome tourism potential. The Governor of Cross River state, as decided in the right direction to diversify her economy outside oil and gas sector, by embarking on a massive project of exploiting the natural beauty of his state.

According to Donald Duke, 'time as passed, it was inevitable that we develop a unique `tourist destination in Calabar, and that was how Tinapa concept came about." His initial plan was to replicate South Africa's Sun City, but professionals offer advised that a typical Sun City venture would not be a roaring success in Nigeria context.

Most Nigerian tourist visits other countries primarily for business and shopping purposes, and a majority of expatriates who visit Nigeria are business tourist." A purely tourist resort therefore, would not attract the required private equity necessary to make it a success" says Duke (2004). Consequently, a business and tourist resort was decided upon.



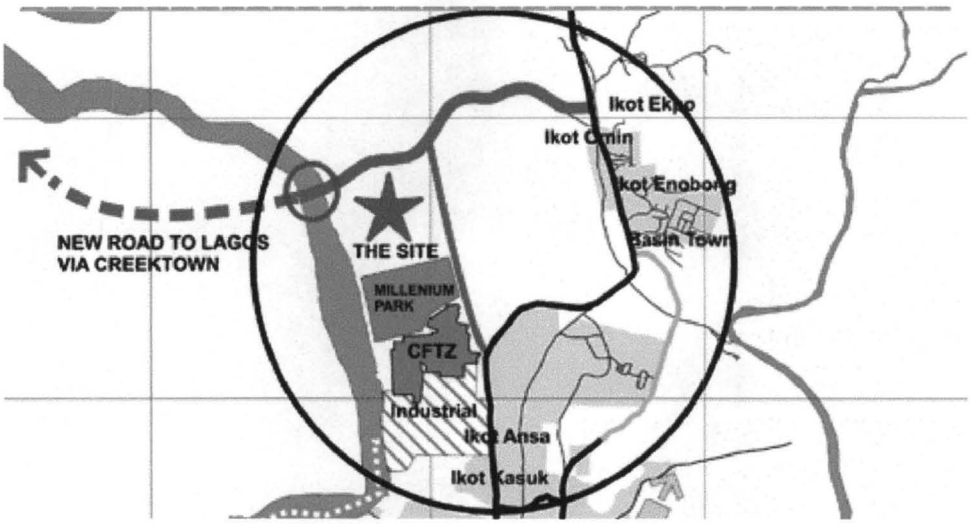
Source: Adapted from THISDAY May,5 2004

Fig.2.4: The on-going Tinapa Project plan

Tinapa is set to become a world- class integrated business resort. Located (fig.2.5) on the Calabar River, and contiguous to the Calabar Free Trade Zone (FTZ), Tinapa is the realization of exciting dream – the first integrated business and leisure resort in Nigeria.

Calabar, with its natural potential for tourism, through the unique vision of

Tinapa, will transform itself into a global trading hub reminiscent of great international free zone like Hong Kong and Dubai.



Source: Adapted form THISDAY May, 5 2004

Fig.2.5: Tinapa Project Site

The complex will provide international standard wholesale emporiums, integrated shopping complexes and product distribution elements supported by business tourism and entertainment facilities. The location of these, in close proximity to a free port on the east-west trade routes, provides exciting opportunities for Tinapa to serve as:

1. The distribution point into Nigeria and the growing economic hub of West Africa.
1. Intimate center for retail and wholesale commercial activities with the ECOWAS sub-region taking advantage of the international agreement on free movement.

The vision for Tinapa project is bold, exciting and insight, highlighting the determination of Cross Rivers state Government, under a public private partnership, to

deliver a project that will ensure high economic growth and prosperity for the people of Cross River state, and Nigeria at large. The vision builds on the principle that the creation of a trade hub will attract investors, traders and business travelers and subsequently domestic, regional and international leisure tourists. The mix components brought together in the phased development of the project create an ideal environment for trade and business tourism to flourish and lays the foundation on which to build a successful leisure tourism industry.

Tinapa project incorporated a Special Purpose Vehicle (SPV) for investment purposes that will be granted FTZ status. Project will offer outstanding opportunities for investment, such as exemption of all federal, state and local Government taxes, levies and rate, free custom duty, among others.

The project has commenced in harness and the state Government has assumed is responsibility by pumping millions of dollars into providing the necessary infrastructure: power, sewage, roads and water to make the resort a success. The project will be executed in four phases. It first phase is expected to be completed in year 2006. Tinapa project therefore, is a typical case study of a well-articulated plan for economic diversification.

2.7 **Application of Remote Sensing and GIS Technology in National Park Service**

Progress in planning continues to depend inter alia on the acquisition of data, the analysis and the interpretation of results. Although the process of data collection generally revolved around the collection of both quantitative and qualitative data, greater progress was made on the analysis of quantitative data. In more recent times,

emphasis is on the collection and analysis of both types of data and indeed on their integration in one single analysis framework. Nevertheless, quantitative data have increasingly become available from different source through maps, remote sensing from satellite and other platforms, field survey and national census. The "increasing power and falling real costs of computers and creation of software system that overcome the organizational problems that underlie the collection, storage, manipulation and display of geographic data" (Haining, 1990.p.3) are some of the reasons for the growth.

A Geographic Information System, or GIS, as it is better known, is an electronic information system that analyzes, integrates, and displays information based on its location. GIS systems have powerful visual display capabilities that present the results of analysis on maps on a wide variety of scales. GIS is an excellent technology to understand and solve problems associated with data whose common attributes are related to place and geography. In its simplest form, GIS can be used to create a map for the user on demand; in its more complex form, it becomes a database with millions of pieces of data that are related geographically and can be displayed in a user-friendly format to make multifaceted interrelationships visually understandable.

GIS comprises an integrated collection of computer hardware, computer software, and geographical data. GIS exists in a variety of forms and embody the potential for and enormous range of applications. The applications of GIS depend on how it is being used. In some cases, GIS is used as an organizing framework for the systematic collection, storage and analysis of data. In others, is used as a means for taking appropriate decisions. The GIS essentially permits the user to bring together information from numerous spatial data sets into a composite for either visual display or

analytic modeling purposes without the laborious manual processing that characterized past map analysis effort.

GIS therefore, is a decision support system involving the integration of spatially referenced data in a problem-solving environment (Cowen, 1988; 155), in other words, is a system with advanced geo-modeling capabilities (Koshkariov at al, 1989; 259), in a form of MIS (Management Information System) that allows map display of the general information (Devine and Field, 1986; 18).

National parks are endowed with rich ecological features that are physically unique, biologically diverse, and experimentally breathtaking. In order to make informed decision with information based so voluminous and detailed like we have in our parks, managers must have a system that organized and presents data in a comprehensible manner.

Planning is the key to the mission of the National Park Service to protect National parklands for our enjoyment, inspiration and education. One of the main principles of this mission is making wise decisions based on scientific knowledge. By law, each national reserve needs a general management plan. Each plan maps out a clear vision and framework to guide a national park for certain period of time (15 to 20years).The plan serve as a road map to guarantee the survival of the park and its cultural heritage. It outlines how the National park service will reach this goal.

GIS has become indispensable to these plans. GIS technology has become the tool of choice to create and analyze layers of mapped data. This includes natural and cultural resources, scenic resources, visitor opportunities, and regional landuse. GIS technology produces colourful, expressive maps that persuasively illustrate planning

ideas to the public and park service managers. It eliminated the old and cumbersome "overlay" technique. GIS save time and money with its easy manipulation and display of data. The digital data also provides accurate information to measure and evaluate how various plans would affect the park and surrounding area as required in an environmental study. GIS analysis can apply a range of valuate to resources to help determine which land may be more sensitive critical for protection than others. This evolution of GIS technology offers exciting possibilities as National park Service planners strive to understand nation's dynamic ecosystems and protect them for generations to come.

2.8 Procedures for Building the GIS Database

Developing a GIS database is frequently thought of as simply replicating a map in a computer. GIS database involves much more than "replicating a map." While substantial portions of the GIS database will come from map source documents, many other sources may also be used, such as aerial photos, tabular files, other digital data, etc. Also, the "map" representation is only part of the GIS database. In addition to the map representation and relational tables, a GIS can hold scanned images (drawings, plans, photos), references to other objects, names and places, and derived views from the data. The collection of data from diverse sources and its organization into a useful database requires development of procedures to cover the following major activities:

Getting the Data, This include acquiring existing data from both internal and external sources, evaluating and checking the source materials for completeness and quality,

and/or creating new data by planning and conducting field surveys. Contemporary GIS projects attempt to rely on existing, rather than new, data due to the high cost of original data collection. However, existing data (maps and other forms) were usually created for some other purpose and thus have constraints for use in a GIS. This places much greater importance on evaluating and checking the suitability of source data for use in a GIS.

Fixing any problems in the data source, this focused only on map source documents; this activity has been called "map scrubbing." Depending on the technology to be used to convert the map graphic image into its digital form, the source documents will have to meet certain standards. Some conversion processes require the map to be almost perfect which other processes attempt to automate all needed "fixes" to the map. What is required here is for the GIS analyst to specify, in detail, a procedure capable of converting the map documents into an acceptable digital file while accounting for all known problems in the map documents.

Converting to digital data, this involves the physical process of digitizing or scanning to produce digital files in the required format. In this case, specifications describing the nature of the digital files should be prepared. In addition to including the physical database design, specifications should describe the following:

- Accuracy requirements (completeness required positional accuracy for spatial objects, allowable classification error rates for attributes).
- Quality control procedures that will be conducted to measure accuracy.

- Partitioning of the area covered by the GIS into working units (map sheets) and how these will be organized in the resulting database (including edge matching requirements).
- Document and digital file flow control, including logging procedures, naming conventions and version control.

Change control, most map series are not static but are updated on a periodic basis. Once a portion of the map has been sent to digitizing, a procedure must be in place to capture any updates to the map and enter these into the digital files.

Building the GIS Database, once digitizing has been completed, the set of digital files is created, not an organized database. The system integration process must take all the digital files and set-up the ultimate GIS database in a form that will be efficient for the users.

2.9 Administrative Structure of the KLNP Park

A Board known as the Kainji Lake National Park management Board (KLNPMB) conducts the affairs of the park. The functions, powers and obligation of the Board are specified in section 2 to 7 of KLNP Decree "To oversea the day-to-day running of the park in accordance with the management goals set for it and execute the general policies of the board is a General Manager appointed by the board with the approval of the honourable Minister of Agriculture, Water Resources, and Rural Development." The administration of the park is decentralized into seven departments

under different heads, all of who are responsible to the General Manager. These departments include:

(i) Protection and Law Enforcement Department

(ii) Tourism promotion/publicity Department

(iii) Research and education Department

(iv) Personal management Department

(v) Finance and supplies Department

(vi) Engineering/works Department and

(vii) Planning.

2.10 **Ecotourism Development in Nigeria:**

Generally tourism development is not just appointment of tourist organizations, and hotels. It is an amalgamation of so many industries, which can hardly be achieved without government support (Muktar, 1988).

Tourism development at National level is the first instance a Government responsibility to formulate a National Tourism Policy and initiate programmes and project (Burkart and Medlik, 1981). It is these National policies, programmes and projects that provide guidelines for any tourism development at the supra urban state i.e. states and local areas. In other words the National policies, programmes and projects determine the nature and extent of tourism development at regional and state level.

The patterns and trends of tourism can be traced through the three stages of political development in Nigeria viz.: pre-colonial, colonial and postcolonial periods (Afolabi, 1978). Tourism development in Nigeria during the pre-colonial period was

limited by economic, cultural and technological factors that hindered traveling. The economy was predominantly subsistence agriculture, which was labour intensive and time consuming leaving little for traveling. Some cultures never welcome visitors and community leaders by virtue of their position were prohibited from traveling outside their hometowns and this affects their subjects, since they look upon the leaders as models of behaviour. The mode of transportation was either on foot or horseback, which was very slow (Afolabi, P 416).

Tourism increased in Nigeria with the advent of transportation network, open spaces, parks, museum etc. in the colonial era for the colonial officers. These were established for rest, recreation and traveling purpose, for colonial officers, Olokemeji forest reserve was the first established in Nigeria in 1900. These form the base for infrastructure for tourism development in Nigeria.

In the postcolonial era, a number of factors created a favourable atmosphere for recreational and business tourism. This include the emergence of an industrial economy, rise in per capita income due to oil boom, increased car ownership, paid holidays, increased rate of urbanization and more time for leisure at week ends. Nigeria also hosted the second world Black Festival of Arts and Culture (FESTAC) to serve as a spring for putting Nigeria in line light of the world as a country bestowed with tourism potentials. This was how the market for a booming domestic and international tourism was created (Afolabi, P. 419).

However, the fortune of the oil boom in the 70s led to ambitious and unviable projects. Toward the end of 1979 the economy was showing signs of depression, this was due largely to the global depression, more also, the issue of 1981 glut whose

genesis can be traced to Saudi Arabia over flooding the market at that time. By 1983, the economy was well deep into the depression. "Amid 1980 to 1985 the gross domestic product was growing at a decline rate and the manifestation of the decline was seen in the per capita income of the citizens, confirmed by the falling standard of living. High rate of inflation, unemployment, disequilibria in the balance of payments that exacerbated the Nigerian debt crises and the deteriorating social serves characterized the economy" (Ndebo and Ekpo 1991: 4).

Although Nigeria is endowed with an abundance of natural and cultural resources and has great potentials to be a major tourist destination, it is one the least patronized as a holiday destination unlike other African countries such as Kenya, Tanzania, South Africa, Namibia, Zimbabwe, Egypt and Morocco.

In 2001 for example, a total of 1,752,948 tourists visited Nigeria. This is a diminutive amount when compared to the six million visitors to South Africa in the same year. South African Tourism (SATOUR) reports show that there's been average yearly increase of 10 per cent.

Low tourist arrivals to Nigeria are primarily due to the neglect of tourism as an economic sector and negative perceptions of the country regarding safety.

CHAPTER THREE

DATA AND METHODOLOGY

3.1 Description of Data

The study was carried out using LandSat ETM+ image acquired on 22nd October 2001(late wet season), LandSat TM acquired on 21st October 1986, and LandSat MSS image acquired on 8th December 1975 (dry season). Other ancillary data used include: Maps (Topographic and Planimetric maps), as well as attribute data (such as species of fauna and flora existing, their distribution, tourist traffic, facilities available, revenue generation and allocation e.t.c.).

3.2 Methodology

Ecotourism planning requires exploring diverse types of natural and cultural attractions along with demographic characteristics, to provide the base for designing the travel industry different from the mass tourism standard. In our National Parks, the park interpreters (Rangers) are always looking out for ways to inspire visitors. This is a constant challenge for park Rangers, as visitors grow increasingly sophisticated in what they expect from parks, gift shops, display brochures and websites. Before they leave home, many visitors check the Internet for colour images, maps, and other background information on national parks. And when visitors arrive, they want clear and visually exciting information to help them understand the potential of the park they are about to

explore. Remote Sensing and GIS and other related technology (GPS) has been used to communicate the sense of the park to the visitors. GIS maps that offer 3-D images of the park topography and key features help make sense of the immense scale and grandeur of geographic features that have a tendency to mystify and astound. Using satellite images, GIS technology translates topography into layered maps that illustrate water bodies, vegetation layer, e.t.c. To fulfill this purpose in this project context, Remote Sensing and GIS approach was used. The summary of the methodology is given in figure3.1. The study area was extracted using information from the planimetric map. The extracted digital data was analyzed (processed digitally) to generate vegetation density map, land use /land cover map, habitat map (ecological niche: fauna distribution at the park), water bodies' map, wetland map, tracks map, Digital Terrain Model (DTM) / Digital Elevation Model (DEM) maps e.t.c.

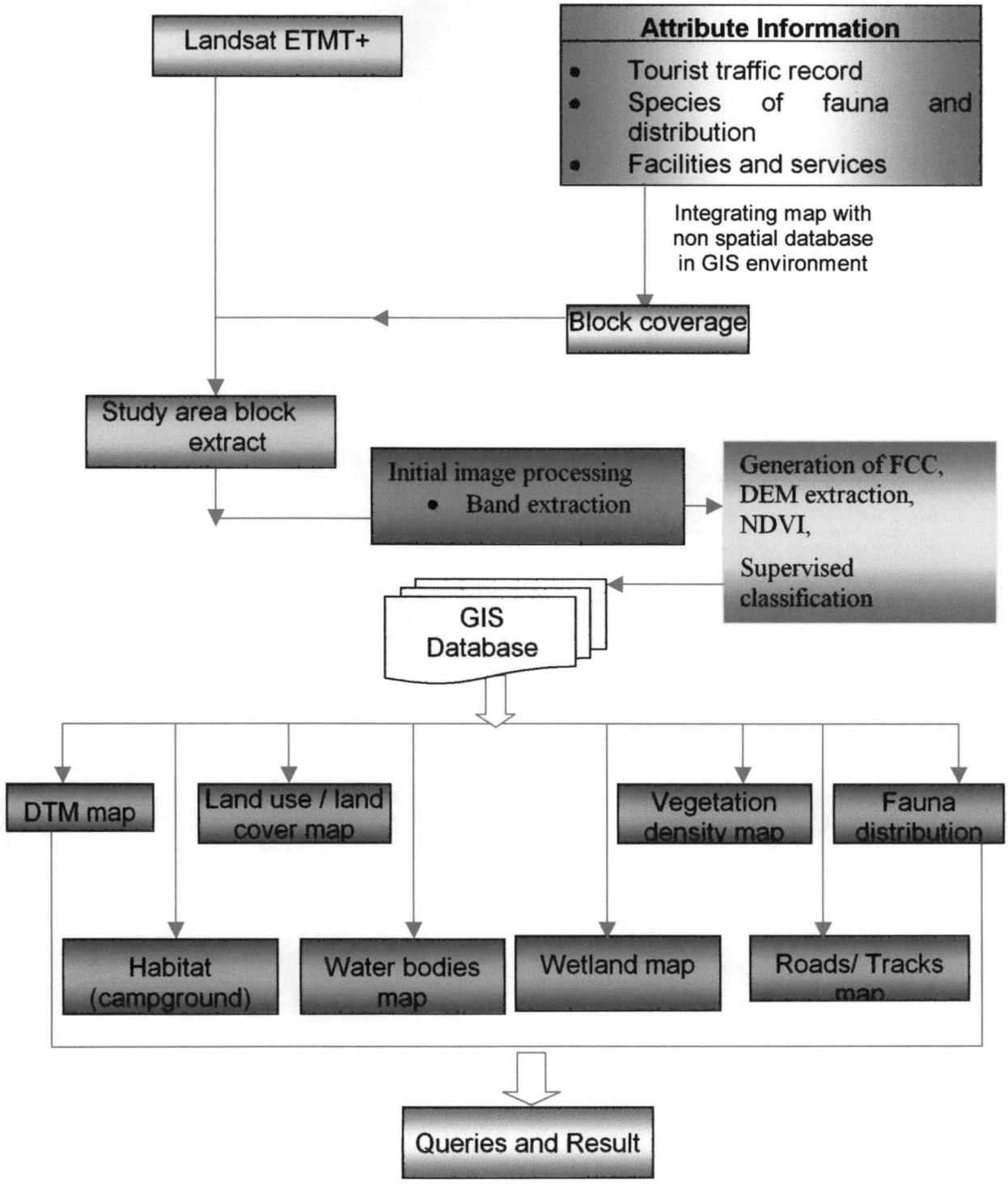


Fig.3.1: Approach to GIS Database Development for the Project

3.2.1 **Vegetation Density maps**:

Vegetation is the key indicator for overall environmental conditions, and changes in vegetation are useful means for recognizing changes in other environmental factors. Assessment of the vegetation in the park is essential if the interaction between the wildlife population, the possibility of the climate changes, and the vegetation resource, are to be understood. Such understandings are necessary for establishing management strategies that will ensure that is sustainable as conservation of wildlife and for tourism.

The information regarding the vegetation density can be of great help to identity and declare potential site for preservation. In order to get this information, *Normalized Difference Vegetation Index (NDVI)* approach will be used, which is highly correlated with vegetation parameter such as green leaf, biomass, leaf and is indicator of photosynthetic activity and hence is of considerable value for vegetation discrimination and monitoring. NDVI is based on the different interaction between vegetation and electromagnetic energy in the Red (*ch1*) and Near Infrared (*ch2*) wavelength. In a generalized spectral response pattern for green leaf vegetation, reflectance in the Red (*ch1*) region (about 0.6-0.7μ) is low because of absorption by leaf pigment (principally chlorophyll). The infrared (*ch2)* region (about 0.8-0.9μ), however, characteristically shows high reflectance because of scattering by the cell structure of the leaves. This empirical approach allows one to assess the state of vegetation on the ground. The formula is simple and given by

NDVI = *(ch2-ch1)/ (ch2+ch1)*

Where ch1 = Red channel

and ch2 = Near infrared channel.

NDVI values ranges between -1 to + 1 and except vegetation, other features show either negative or zero NDVI values. Typically, NDVI values of 0.0-0.2 correspond to bare soils, large values (0.2-0.6) indicate the presence of green vegetation and negative values indicate water. For clarity of analysis and comparison purpose, *Normalized Ratio Vegetation Index (NRVI)* of the image would be calculated. This normalization is similar to that of the NDVI, but it reduces topographic illumination and atmospheric effects and creates a statistically desirable normal distribution. It is denoted mathematically as follows.

$$\text{NRVI} = \frac{\text{RVI} - 1}{\text{RVI} + 1}$$

$$\text{Where RVI} = \frac{\text{ch1 (Red)}}{\textit{ch2} \text{ (NR)}}$$

Alternatively, the fused product of LandSat ETM+ bands and PAN data is used to get both multispectral and high-resolution information for vegetal classification for comparison and visual interpretation. The goal of the data fusion is to exploit the different information content about the park captured by PAN (15m resolution) and other multi-spectral bands (30m resolution) in order to improve the recognition and discrimination of features in the scene. This is often accomplished by enhancing the

visual interpretability of features, or through improved class separability in numeric classifications. The end-product of fusion through enhancement is typically a colour image in which the PAN Image and others data have been combined into attractive, interpretable scene. The fusion for classification result in improved classification accuracies for the classes of interest such as NDVI.The image processing techniques for data fusion adopted in this project context is the Band Combination techniques. Band Combination refers to the simple assignment of different channels' of data to the Red, Green and Blue (RGB) channels of the display device. For example:

PAN ⟶ Red
ETM4 ⟶ Green
ETM3 ⟶ Blue

The fusion of the PAN data is achieved through simple visualization of the PAN image in combination with other data set.

Using the information derived from NDVI, the park area was broadly classified into different categories of vegetal cover: closed canopy woodland vegetation, open canopy woodland vegetation, grass/shrub land, marsh /wetland and bare/degraded land.

3.2.1.1 **Time Series Analysis (TSA) of Fused Image and NDVI**

Long-term time series image data provides an opportunity to assess quantitatively and qualitatively the vegetation cover status in the past and present, to determine trends, and to predicting the ecosystem processes (Nemani et al.1997). Time series correlation of multispectral and high-resolution (PAN) band combination, and

NDVI analysis of the Park vegetation status was assessed to evaluate the vegetation growth rate or greenness visually and statistically.

Result from average greenness can be applied for inter-annual assessment of vegetation cover status over the whole reserved area. This temporally and spatially distributed information provides support to decision makers, planners and park managers, and give the opportunity to compare each year in terms of vegetation growth, stress and productivity, resource allocation and human encroachment (farming or grazing).

3.2.2 **Land use/ landcover map:**

After extraction of the study area, stratified approach was adopted to generate land use / landcover from digital classification of LandSat ETM+ data acquired in October 2001, landsat TM of 1986 and landsat MSS acquired in 1975.The first step was to perform *linear contrast stretch* of all the bands, and then the ETM+ bands with 30m pixel size were combined in order to select the most suitable band combination. The enhanced false colour composite of bands depicting the vegetation was chosen and *classified by supervised mode with maximum likelihood (MXL)* algorithm using necessary ground truth information. Information gathering during the site visits pertaining to land use/land cover substantiated the training sites during remotely sensed image classification by maximum likelihood *(MXL)* classifier. This analysis highlights the changes in landuse/landcover patterns in the study area.

3.2.3 **Digital Terrain Model (DTM)/Digital Elevation Model (DEM) map Generation:**

A Model is used to conceptualize certain aspects of reality. Digital terrain model is a numerical representation of terrain features in terms of elevation and planimetric measurements obtained by sampling a topographic surface. In other words, it is a numerical representation of both planimetric details and height information that provides a continuous description of the terrain surface.

DTM map of the study area was generated from the numerous Spot heights extracted manually from the topographic maps on the scale 1:50,000 covering the study area. The actual height information (contours/ hysopraphy) derived from the topo-sheet as recorded in the corresponding DLG file, is then used mathematically to manipulate Digital Elevation Model (DEM) by a process called interpolation. DEM is the base surface used for other mapping product such as the oblique, 3-Dimension map e.t.c. Interpolation is the determination of an intermediate unknown values or rate of surface change. This mathematical procedure was performed in order to derive a continuous surface of the study area.

The DEM surface in important in this project context to understand the hydraulic flow and hydrologic system of the park terrain, which is controlled by the topography. The elevation surface is also relevant in wildfire response and useful in determining the spatial relationship of the species of fauna and various scenic viewing points in the park.

3.2.4 Digital Line Graph (DLG) data of Water bodies (Rivers):

The digital line graph (DLG) map of rivers was generated by on-screen digitizing of the rivers and water bodies from the block coverage of the study area extracted from the digital image (Landsat ETM+). This map shows the various water bodies/ rivers in the Borgu sector of the park. The rivers include: river Oli, river mane, Timo, e.t.c.

3.2.5 Digital Raster Graphic map of wetland:

The wetland areas of the park were identified, delineated and mapped. This was achieved using *maximum likelihood classification* (MXL) approach and on-screen digitizing. Wetland generally includes swamps, marshes, bogs and similar areas. Wetlands are transition between terrestrial and aquatic system where the water table is usually at or near the surface or land covered with shallow water.

3.2.6 DLG data of Access Roads/ Tracks:

The digital line graph map of access Roads/ tracks existing in the park was generated form the planimetric map obtained. The map display all the roads and tracks within the park for accessibility and game viewing.

3.3 Field data collection:

3.3.1 **Oral interview**: Oral interview was conducted with the park management staff in order to generate information about the park. Such information include the inventories of services and facilities at the park, management constraint

(administrative/environmental), organization, facilities conditions (Poor, Good, and Excellent), tourist demography, revenue generation and allocation, type of tourist visiting the park (domestic/foreign) etc.

3.3.2 **Reconnaissance Survey**: -A reconnaissance survey of the park was carried out to ascertain the present ecological status and condition of facilities as well as services available at the park. Other observations include potential landscape features, physical factors, human factors, and economy factor related to investment as well as management factor (human activities around the park). A cross section photograph of features was taken. The aim of this is to enrich the researcher with the first hand information about the park and its functions.

3.3.3 **Ground-Truth**: -For the purpose of comparison and analysis of data accuracy the study area was sampled randomly and ground control point coordinates measured. Such ground-control point's selection was carried out over different surfaces (vegetation, land use/land cover, stream/rivers, roads, and tracks) using handheld Global-positioning system (GPS) receivers. The field data was used to geo-reference the accuracy of the Landsat -7 ETM+ image obtained, in order to correct the error that may likely occur, (i.e. geometric error).

3.3.4 **Secondary data**: - In order to develop a comprehensive GIS database for this study, data (secondary) were obtained from various concerned departments. Data such as tourist visit statistics (monthly/annually), Kainji park base map, habitat map, revenue

generation and allocation etc. were obtained from the park management. Satellite imageries: LandSat MSS, LandSat TM and Landsat-7 ETM+ required for analysis were obtained from the Global Landcover Facility (GLCF) archive location and National Center for Remote Sensing (NCRS) respectively. Other related literature on the subject was explored. Both published and unpublished materials such as journals, seminar, web resources, officials' publication, handbooks, bills, pamphlets etc were used. The aim of this is to come up with a comprehensive review of literatures and concepts for better analysis and assessment. Inferences and recommendations made was used to propose for the enhancement and development of effective tourism.

3.4 Evaluation and choice of image processing and GIS (Visualization) software

It is important to establish the software to be used and to evaluate the compatibility of the GIS software with the image processing software. In this project context, ArcView 3.2a is chosen as the GIS software and for visualization. IDRISI 32 is chosen as the image processing software because of its compatibility with the ArcView 3.2, user-friendly interface.

3.5 GIS Database Developments

According to the New York state archives GIS Development Guide, database planning is the single most important activity in GIS development. Database development could be described as the task of finding, creating, assembling and integrating of data. It is the most essential and usually time and resource consuming.

The following stages were followed in database development in the course of this project.

3.5.1 **Data Capturing**

Data Capturing simply refers to the input process of information into the system. It involves identifying the objects on the maps obtained, their absolute location on the Earth's surface (geo-reference), and their spatial relationships. Objects are identified in a series of attribute table (the "information" part of a GIS).

For the purpose of this study, the planimetric map of Borgu sectors of the Kainji Park with a scale of 1.250, 000, and topographic map (with the scale of 1:50,000) covering the study area were acquired. The map was scanned using electronic scanner with a fine resolution into digital maps. The digital maps and the processed satellite image were Geo-referenced. GIS software was used for on-screen digitizing of the digital images into thematic maps (coverage) to form the database. The GIS database model work Flow is shown in Fig.3.2 below.

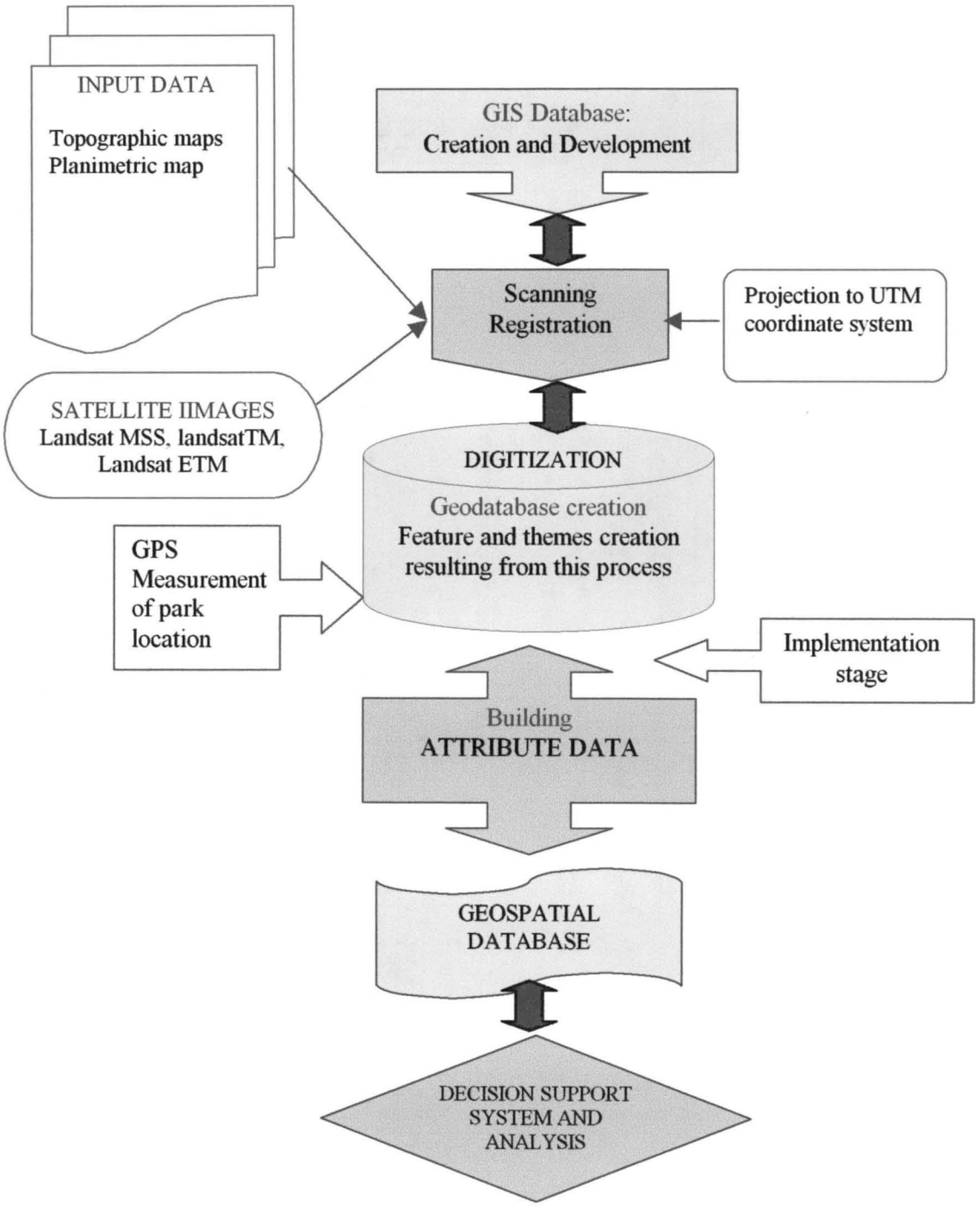


Fig.3.2: GIS Database Model Work Flow

3.5.2. **Data editing**

As a result of the problems that may be encountered during data encoding, data editing was performed. GIS data may include errors derived from the original source data, as well as errors that have been introduced during the encoding process. There may be errors in co-ordinate data as well as inaccuracies and uncertainty in attribute data. Therefore, the digitized map was edited. During the process of editing, edge matching errors, feature duplication errors and all other errors associated with the map were identified and eliminated. The entire system was then subjected to quality assurance test.

3.5.3 **Database implementation and integration**

The databases corresponding to the various theme earlier created in the system were implemented. Each feature has attribute data, which are entered into the attribute table. Other related information that would be necessary in generating result in decision making for the park was entered. The themes generated are manipulated and integrated (overlay) based on the importance of the decision required on the park. The GIS can recognize and analyze the spatial relationships among the mapped phenomena. Questions on conditions or trend of activity can be answered conveniently.

3.6 **Querying capability and Results**

Geographic Information System (GIS) has capability to produce graphics on the screen or on paper to convey the results of analysis to the people who make decision about resources. In this project context, Interactive maps and other graphics that would

be of help to the decision makers were generated from the GIS Database. It is also possible to query/manipulate the database to simulate or modeling spatial outcomes. For instance, a simple query was performed to test the GIS database developed using ArcView query builder, the query syntax, the spatial and the tabular result form the basis for the timely retrieval and manipulation of database for future problem solving on ecotourism activities of the park.

CHAPTER FOUR

ANALYSIS AND DISCUSS OF RESULTS

4.0 Introduction

In this chapter, the results of data collection are described and the findings of the digital image processed and GIS database developed are presented. First of all, the analysis from the satellite data are presented and described. Next, the results of the queries made: statistics measurement, map creation, map displaying and hotlink of potential landmarks, to test the reliability and validity of the GIS database developed are examined and reported

4.1 Image Registration and Extraction of Study Area

Raw satellite images were registered through image- to- image registration procedures using 25 ground control points on average and that were taken from existing vector coverage of lake, river and road intersections and readings from GPS. To keep original values of the image, the nearest neighbor method was used for resampling. The study area (Row =3253, Col. = 3806) was then extracted using the existing boundary from the planimetric map as a guide (Fig.4.1). The extracted digital data was further analyzed to generate landuse/landcover map, vegetation density map (NDVI) and DEM/DTM.

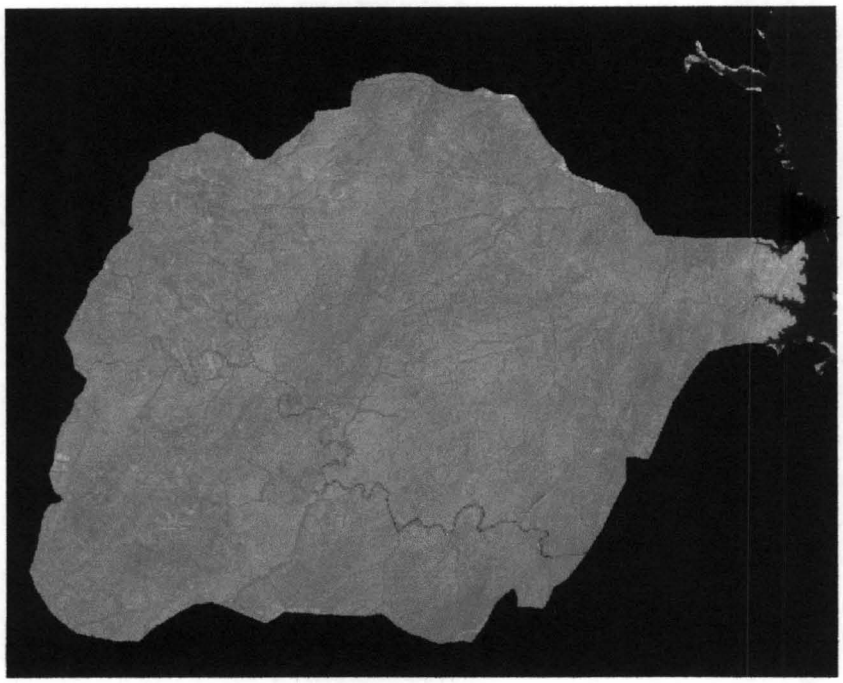


Fig.4.1: The perimeter of the Borgu Sector of Kainji Lake National Park (3970.83 sq.km)

4.2 **Times-Series Analyses of the Park, 1975-2001**

4.2.1 **Trend of Land cover Change**

The image differencing technique (Ross et al. 1998) has been applied to assess the trend in land cover changes between 1975 to 2001 using Landsat MSS, Landsat TM and LandSat ETM+ acquired in 1975, 1986 and 2001 respectively. The result shows differences in spectral responses of various land cover type existing at the park (Fig.4.2a, Fig.4.2b and Fig.4.2c). The grasses and shrubs zone in the middle of the park have negative changes (i.e. a reduction in the land cover type). This reduction might be the direct effect of bush burning, resulting into soil degradation. The north and Southern areas of the park have low spectral responses that are correspondent to marsh/wetland

vegetation growth condition. This land cover type has reduced to grass/shrubs cover types and degradation. A remarkable observation of great concern in the management of the park was made in agriculture land cover type.

A high level of human activity, precisely agriculture and deforestation, are encroaching and engulfing the park premises. This call for the attention of the management and need to sensitize the villagers around the park to avoid and mitigate continuity in such activity at the fringe of the park reserve to save the ecosystem from destruction and human interference. The profiles of the changes that occur over time the period are represented in Figure.4.3.

Fig.4.2a: Land cover Classification from LandSat MSS of 1975

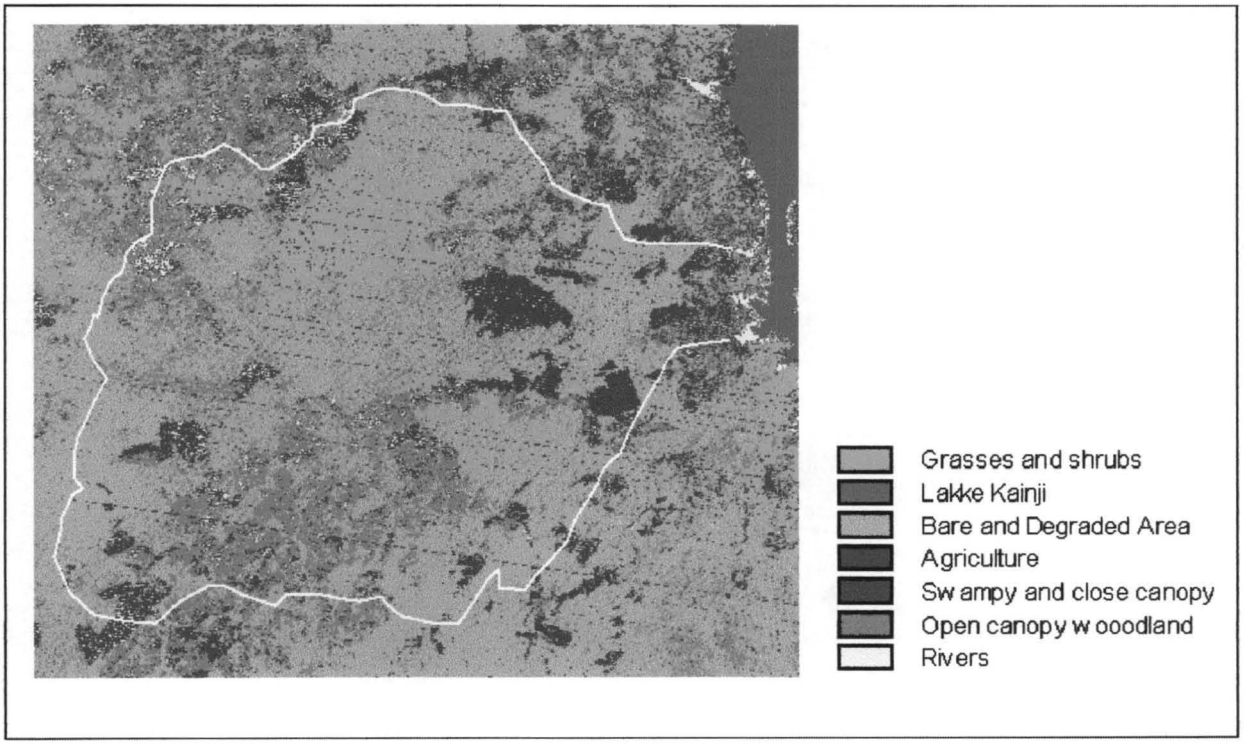


Fig.4.2b: Land cover Classification from LandSat TM of 1986

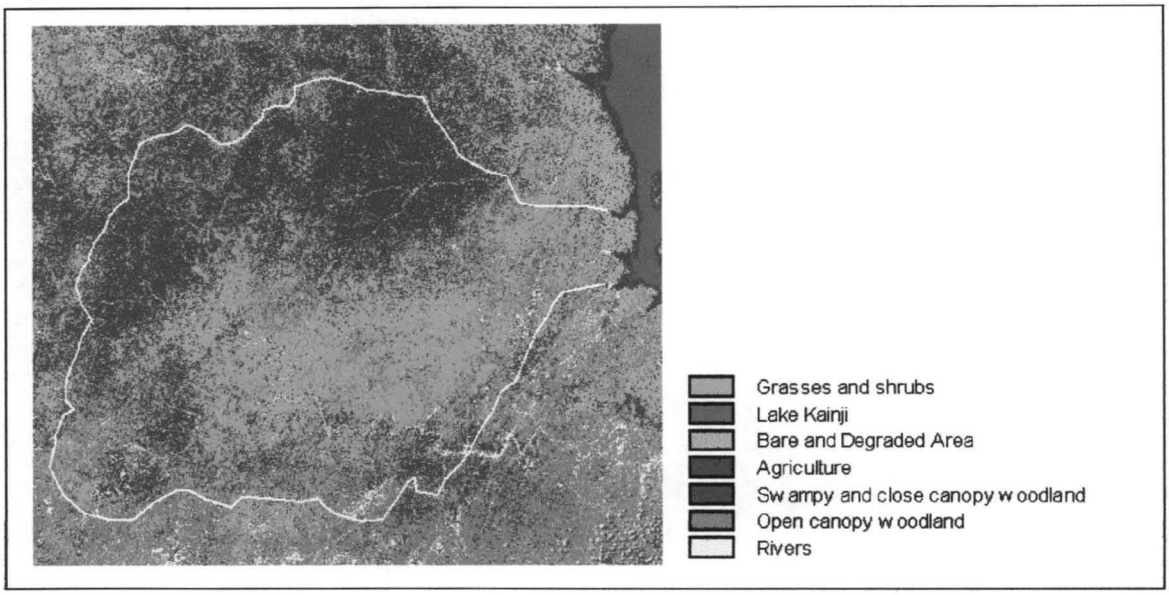


Fig.4.2c: Land cover Classification from LandSat ETM of 2001

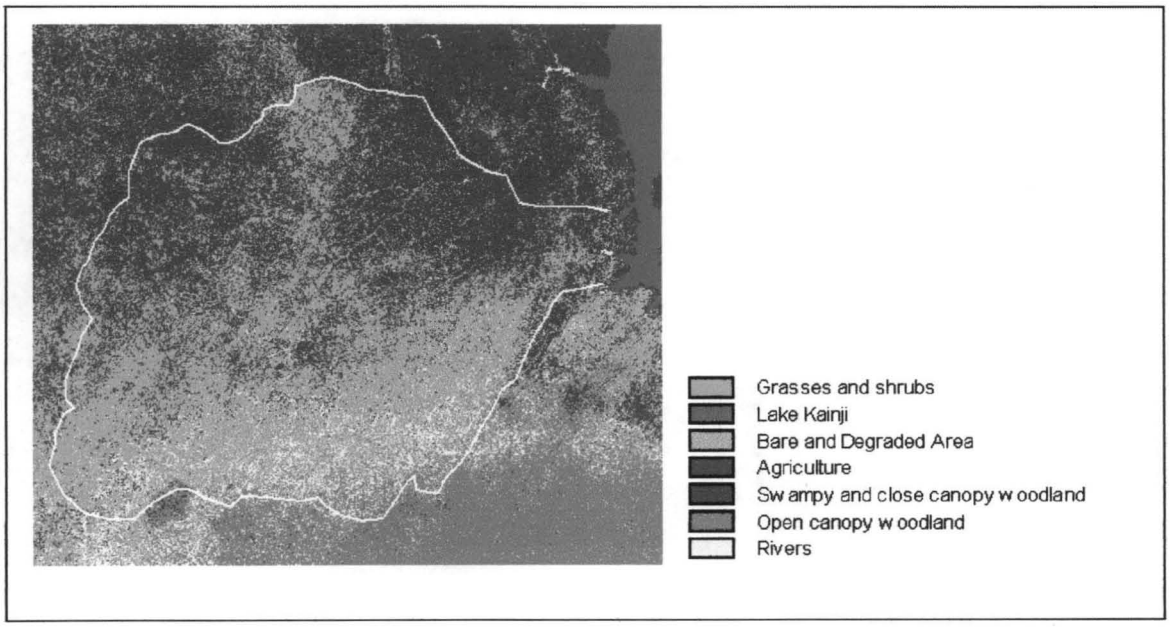
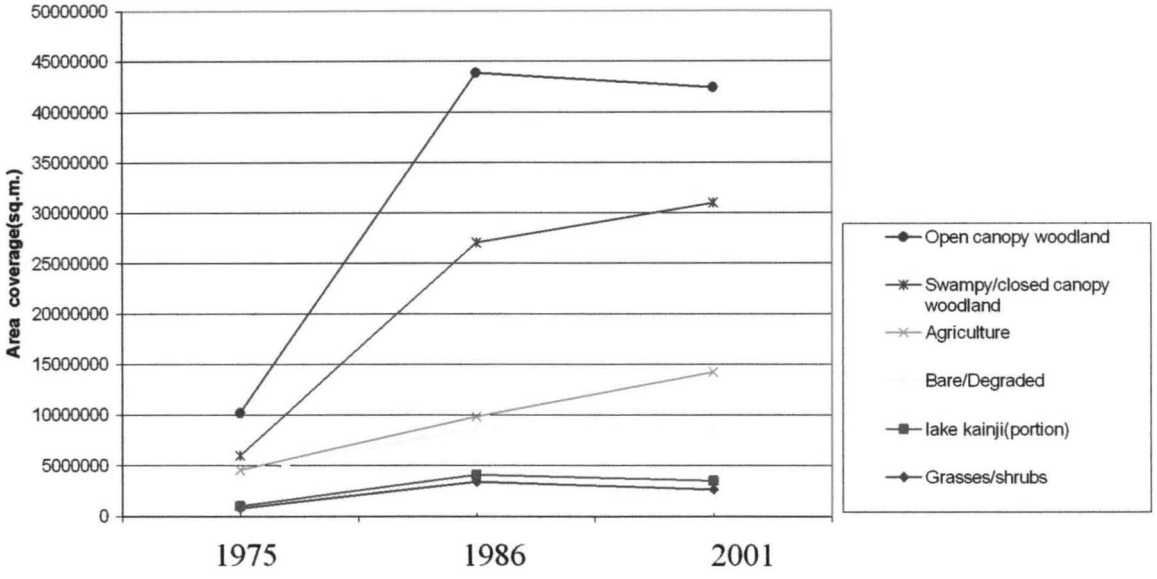
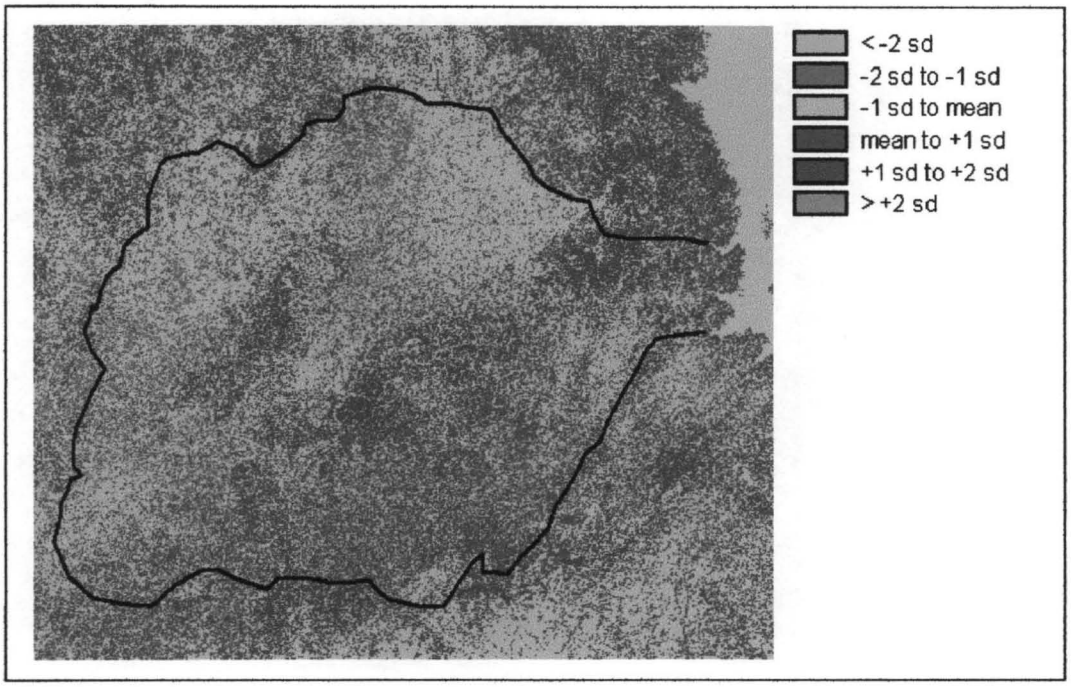


Fig.4.3: Changing trends of land cover patterns between 1975 and 2001



Quantitative comparison was made to show the extent of the changes between the images (i.e. 1986 and 2001) using IMAGEDIFF tool. A threshold value of 1 standard deviation was used (i.e., all areas within 1 STD are considered non-change areas and those beyond 1 STD in either the positive or negative directions are considered change areas (Fig.4.4). Based on this, the value of STD threshold to distinguish true change from natural variability in any of this difference images has shown changes in all cover type.

Fig.4.4: Variation in land covers between 1986 and 2001



4.2.2 Vegetation Greenness Distribution

Normalized Difference Vegetation Index (NDVI) data for each image was generated. NDVI is calculated from the reflectance of solar energy in the red and infrared wavelength regions according to the simple formula:

$$NDVI = (IR - R) / (IR + R)$$

This index has values that can range from –1 to +1. With NDVI, vegetation areas typically have values that range from 0.1 to 0.6 depending upon the amount of biomass present

The vegetation greenness distribution around the park was compared for 1975, 1986 and 2001(Fig.4.5a, Fig.4.5b, Fig.4.5c and Fig.4.5d). The images show disparity in the distribution of vegetation greenness at the park for these periods.

NDVI values are distributed unevenly on the image scene covering the entire National park. As a parameter well correlated with ongoing photosynthetic process in vegetation, NDVI higher values ranging 0.88-0.1 were distributed over the north-central and the southern part of the park, where dominate grass/shrubs cover areas. NDVI 0.6-0.88 values are mainly distributed in swampy/marsh forest fringe areas extending from north to west and east of the park. Lower values of 0.13-0.6 dominate in north-central part and ranged from west to east. The lowest values are associated with the areas of Lake Kainji. With some variations from year to year, NDVI spatial distribution reflects the boundary and extent of dominant natural ecological zones of park. Transitional matrix is calculated based on the clusters to assess yearly the change of NDVI classes.

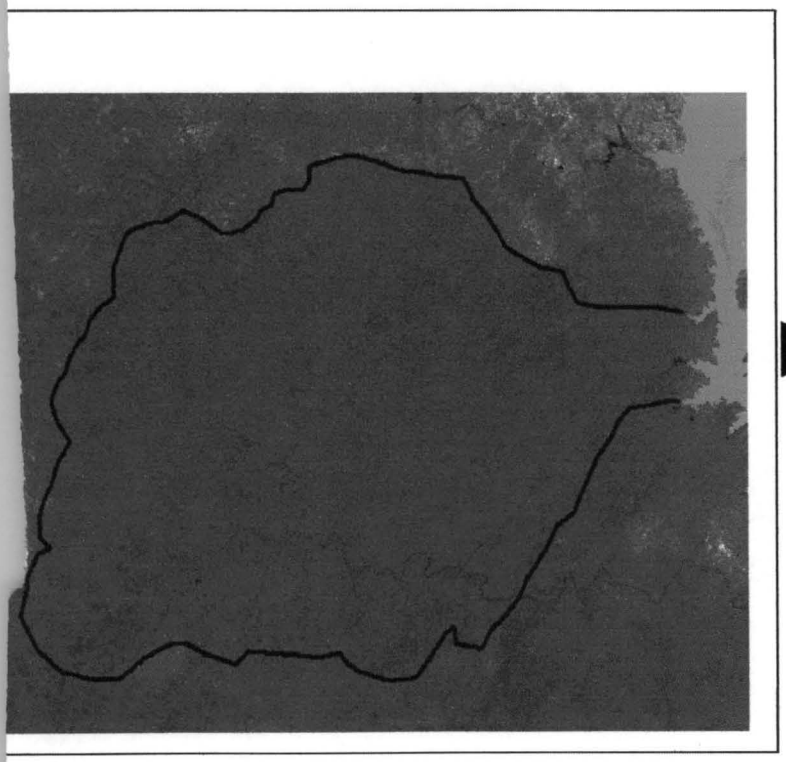


Fig.4.5a: False colour composite (band 234) of the park illustrate vegetal status in red. LandsatTM acquired 1986.

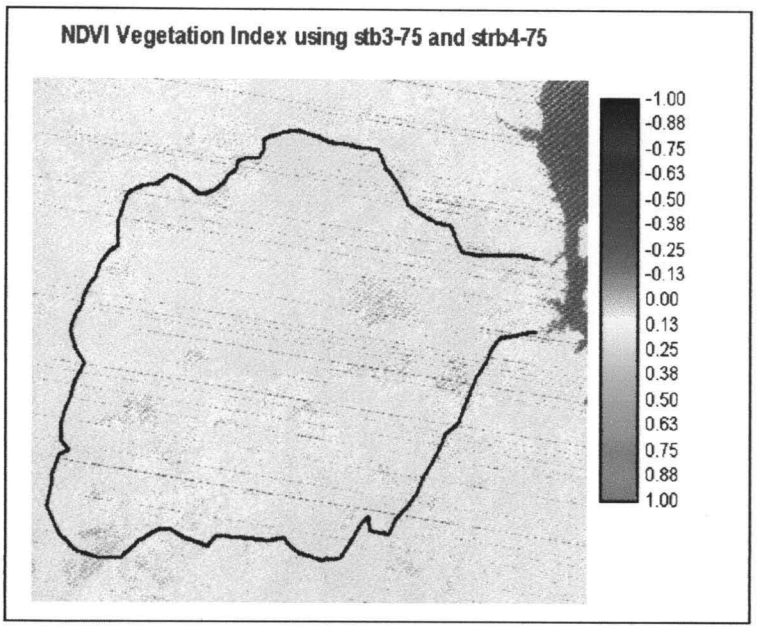


Fig.4.5b: 1975 NDVI: pre-vegetation condition

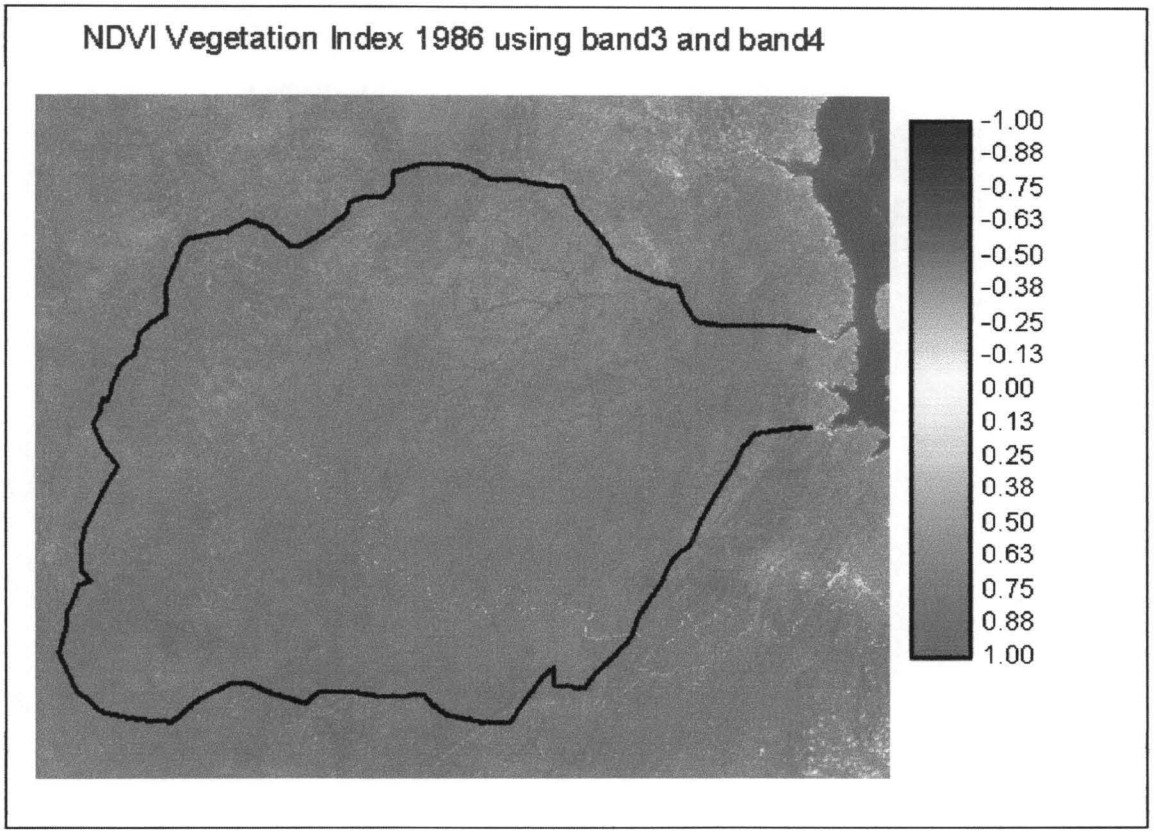


Fig.4.5c: Vegetation status in 1986

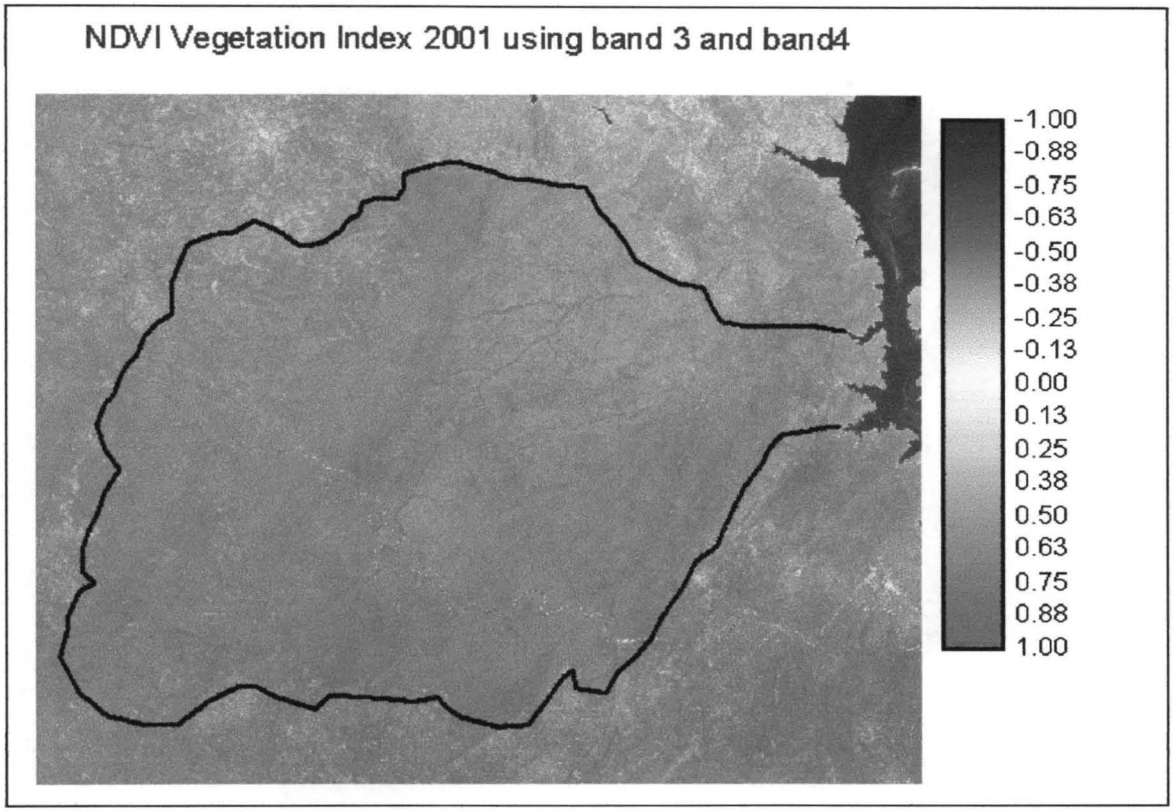


Fig.4.5d: Vegetation status in 2001

4.2.2.1 Transition Matrix of NDVI from 1986 to 2001

The spectral responses of vegetation cover in 2001 were lower and transitional matrix shows a decrease in vegetation spectral responses between 1986 to 2001. Standard deviation of pixel values for this period has been plotted on the map below to display the variability. Variations of spectral responses were very high from north to south and west to east spatially (Fig.4.6a).

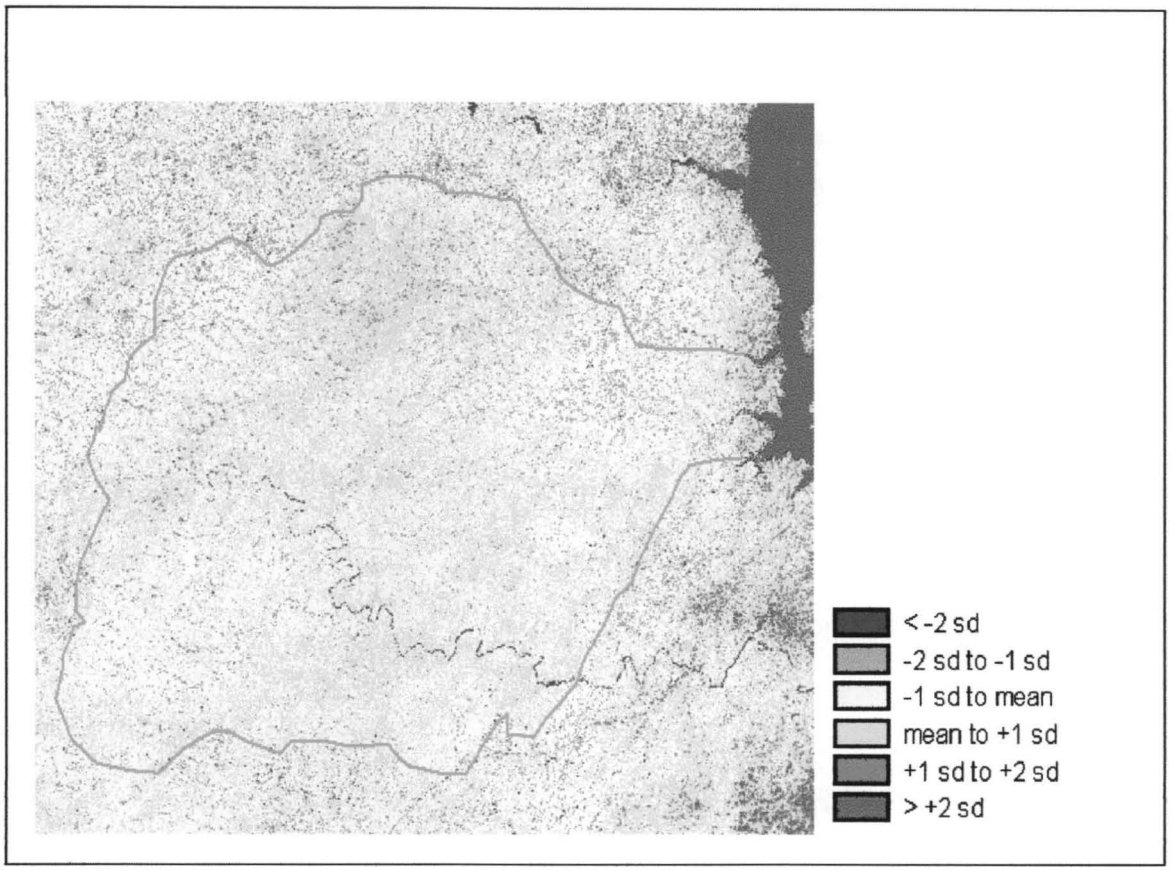


Fig.4.6a: Standard deviation in pixel values for 1986-2001

Distribution of high standard deviations is shown in the north central of the park. All open forested areas, except wetland region, have high spectral variations; the causes can be the changes in precipitation regimes, temperature fluctuations as well as human induced disturbance factors (bush burning). It is interesting to note that similar high variability exists in Eastern and the western part of the park, despite their distinctive nature. The lowest values of standard deviation are distributed over the Lakes Kainji areas. The sandy areas with sparse vegetation areas are more stable in terms of spectral

response over time. This was obvious from scene to scene, the changes in vegetation dynamics, as to NDVI is a direct function of precipitation temperature and human factors. The relationship between the changes in NDVIs was calculated (Fig.4.6b). And it shows a significant relationship between the changes in NDVI compared (91%).

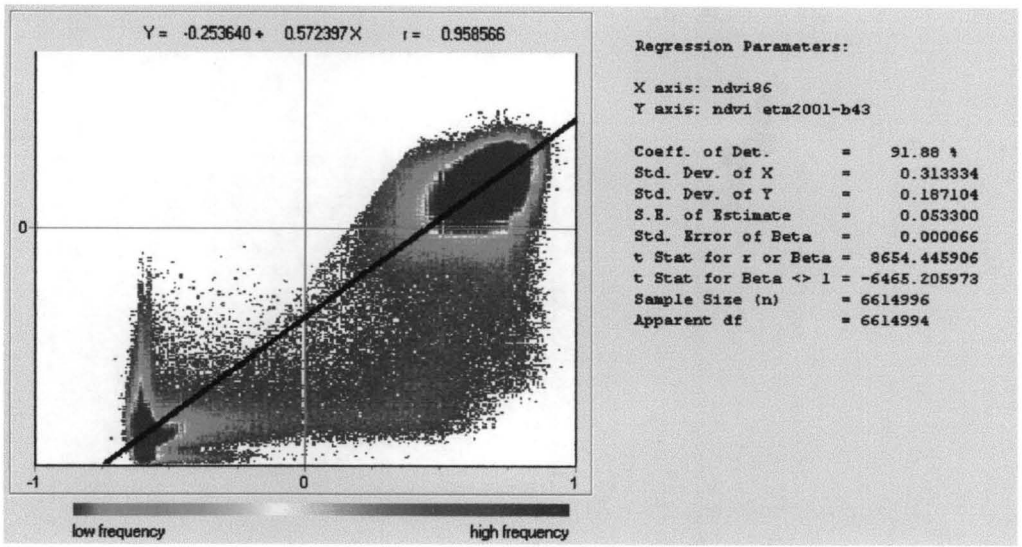


Fig.4.6b: Relationship between NDVI of the park between1986 and 2001

4.3 **Digital Elevation Models**

Digital Elevation Models (DEMs) is the representation of array of values that record topographic elevations observed at equal intervals on other earth's surface. The availability of digital elevation models (DEMs) is critical for performing geometric and radiometric corrections for terrain on remotely sensed imagery, and allows the

generation of contour lines (Fig.4.7) and terrain models (Fig.4.8a and Fig.4.8b)), thus providing another source of information for analysis.

Understanding biodiversity and its effect on the distribution and movement of animals through the landscape is a major objective of scientist, conservationist, and natural resource managers alike. Only through development of this knowledge can animal population be managed to meet conservation, spoting, or natural heritage objectives.

Habitat maps are generally derived from remote sensing imagery usually generated. Reference data acquisition involves collecting measurement or observations about the phenomena being sensed remotely. Reference data aids analysis and interpretation of remotely sensed data; calibrates sensors; and verifies information extracted from remote sensing data. This implies that for the data to be meaningful, it should be collected in accordance with the principles of statistical sampling design appropriate to a particular application.

For this work, reference data are generated to aid in the interpretation and verification of wildlife habitat. Identification of habitat based on vegetation conditions change over time. Therefore, multi- temporal images are required to define various niches for the wildlife. Elevation data therefore, integrated with imagery is also used for generating perspective views (Fig.4.9), useful for ecotourism game viewing.

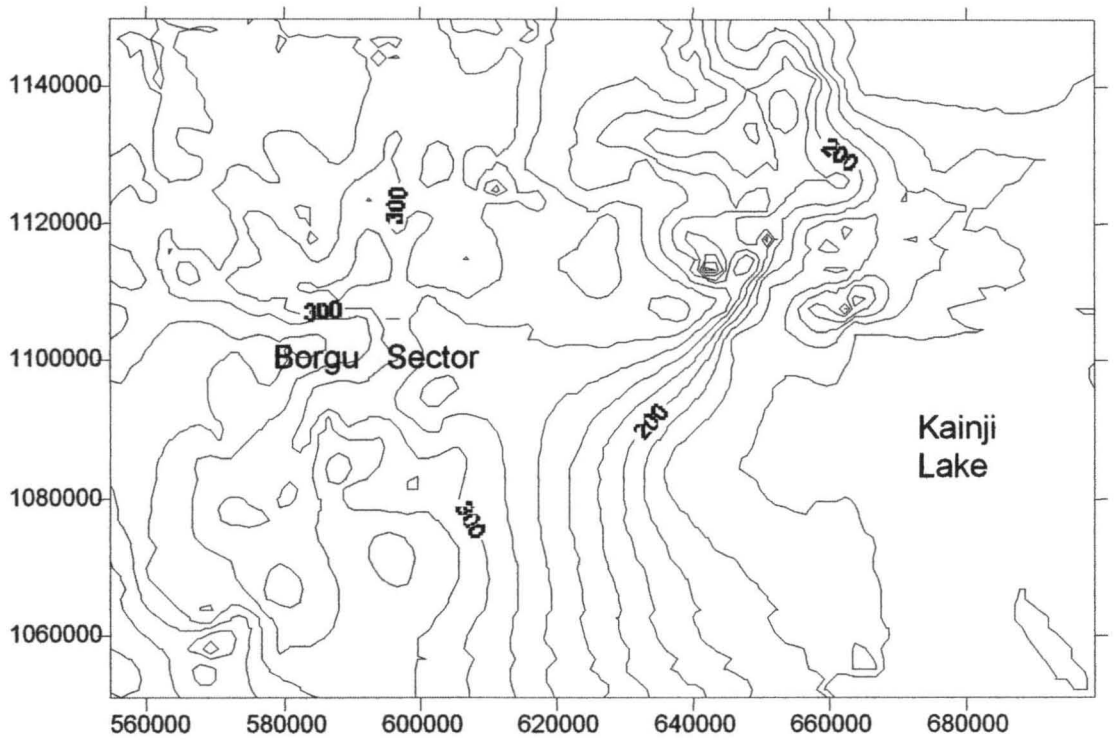


Fig.4.7: Contour map generated from 600 spots height extracted from topomaps

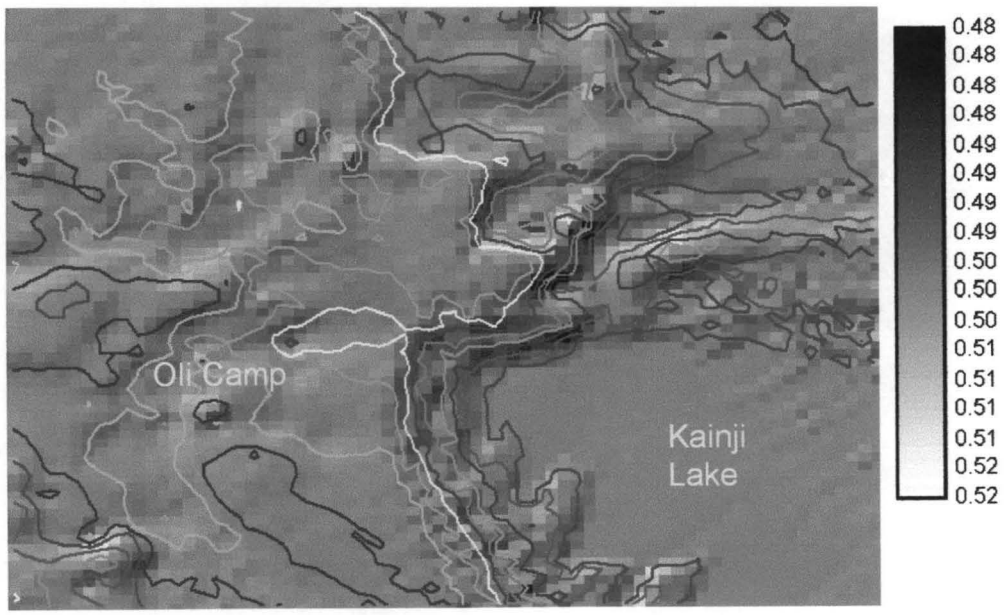


Fig.4.8a: Hill shade of the study area generated from the DEM

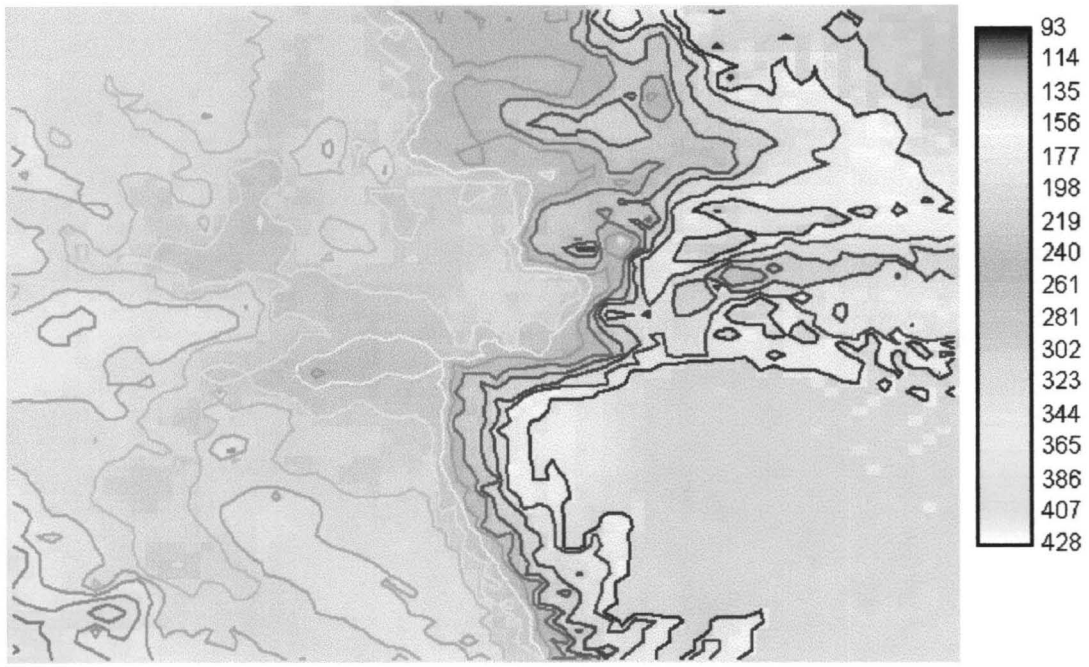


Fig.4.8b: The DEM of the study area generated from topomap spot heights

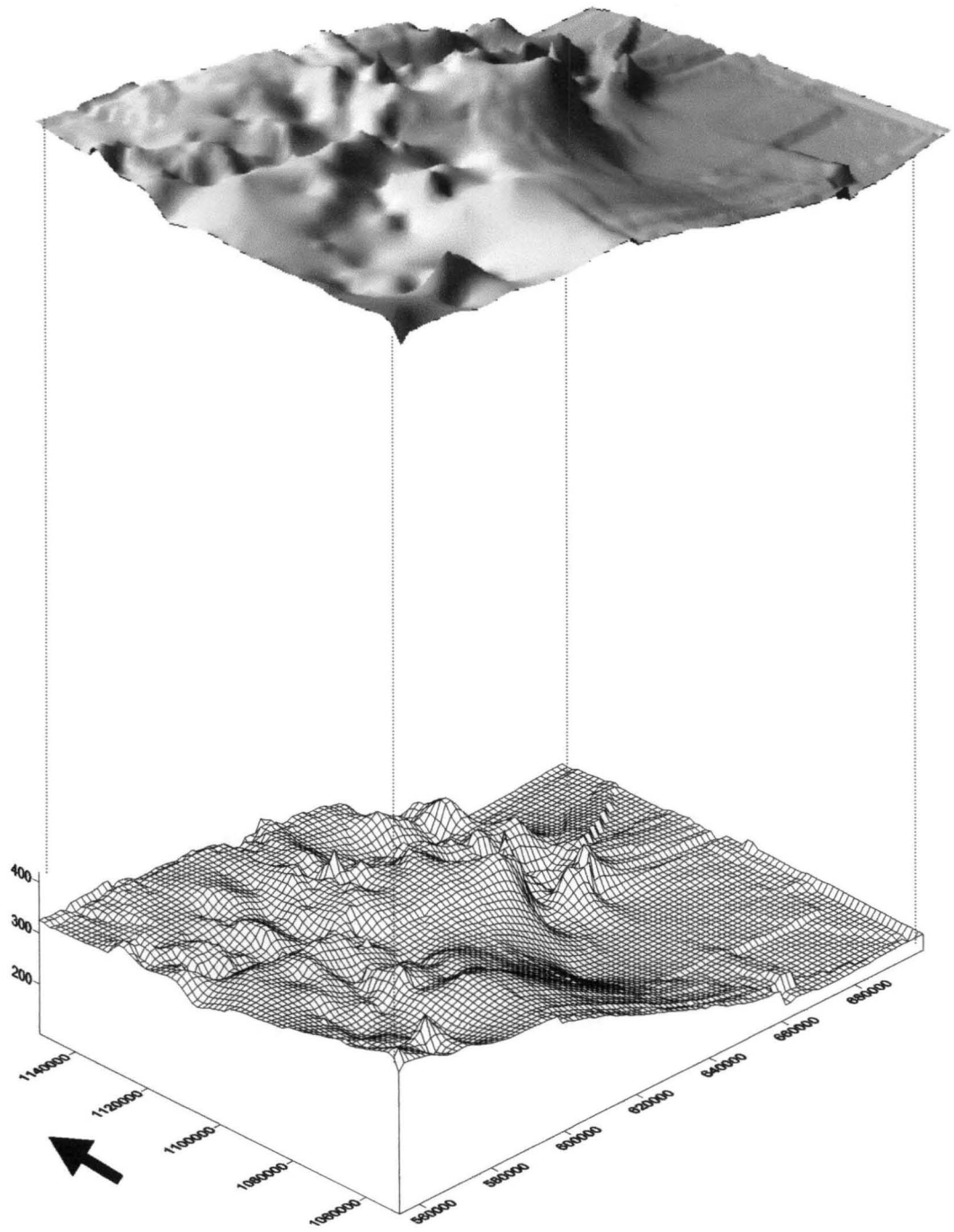


Fig.4.9: 3D perspective showing the topography of the Borgu sector of the park

4.4 GIS Database Developments: A Decision Support Tool

With rapid increase in population and continuing expectations of growth in the standard of living, pressures on natural resource-use have become intense. For the resource manager, the task of effective resource allocation has thus become specifically difficult. Added to this very dynamic environment subject to substantial and complex impacts from human intervention, GIS have the ingredients for a decision making process that is dominated by uncertainty and consequent risk for the decision maker. Such capability is demonstrated below.

4.5 Database Querying Capability

Database query simply asks questions about the currently stored information. In some cases, we query by location—what land use is at this location? In other cases, we query by attribute—which part of the park areas has high levels of poacher's threat to the games?

In this project context For example, basic query of immense significant in park management are generated and tested to validate the authenticity of the GIS database prepared. The results are presented below:

4.4.1 Query Test 1: Create Quality Map Presentation

Suppose the management of Kainji Lake National Park (KLNP) has reached a decision to designing a tourist brochure for the park. A map is needed for the brochure to show the park and reserve areas that the tourists might visit, the near by towns and

villages (of historical background) around the park which they might be interested on visit, the security measure (patrol-post) , the roads and tracks that provide access to the park and game viewing. With a comprehensive GIS database designed for the park, the map can be created with ease (Fig.4.10).

As mentioned previously, it is only GIS that can combine conditions such as this that involve features with different layout. Typically, an overlay operation in GIS will allow the production of new layers based on some logical or mathematical combination of two or more input layers

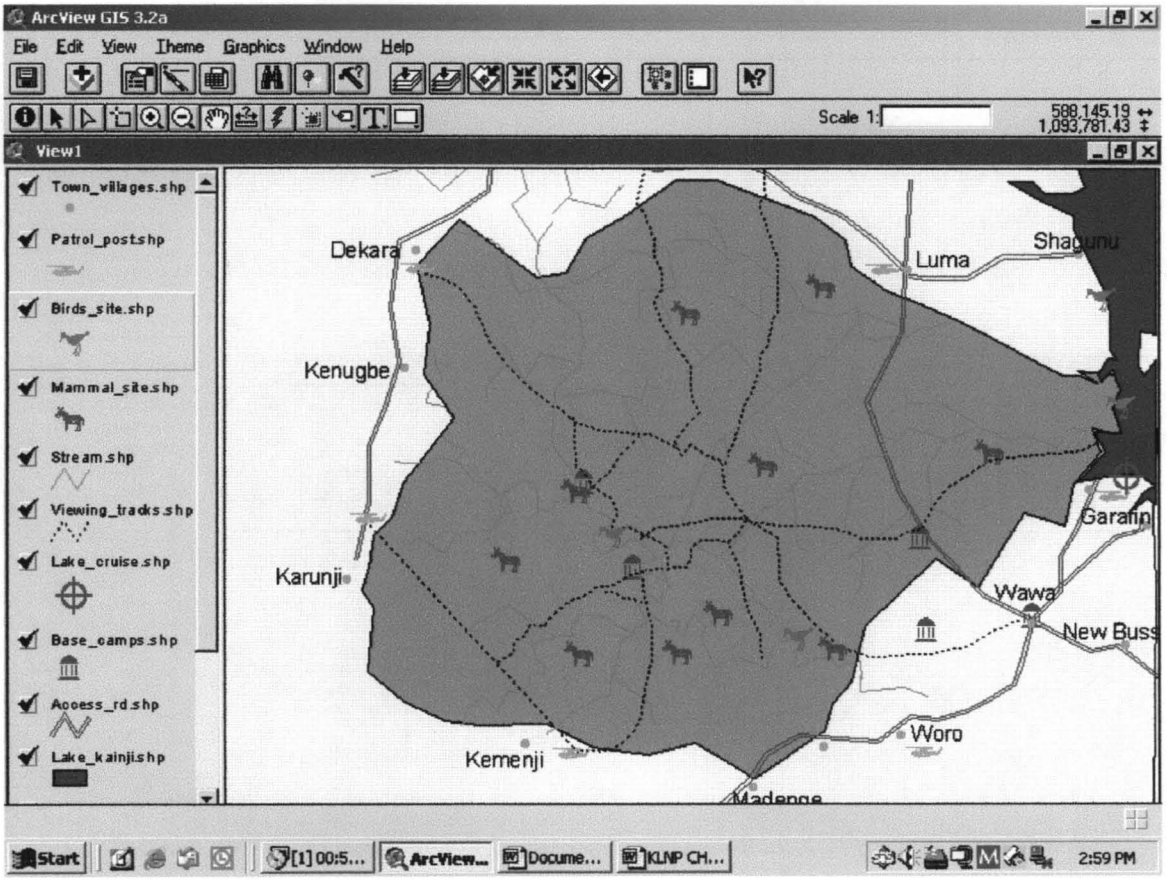


Fig.4.10: GIS database composed for Kainji Lake National Park tourist's map

4.4.2 **Query Test: Querying Data**

Queries can be made on the National Park/safari concerning their accessibility from the nearest town/villages in terms of distance and mode of transport. Services provided can be obtained from the tables. By clicking on several points in the park, information on the animals, birds or vegetation in that section can be obtained (Fig.4.11). Information on the camps in the National Park is also available

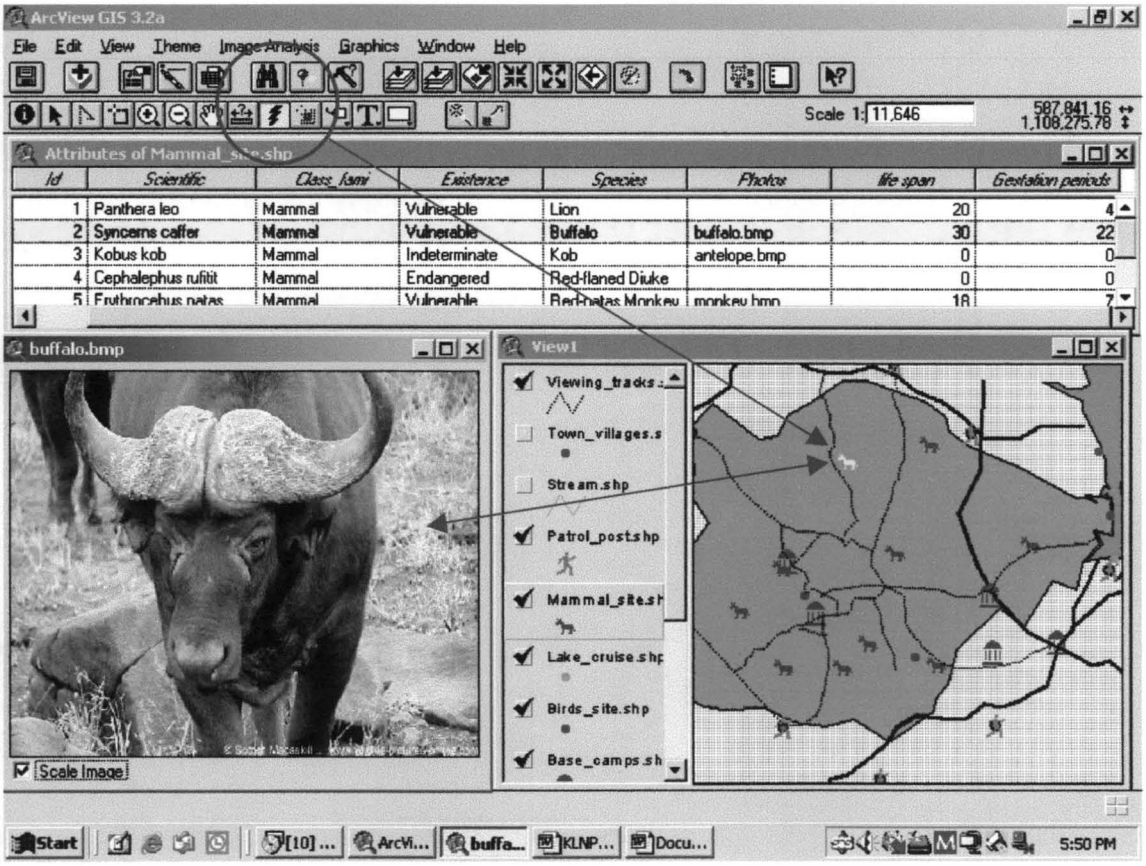


Fig11: A hot link to a still photograph created for each animal available in the park

In our National Parks, the park interpreters are always looking for a ways to inspire visitors. These are challenges faced by the park interpreters. Many at times, the

visitor on arrival may want clear, yet visually exciting information to help them in understanding the potential of the park they are about to explore. Geographic Information System (GIS) can be used to communicate the sense of the park to the visitors (Fig.4.12).

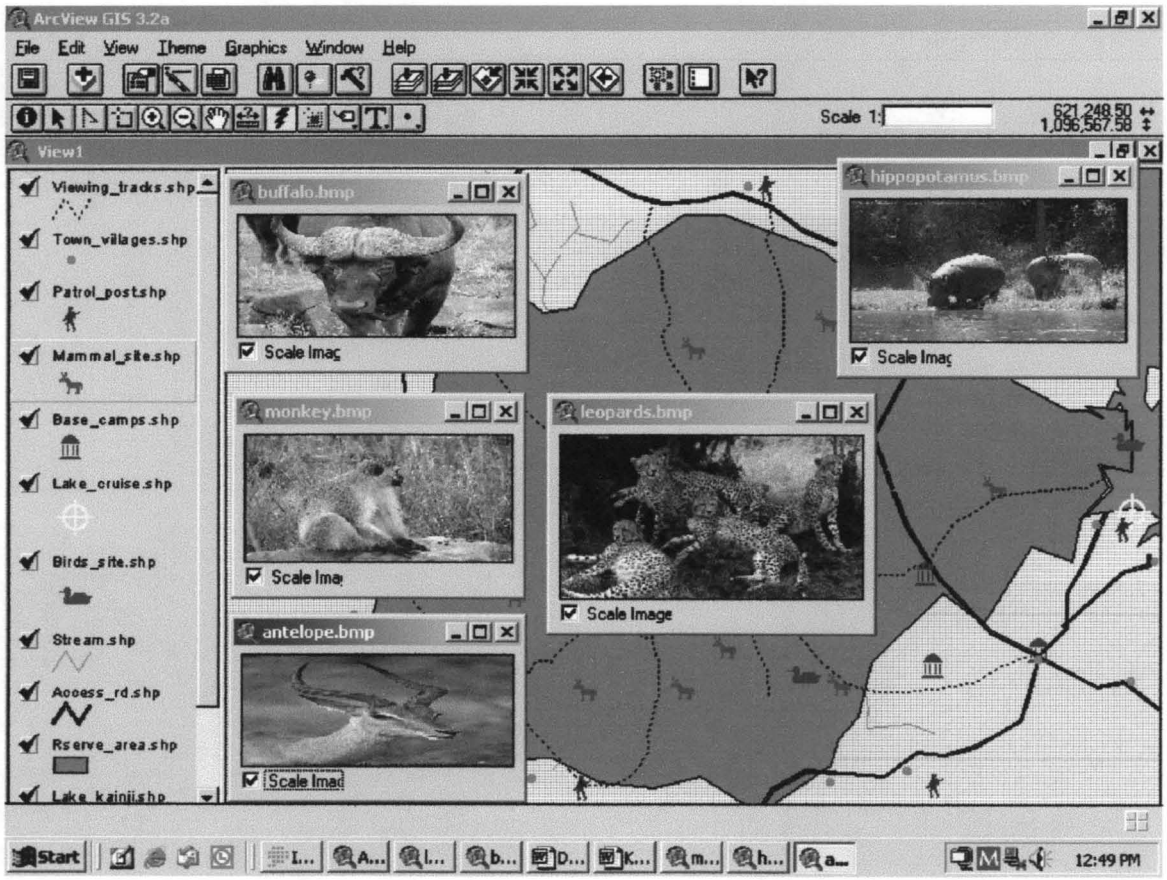


Fig.4.12: Existing species of fauna and their location (niche) at the park

4.4.3 **Query Test: Spatial Analyses**

With ArcView Network Analyst and query builder, it is possible to calculate the shortest route between places and also to generate directions. These can be printed out for a client and would make it easier for him/her to get the required destination by following the mapped out directions. Information on the type of road, the width, and

whether it is tarred or not can be obtained from the attribute tables. This is also required and enables those visitors who will be driving to choose the best mode of transport to use (Fig.4.13a).

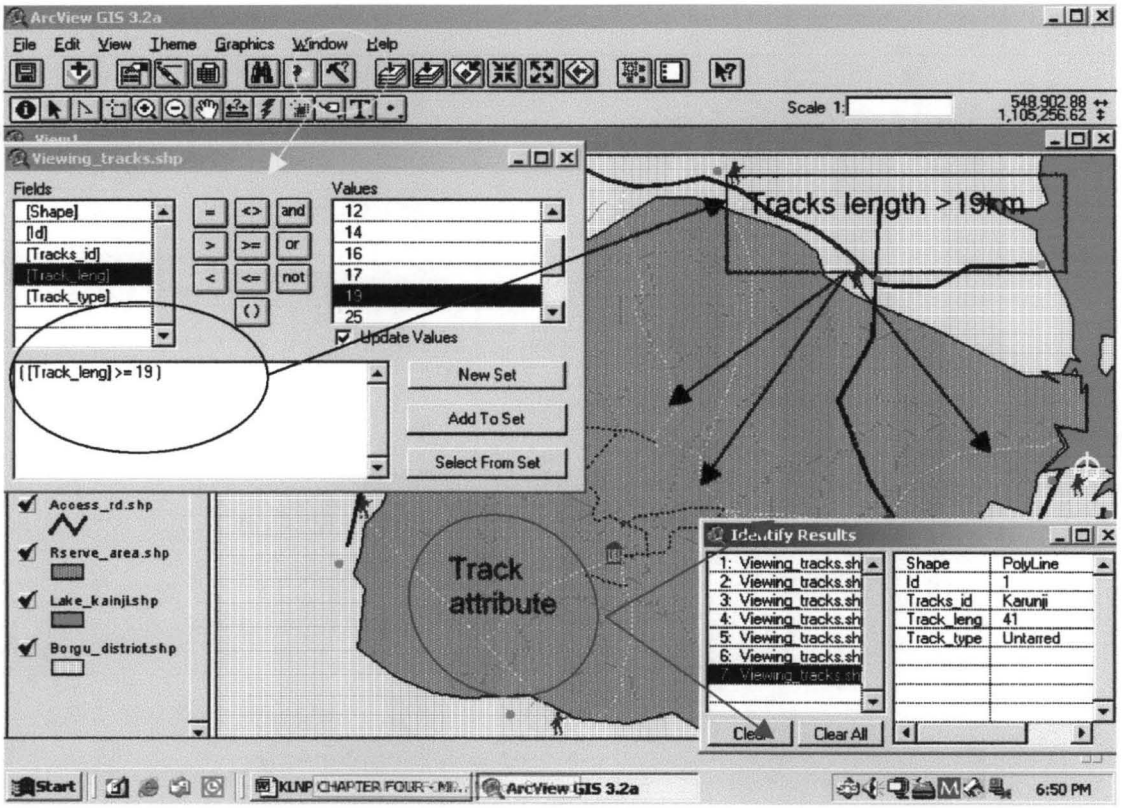


Fig.4.13a: Geospatial Network Analyses of park Viewing Tracks

The figure above shows the Network analyses of the viewing tracks that are greater than 19 km in length (yellow tracks) and those less than 19km in length(black tracks) using query builder tool. The information about the track (attribute) is given on clicking the track using the identifier button. Spatial analysis involving land uses and land cover can be performed using Fig.4.13a: Geospatial Network Analyses of park Viewing Tracks age analysis module of ArcView 3.2a. Spatial analysis of the database provides accurate information for measurement and evaluation. GIS spatial analysis can

be apply to a range of evaluation of resources to help determine which land may be more sensitive or critical for protection than the other(Fig4.13b).

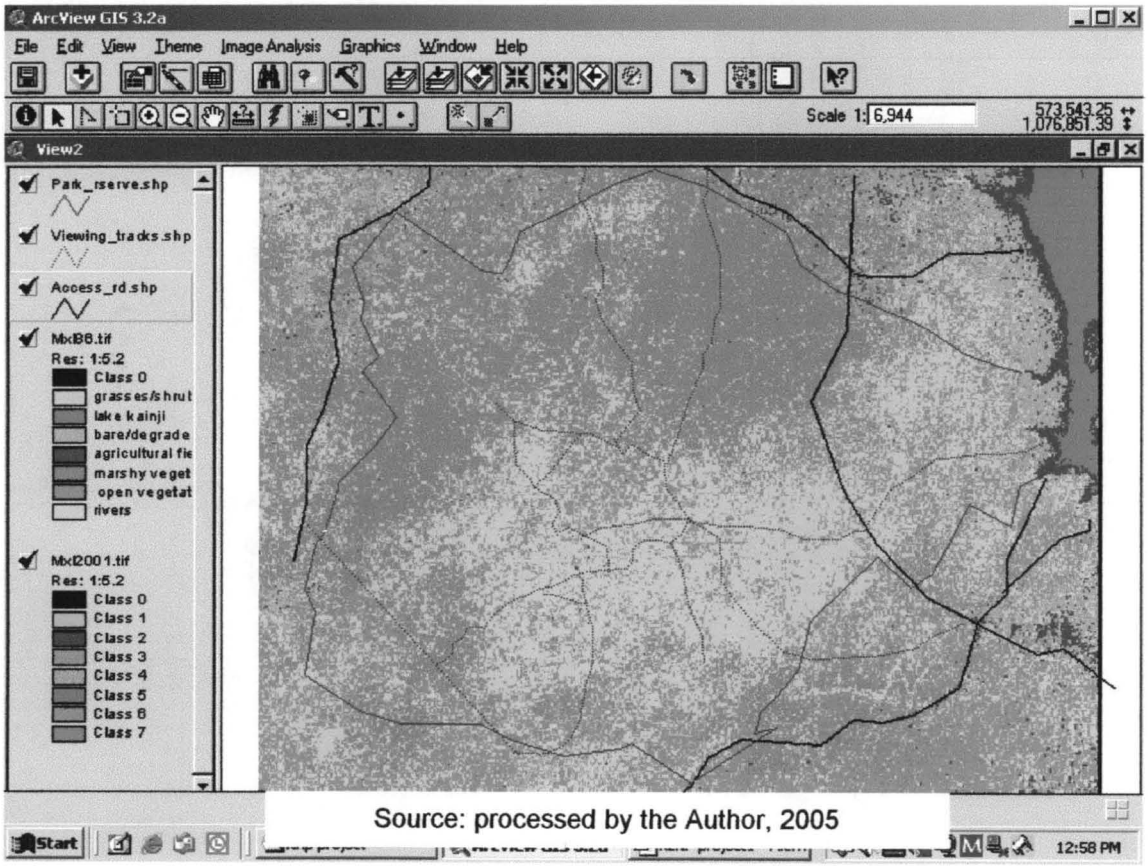


Fig.4.13b: Image Analyses of Existing land use and land cover at the park

4.4.4 **Query Test: Data Displaying**

Statistics on the number of tourist's arrivals and tourism receipts (revenue) to KLNP from 1971 to 2003 and 1991 to 2002 respectively can be generated from the menu and the chart printed for an interested client (Fig.4.14)

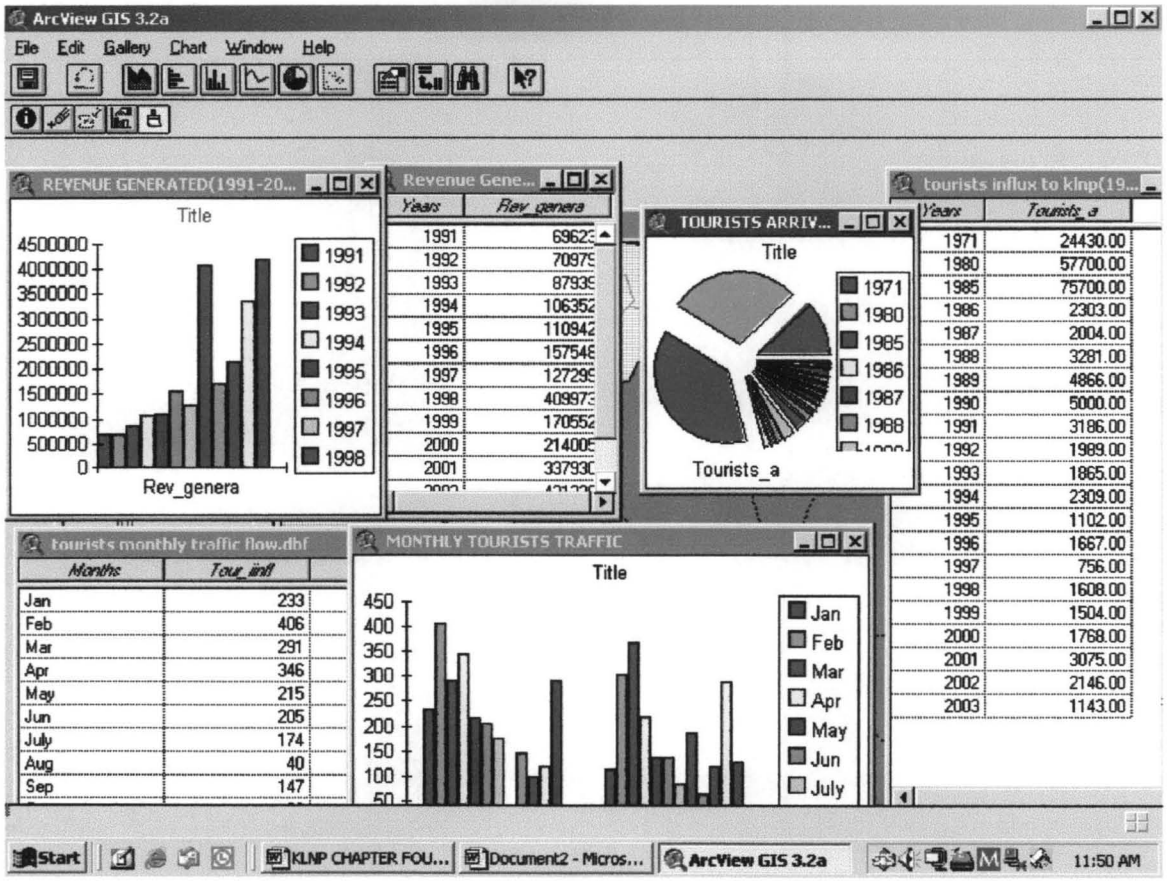


Fig.4.14: Statistical analyses and display

4.4.5 **Query Test: 3-D Analysis and Display**

Spatial analysis is a process that betters our understanding of spatial condition or events. The model uses a methodology or set of procedures to simulate real world conditions (Fig.4.15a). ArcView spatial analyst helps us in visualizing and understanding event (Fig.4.15b).

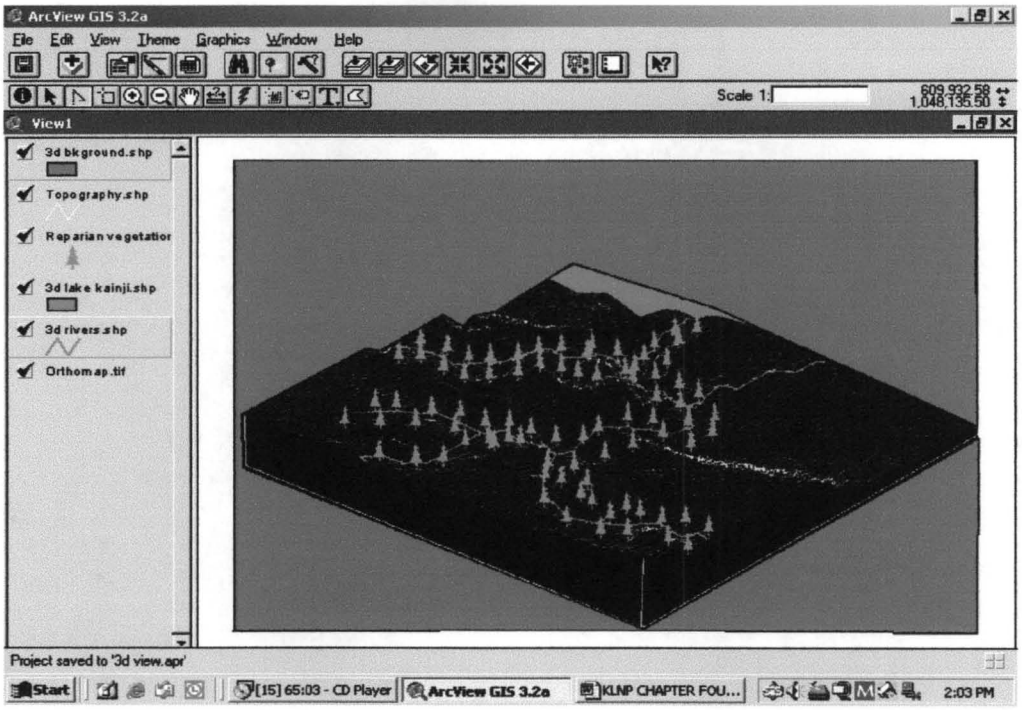


Fig.4.15a: 3-D Model of the park showing the topography

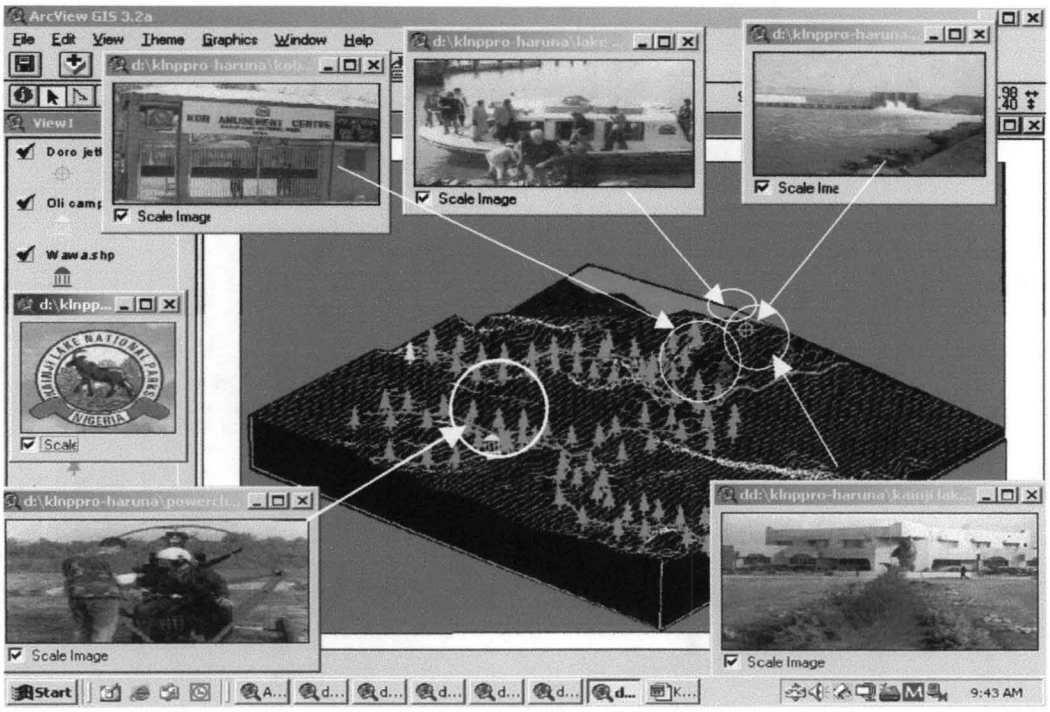


Fig.4.15b: 3-D Model of the park showing the location of Tourists facilities

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Summary of the Research Findings

The empirical summaries of findings in this project context are derived from two source analyses: findings derived from remote sensing data processed and analysed (i.e. vegetation analysis) and findings derived from the GIS database developed. The research findings are as follows:

5.0.1 Remote Sensing Analyses

The assessment of the multi-temporal satellite data reveal the trend in vegetation status existing at the National Park before and after the establishment of the park.

The classified image of LandSat MSS acquired in 1975 show the presence of sparse vegetation spread round the study areas with sizeable bare/degraded area spanning the park reserved area. This was the existing situation of the vegetation before the establishment of the park in 1st of April 1976. The sparse condition of the vegetation cover has reflected the true status vegetation in the area before it was preserved for park purposes. Although, the period in which the image was acquired (08/12/1975) i.e. early dry season is also a factor to the greenness distribution of this area.

Eleven years later, as depicted in the LandSat TM image acquired in 1986, the park shows an improvement in the existing vegetation cover. This appreciable increase in the vegetation status might be attributed to good management and non-human

interference such as farming, bush burning, grazing and deforestation.

By the year 2001, there was an insignificant decrease in the existing vegetation cover at park compared to the vegetation status observed in 1986. This trifling change in vegetation dynamics is a function of precipitation, temperature and human factors such as deforestation, grazing, bush burning and agricultural activity (farming).

5.1.2 Geographic Information System (GIS) Database Creation

Since tourism generally contributes a lot to the economy of a country, it can be looked at as some form of business; hence this application is also relevant to it. In this context, with a GIS, instead of doing market research using statistical software on thematic data only, the research and development department/unit can do it effectively by adding the spatial component to it. The market research can help identify popular areas and underutilized potential areas and from these, the industry is expanded and services improved

With this GIS database, Kainji Lake National Park (KLNP) employees will be able to show a large amount of tourist information in an easy to read key (legend) map and the ecotourism information can easily updated.

The GIS databases provide an indispensable tool of choice to create and analyze layers of mapped data. This includes natural and cultural resources, scenic resources, visitor's opportunity and regional landuse. The technology produces colourful, expensive maps that would persuasively illustrate planning ideas to the public and park service managers. The digital data also provides accurate information to measure and evaluate how various plans would affect the park and surrounding areas as required in

an environmental study. GIS analysis can be apply to a range of valuable resources in the park to help in decision in determine for instance which land may be more sensitive or critical for protection than others.

5.1 Implications of the Research Findings

The knowledge of the dysfunction of various attributes of tourism development: organization, management, markets, services, publicity, security, fund, infrastructure and utilities- have profound implication in the success of tourism planning and development in general.

Therefore, understanding of how ecotourism destination can be enhanced and sustained is a fundamental issue in successful park management and planning. Since ecotourism destinations involve multi-faceted components of natural/cultural tourism resources and a multiplicity of man-made tourism businesses, a systematic GIS database and analysis framework for effective activity is required. This analytical GIS database may also contribute to creating and integrating value added ecotourism attractions/resources to achieve greater challenge in park management competitiveness. More so, in order to make informed decisions with an information base so voluminous and detailed, managers must have a system that organizes and presents data in a comprehensible fashion.

Importantly, these research findings may help tourism and ecotourism planners, developers, and policy-makers to understand what key tourism players such as tourism stakeholders prefer to develop in ecotourism attractions/resources and to plan and implement successful competitive strategies. These results are likely to help potential

ecotourism stakeholders and marketers to collect information and plan appropriate competitive strategies based on the potential ecotourism attractions/resources they prefer to develop (i.e. small independent businesses and cultural and folk events that may include gift shops, prearranged attractive, flexible tour packages, guide services, campgrounds, concerts, arts and crafts, dances, and festivals). These strengthen and encourage private participation in ecotourism planning and development.

Information for tourists in order to attract more tourists to park communities was also an important source of tourism attraction. Accordingly, with not only these ecotourism attractions/resources but also well-prepared marketing plans and strategies, and effective support and help by destination management organizations via GIS technology, the best strategies for enhancing destination competitiveness may be established for the ecotourism destinations.

5.2. Limitations and Suggestions for Future Research

As expected in all research, limitations to this study were found and should be addressed to encourage more sound research in the future. The major limitation derived from this study was the lack of adequate data. Besides, most of the information accessible was not in anyway detailed and basically non-digital and were not georeferenced. Time and finance were also major constraints to enable the study cover more areas. There was the difficulty of collecting information from the tourism boards.

Due to the fact that this study did not include soil analysis, rainfall information, and basic facilities (lodging facilities) into the database, future research should address this limitation to come up with a more comprehensive database. High-resolution

satellite imagery could be use to map the park existing and available facility.

Consequently, the above-mentioned limitations should be considered as essential and critical suggestions for future research. Future studies should take into account these limitations to produce more complete research results.

5.3 Conclusion

Given the fact that, if any, there are a limited number of empirical studies on remote sensing and GIS based ecotourism planning in Nigeria, this study developed GIS database for national park planning and management precisely Kainji Lake National Park (KLNP) and its relevant constructs from the perspectives of ecotourism development. Accordingly, as discussed in the research findings, it is hoped that this study has made valuable contributions to the understanding and insights about ecotourism planning and management through the use of integrated GIS technology. From the results of the database analyses, this study may conclude that a successful ecotourism development and management depend more thoroughly on comprehensive GIS information to support for effective and efficient park management system.

Finally, even though the results and findings of this study are somewhat exploratory in nature, it is expected that the information produced and the implications of the study may be of help to ecotourism planners, policy-makers, and marketers to build more competitive ecotourism destination environments and positions in Nigeria.

Ecotourism generally receives some recognition from the government as one of the foreign currency earners hence any moves that would improve on it would get attention. It is from this important point that the executive in Nigeria tourism industry in

general and Kainji Lake National Park (KLNP) management should become well appraised of the importance of GIS in their day to day operations.

5.4 Recommendations

The following recommendations were made towards improvement for sustainable GIS ecotourism development in Kainji Lake National Park:

1. Integration of a global positioning system(GPS) receiver with image processing and GIS can aid in understanding behaviour,improve wildlife management model and provide accurate and timely reference data for remote sensing applications that are typically employed in the production of habitat map. It is from this important point that should the executives in the park become well appraise of the importance of GIS in their day to day operation, then the use of the technology will be implemented.
2. The list of queries offered in GIS is endless, and unique to every potential tourist. For the system to be more effective, it can also be made available on the Internet for access by lots of potential visitors from the country and other parts of the world.
3. The employees of the National parks and KLNP should be developed/train to become computer literate in some application packages (Microsoft Excel or Access). This would help n the implementation of the GIS system, because the starting point can be Microsoft Access and then gradual shift to ArcView for spatial information.

REFERENCES

Afolabi, G. J. (1978) "Recreation *and tourism*" pattern and trend. In Oguntoyinbo, J.S. et al (Ed). Geography of Nigerian Development. Heinemann education book, (Nig) Ltd p. 415.

Anonymous,1996. Kenyan Tourism Declines. Toronto Globe and Mail,June 5.

Bahaire, T. and M. Elliot-white (1999). The application of Geographic information system (GIS) in sustainable tourism planning: A *journal of sustainable tourism* 7(2): 159-174.

Berry,J.K. (1991).*Beyond mapping: Concepts,Algorithms and Issues in GIS.* GIS World Inc.,Colorado.

Boyd, S.W., R.W Butler, W.Haider, & A. Perera (1996). Identifying areas for ecotourism in Northern Ontario application of a Geographic information system methodology. *Journal of Applied Recreation Research* 19:41-66.

Burgan, Robert,E & Hartford, Robert,a(1997).Using NDVI to assess departure from average greenness and its relation to fire business. Gen. Tech. Rep. INT-GTR-337. Ogden,UT:U.S. Department of Agriculture, Forest Service, *International Research Station*.p8.

Burkhart, A. J. & Medlik, (1981). "*Tourism past, present and future*" (2nd ed). London Heinemann England.

Buttler, R.W. (1993).The concept of a tourist area cycle of revolution: implications for management of resources. *Canadian Geograper*,2 910, 5-12.

Cater,E.(1995). Ecotourism in the Third World—Problems and prospects for sustainability. In E.Cater and G. Lowman, (eds). Ecotourism: A Sustainable Option? Chichester: John Wiley and Sons.68-87

Carver,S.J, Heywood, D.I.& Cornelius, S.C (1995).Evaluating field-based GIS for environmental characterization,modeling and decision support. *International journal of Geographical Information Systems*. 9(4):475-86

Chen,P.P.(1976).The entity- relationship model – toward a unified a unified view of data of data, *ACM Transactions on Database Systems*, vol.1,March 1976,pp.9-36.

Collier, P., and A. Hoeffler, (2001). "*Greed and Grievance in civil war*" manuscript, October 21. cited in Ross, M. (2003) Natural resource and civil war. An overview. August 15, 2003, P.6-10.

Cowen, D.(1988)GIS vs. CAD vs. DBMS:*What are the differences*? An Francisco: GIS.87, pp.45-46.

Devine, & Field (1986) cited in Isi, A.I, (1998), *Fundamental of remote sensing, photo Interpretation and Geographic Information Systems*. St. Ambrose computer service, University of Benin, Nigeria.

Donald, D. (12204). Editorial special advertising section THISDAY May5 p2

Drumm,A.(1991). Integrated Impact Assessment of Nature Tourism in Ecuado's Amazon Region. Quito: Feprotur.

Eagles, Pual F.J.(1995A).Understanding the Market for Sustainable Tourism. Pages 25-33 in Stephen F. McCool and Alan E. Watson, compilers, Linking tourism, the environment and sustainability. Proceedings of a special session of the annual meeting of the National Recreation and Parks Association; 1994 October 12-14; Minneapolis, MN. Gen. Tech. Rep. INT-GTR-323. Ogden, UT:U.S. Department of Agriculture, Forest Service, Intermountain Research Station.95p.

Eagles, Paul F.J & E. Wind, (1997). International Ecotourism Management: Using Australia and Africa as case studies. Paper prepared for the IUCN World commission on protected areas in the 21st Century: from islands to Network. Albany, Australia. www.ahs.uwaterloo.ca/rec/ecotour.htm

Elmasri, R. & S.B. Navathe(1994).*Fundamentals of Database Systems*, Redwood City, California: The Benjamin /Cummings Publishing Company, Inc.

Feick, R. D. & G. B. Hall, (2000). " The application of a spatial decision support system to tourism based land management in small Island States", *Journal of Travel Research*, 39,2,163-171:

Gamble, G.M. (1992),"*Tourism Development in Africa*: Case studies in the developing world"John Murrary.

Gunn; C. A. (1994). Tourism Planning (3 ed). New York: Taylor and Francis

Ghosh, B., (1992). *Tourism and Travels management*. Vikas publishing House pvt Ltd.

Haining, D. A. (1990) *Spatial Data Analysis in the social and Environmental Sciences*.

Cambridge, Cambridge University Press.

Harrison, D. (1992). *Tourism and the less developed countries* (ed) Belhaven press London.

Healy,R.G.(1988). Economic Considerations in Nature- Oriented Tourism: The Case of Tropical Forest Tourism. Working paper No.39. Raleigh: USDA Forest Service Southeastern Forest Experiment Station.

Hunter, C., & H. Green (1995). *Tourism and the Environment: A sustainable relationship*? London and New York: Routledge.

In keep, E. (1991). *Tourism Planning: An integrated and sustainable development approach*. New York: Van Nostrand Reinhold.

Jason, P. (1984). Editorial national concord, November 17, p.3.

Jomo, Keyatta (1973) " *Anonymous*" Kenyan, an official Report, p. 5

Kilical & Kilical (2001). In Wyne, G. (2003), GIS Application in Tourism planning. GIS 340-GIS seminar, Novermber 2003.

Koshkariov, Tikunov & trofimov (1989). In Maguire, D.J., Good child, M. F. & Rhind, D. W. (1990). Geographic Information Systems: Principles and applications; vol. 1, John Wiley, New York.

Mark, H. & Leslie, A.(2004).Mapping the feature of America's National Parks Stewardship through GIS.The National Park Service.ESRI Press,RedLands,Calfornia.

Medlik, S. & C.L Jenkins (1991) Managing Tourism. Butter worth-Heinemann.

Moore, S & B. Cater (1993). Ecotourism in the 21st Century. Tourism management (April): 123-130.

Nedvic and Budic et al., (1999).recreational facility inventory. In Wayne,G(2003) *GIS Application in Tourism*.GIS340-GIS Seminar. November 2003.

Nemani, Ramakrishna & Steve,R(1997).Landcover characterization using multitemporal red, near-Ir and thermal-Ir data from NOAA / AVHRR. Ecological applications, 7(1), pp 79 – 90.

Nepal (1999).*Visitors impact assessment*. In Wayne, G(2003).GIS Application in Tourism. GIS340-GIS Seminar. November 2003.

Ndebbio, E.U John, (1991). Assessing Nigeria's Structural Adjustment Programme

three years after its introduction, in the Nigerian economy at correspond policies and their effectiveness. Ekpo & Ndebbio (ed) p. 325, University Press Calabar.

Poverty Alleviation and Tourism (2003).Retrieved on 5 May 2004,on www.worldtourism.org.

Ramaswami,N. & John,J(2000). "Ecototurism a Sustainable Option need for Effective Planning" Published as report on AICTE Short Term Training Programme Through on Emerging Trends in Planning, pp-A2.1-A2.8,.Kollam.

Redclift, M. (1987). Sustainable development: *Exploring the contradictions* London. and New York: Methien.

Ringer, G. (1996a). Ecotourism Development in Uganda's National Parks.

Ross, M. L . (2001b), "*Extractive sectors and the poor*" Report issued by oxfarn America, available at www.oxfamerica.org.

Sanchez, M.M (1998). Assessment of progress in the implementation of Agenda 21 at the National Level. Division for sustainable Development sixth session, New York . hpp://www.un.org/eas/agenda21/nat/info/niaual.

Schaller, T.D.(1999),Indigenous Ecotourism and Sustainable Development: The Case of RioBlanco,Ecuador,http://www.eduweb.com/Schaller/section2RioBlanco.htm.

Teye, V.B(1987). Developing Africa's Tourism potential prospect and issues. *Tourism Recreation Research* XII (1): 9-14.

Timothy, D.J (1999). Participatory Planning: A view of tourism in Indonesia, *Annuals of Tourism Research* 26 (3), 371-391

Thresher,P.(1972). African National Parks and Tourism – an Interlinked Future. *Biological Conservation* 4(4):279 – 284.

West, P.C.,and S.R.Brechin,(1991). Resident Peoples and Natonal Parks (eds.). Tucson: University of Arizona Press.

Western,D.(1997)."50 Years of Challenge and Achievement: Mission of KWS." http://www.kenya-wildlife-service.org/vision.htm

Zurick, D.N. (1992). Adventure travel and sustainable tourism in the peripheral economy of Nepal. *Annuals of the Association of American Geographer* 84 (4) 608-628.

------- Canadian Centre for Remote Sensing (2000).Fundamental of Remote Sensing. Retrieved on 3 marches, 2004 on http:/ www.ccrs.nrcan.gc.ca/ccrs/learn/tutorials/fundam/chapter1/chapter1_1_e.html.

------- Geographic Information System (GIS 1) poster (2004).Retrieved on 11/4/2004 on http:/ www. erg.usgs.gov/isb/pubs/gis-poster.

------- Global Environment Facility (GEF).1995. Uganda: Bwindi Impenetrable National Park and Mgahinga Gorilla National Park Conservation. Project Document .World Bank.

------- -World Commission on Environment and Development. 1987. *Our Common future*. New York: Oxford university press.

-------- World Tourism Organization (WTO), (1999).