

**ASSESSMENT OF THE EFFECTS OF URBANIZATION ON VEGETATION IN
SULEJA METROPOLIS, NIGER STATE, NIGERIA**

BY

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M.TECH/SSSE/2005/1403**

DEPARTMENT OF GEOGRAPHY

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

MARCH, 2011

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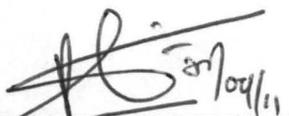
**A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL,
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA. IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER
OF TECHNOLOGY (M.TECH) DEGREE IN GEOGRAPHY
(ENVIRONMENTAL MANAGEMENT)**

MARCH, 2011

DECLARATION

I MUSA, Ibrahim Jemaku hereby declare that this research work has been carried out by me under the guidance of Dr. A.S. Abubakar of the Department of Geography, Federal University of Technology, Minna, and have neither copied some one's work nor have some one's else do it for me.

The information is derived from personal field investigation, published and unpublished work of other's which have been acknowledged.



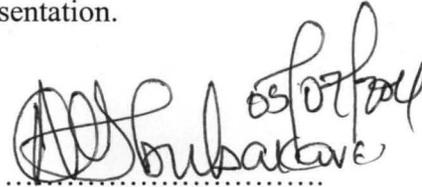
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CERTIFICATION

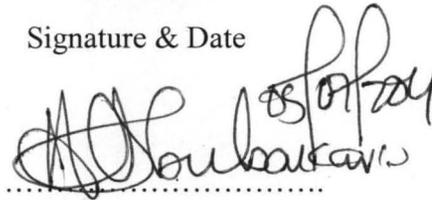
This thesis titled: Assessment of the Effect of Urbanization on Vegetation in Suleja Metropolis, Niger State, Nigeria: MUSA, Ibrahim Jemaku (M.Tech /SSSE/2005/1403) meets the regulations governing the award of the degree of Master of Technology (M.Tech) of the Federal University of Technology, Minna and is approved for its contribution to scientific knowledge and literary presentation.

Dr. A.S. Abubakar
Name of Supervisor


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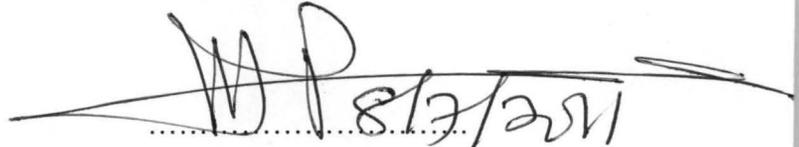
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14/7/2011

DEDICATION

This project is dedicated to God Almighty for his Devine protection and favour upon me and my family.

ACKNOWLEDGEMENTS

I wish to express my profound gratitude to Almighty Allah who granted me the strength, wisdom and health needed throughout my Masters Programme. It is impossible to describe adequately all of the many contributions made to this thesis by my able supervisor, Dr. A.S. Abubakar. Not only did he assist in shaping my research topic, but he was a constant source of inspiration and good judgment that was felt on every page of this thesis. I must be considered ungrateful should I forget to mention Late Dr. P.S. Akinyeye of a late memory, may his soul rest in peace. Amen.

Mention must be made to the following peoples; Engr. Musa Jemaku, Rabi Musa Jemaku, Rahmat Ibrahim Jemaku, Rabiat Ibrahim Jemaku, Khadijat Ibrahim Jemaku, Idris Ibrahim Jemaku and Musa Ibrahim Jemaku. Others that deserve my thanks include Mallam Yusuf Nasidi and Mr Adewuyi Tunde Director of DataNET and also Niger State Ministry of Land and Housing (my employer).

Finally I also thank all those whose names had not been mentioned but who assisted me either covertly or overtly in undertaking this piece of work. I pray for God's guidance and blessing upon them all.

ABSTRACT

Environmental change has become a central component in current strategies for managing natural resources and monitoring environmental changes. The advancement in the concept of vegetation mapping has greatly increased research on change thus providing an accurate evaluation of the spread and health of the world's forest, grassland and agricultural resources has become an important priority. The study analyses the level of Human activities on natural Vegetation degradation of Suleja and identifying the direction of growth, spatial changes that have occurred within the period of 1992-2005. Remote sensing techniques were applied; Landsat imagery and QuickBird Imagery of different years were used to show the spatial changes within the study area complimented with field survey. Questionnaire was administered to get peoples opinion, physical observation was also undertaken, and field measurement was conducted. The study reveals that human activities as a result of urbanization growth are the factor responsible for spatial growth of the study. The analysis shows spatial; changes of over 200% landuse in terms of intensive built up, which signifies serious landuse as a result of expansion, wet vegetated land and water body reduces. Based on the findings of the research, it was suggested that adequate intervention measures need to be put in place by both the community, Government and other relevant agencies in arresting the situation through environmental education, awareness and enforcement of environmental legislation.

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CHAPTER ONE

1.0

INTRODUCTION

1.1 Background of the Study

Humans have destroyed many prairies, wetlands and old growth forests and only remnants of these habitats remain in relatively natural condition. Nigeria is undergoing not only economic stress but also social, political and environmental stress. Nigeria has a considerable diversity of habitats, from savanna forest in the extreme north to freshwater swamp forest in the south. Several plant and animal species exist in the country and derives all her food and a broad array of medicines and industrial inputs from both wild and domesticated components of biodiversity. Despite the unquantifiable value of the rich biodiversity resource, the general ecosystem is under threat of mass elimination of species and genetic resource through the impact of man's activities. Uncontrolled logging and felling of trees are rampant and with increased pressure from hunter trappers and bush burning, Nigeria's natural resources are declining.

Vegetation degradation is a result of the dynamic inter play of socio-economic, institutional and technological activities. Vegetation declaiming may be driven by many factors including economic growth, population growth, urbanization, intensification of agriculture, rising energy demand and transport. Poverty still remains a problem at the root of several environmental problems, because ecological problems are caused by human activities.

Population is an important source of development, yet it is a major source of environmental degradation when it exceeds the threshold limits of the support systems. Unless the relationship between the multiplying population and the life support system can be stabilized, development programmes and innovative are not likely to yield desired results. Population impacts on the environment primarily through the use of natural resources and production of wastes and is

associated with environmental stresses like loss of biodiversity, air and water pollution and increased pressure on arable land. India supports 17 per cent of the world population on just 2.4 per cent of world land area (FAO, 1985). Its current rate of population growth at 1.85 per cent continues to pose a persistent population challenge (FAO, 1985). In view of the linkages between population and environment, a vigorous drive for population control need hardly be over emphasized. Poverty is said to be both cause and effect of resources degradation.

Environmental change has become a central component in current strategies for managing natural resources and monitoring environmental changes. The advancement in the concept of vegetation mapping has greatly increased research on change thus providing an accurate evaluation of the spread. The health of the world's forest, grassland and agricultural resources has become an important priority.

Viewing the earth from space is now crucial to the understanding of the influence of man's activities on natural resource base over time. In situations of rapid and often unrecorded land use change, observations of the earth from space provide objective information of human utilization of the landscape. Over the past years, data from Earth sensing satellites has become vital in mapping the earth's features and infrastructures, managing natural resources and studying environmental change.

Increasingly Suleja as an urban area is growing horizontally and the level of human activities has serious effects on most of the vegetal cover within the Suleja metropolis and environs, which is the subject matter of this study or research work.

Statement of the Problem

The economic condition of most of the rural area in Niger State are below average level of development. Major development activities have been taken up for the upliftment of these

conditions. Given the ecological importance of vegetation and the extent of human dependence on the services provided by them. Yet efforts to develop and use goods and services provided by watershed have not been well integrated with efforts to protect and manage vegetation sustainably. Vegetation faces growing stress from rapid economic development increasing human population, and often wasteful use of natural resource. The result is to put vegetation at increasing risk to degradation and hence to jeopardise the ecosystem service that can be extremely costly to replace. Integrated vegetation management especially relying on remote sensing, is a newly established procedure in developing countries. It is proving to be a major component in ecological management. The problem to be investigated here is to see socio-economic survey and remote sensing technique can provide an efficient tool for assessing ecological problems.

Aim and Objectives

The aim of this project is to assess the effects of human development on vegetation degradation in order to sustain eco-system sustainability in the study area. Under this general aim, the specific objectives are;

- 1) To assess the level of vegetal degradation
- 2) To assess effect of human activities on natural vegetation
- 3) To access vegetal changes within some neighbourhood over the years using different satellite images.
- 4) Make recommendations to sustainably balance urban land development with preservation of vegetation.

4 Scope of the Study

The study focuses on the effects of human activities on vegetal land and suggest most relevant techniques to sustain natural resources. The study will use Landsat ETM imagery of 1992 and QuickBird satellite imagery of 2005 to assess the level of vegetation damaged in three selected neighborhood within Suleja metropolis.

4 Justification

With the intensification of the pressure by man upon his resources and the environment, there is rapidly growing need for more and better information for multidisciplinary decision and action programmes. The complexity of mans impact or the environment in relation to vegetation resources and land-use planning and management demand more efficient and rapid method to acquire and analyze resource information (Poulton, 1985)

Recent advance in science and technology fortunately, continue to create hope and produce new technologies and this helps to collect data for land degradation problems. These include the application of remote sensing in the area of mapping resources monitoring and modelling land degradation and hazards. Infact, many dynamic geo-physical processes occurring in very different locations are difficult to reach and it is therefore hoped that this study will not only help vegetation management.

Importance of vegetation resource cannot be over-emphasised; this research work will be of great importance to the nation in general as it will provide a frame work upon which individual community and government can build and expand in solving the problem of vegetation degradation.

6 Study Area

6.1 Topography

Suleja is a town located in the eastern part of the State, Although it is geographically centrally located and can easily be accessible by road. Suleja is on a geological base of undifferentiated basement complex of mainly gneiss and magness. To the north-east of the town is a continuous steep outcrop of granite. This outcrop form the principal physical development constraint on the west side of the town.

6.2 Population

Suleja has a total population of approximately 201,429 people out of the total population of the State, (3,950,249). The study area has an annual growth rate of 2.3% (NPC,2006) The main occupation of the indigenes of Suleja is farming. This is a predominant occupation that takes place all year round. All types of crops are cultivated by the people. Since the colonial period, Suleja has become a cosmopolitan city with most of the non-indigene engaging in white collar jobs. Due to its proximity to the FCT majority of the inhabitants are civil servants.

6.3 Climate

The study area is located in a tropical climate which is characterized by two seasons in a year, wet seasons and dry seasons. The annual rainfall received within the region is less than 1000mm in the wet season and it last between April and September with a maximum downpour between months of July and August. The dry season lasts between the month of October and March. Temperature varies within the region annually with the seasons. During the dry season, temperatures are low because the sun is in the southern hemisphere. Minimum temperatures

below 20⁰ C are recorded during the harmattan period, which is late December and January in the following year. And maximum temperature are not above 26⁰C. During the wet season the sun moves northwards from the equator to the tropics of cancer. This results to high temperatures because the sun overheads at noon. Minimum temperatures average above 26⁰C and Maximum temperatures average about 30⁰C particularly at mid-day between May and July.

Fig. 1: Locational map of Niger state, Fig. 2: Locational map of Suleja and Fig. 3: Map of Suleja metropolis.

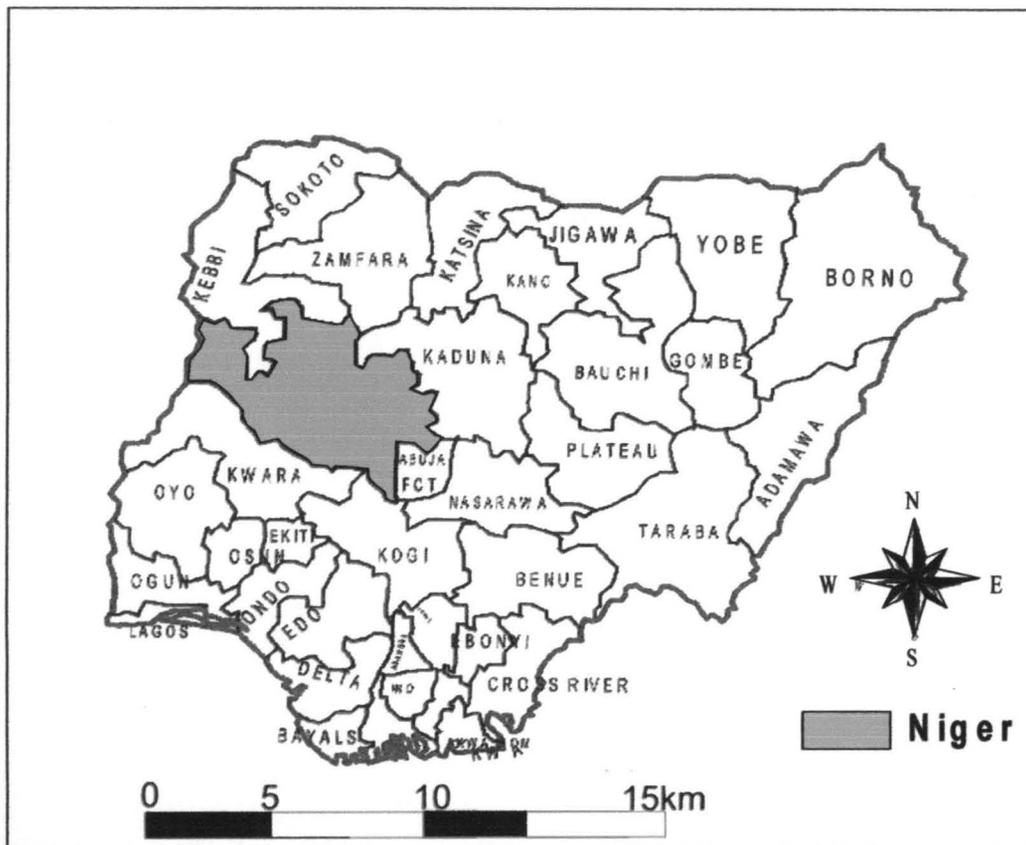


Fig. 1.1: Locational Map of Niger State

Source: Ministry of Lands with modification

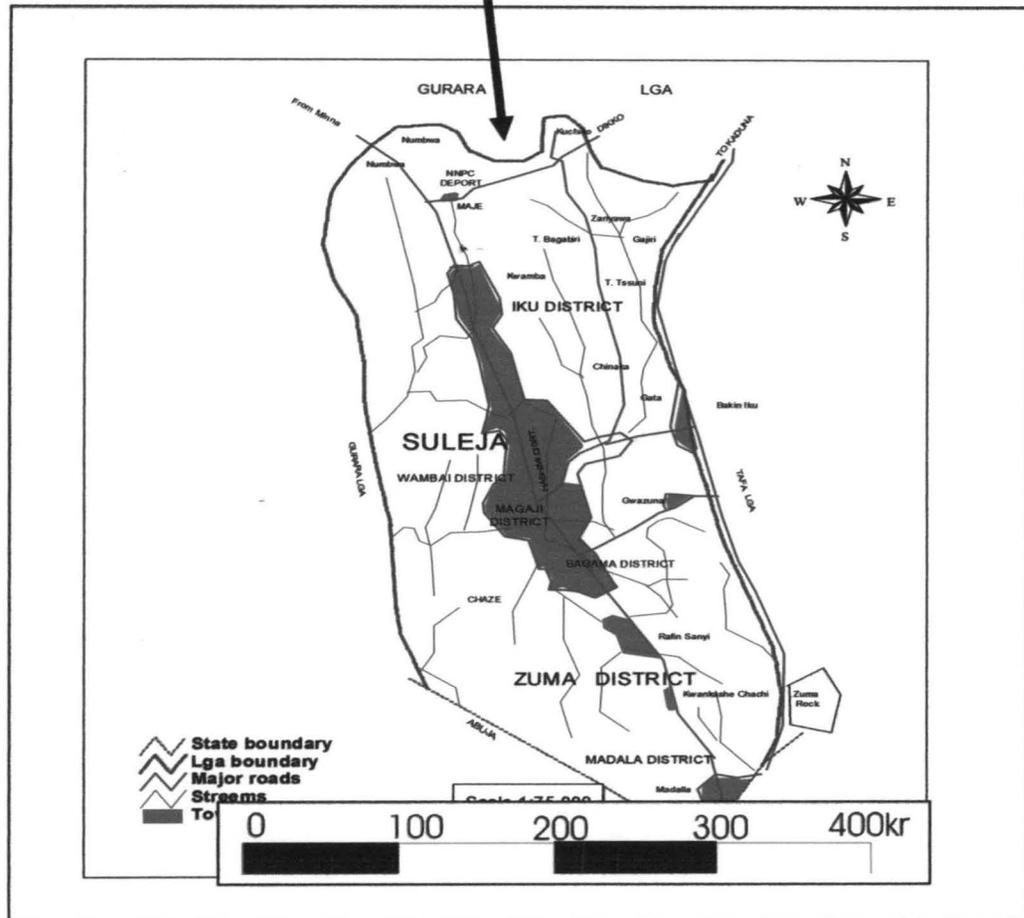
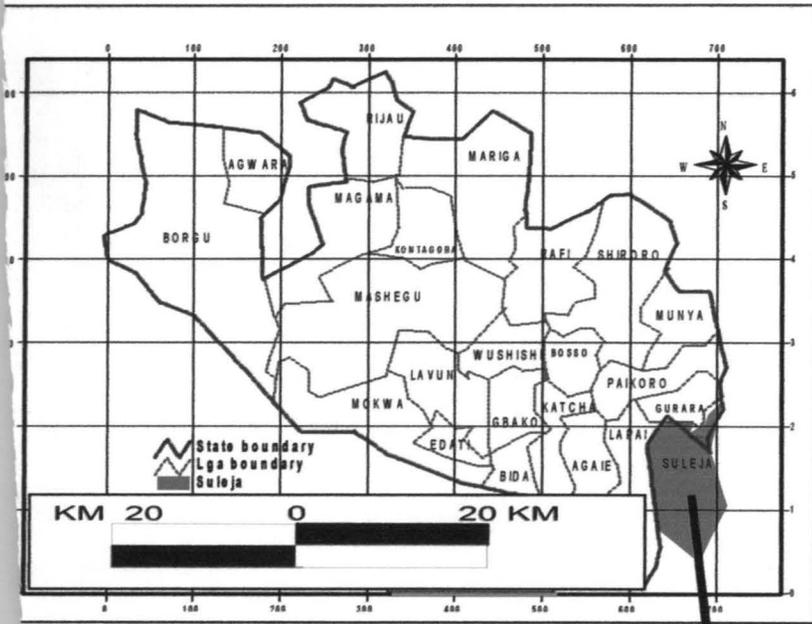


Fig. 1.2: Map of Niger State showing the location of Suleja

Source: Ministry of Lands with modification

CHAPTER TWO

LITERATURE REVIEW

2.1 Environmental Impact of Human Growth

Human growth has an impact on ecosystem and other environmental resources and all these considerable spatial growth is a road way to development in the environment due to expansion that occur in an the environment. The spatial growth of an area has impact on development of the environment.

Row (1968) sees environment as the surrounding of man in relation to the general comfort, convenience and aesthetics of the surrounding while the oxford advanced learner's dictionary, 6th edition (2001) describes the environment as the condition that shapes the behaviors and development of an organism. However, the core of this definition, which this research work is to address, is the physical environment which encloses man and his activities and the various factors that brings about changes.

Furthermore, the point of digression from borrows' point of view is his description of the environment in times of convenience and comfort. Urban area is the condition in which the natural existence of the environment is distorted as a result of development which has a direct impact on urbanization. The areas affected are: Land, Water and Air.

Moreover, while describing the world's cities, UNCHS (2001) averred that the concentration of world population is more in the industrialized world; and this has given rise to urban conditions such as megacities. This is however, the highway to urban problems such as security,

the struggle for shelter, infrastructure, health problems waste generation and pollution, among others. There are two major schools of thought that underscore the concept of urbanization.

The first school of thought is view urbanization as a basic necessity for the development of the environment and it also sees urbanization as a blessing and a phenomenon which is desirable.

The second school of thought is views urbanization as a process which distorts and destroys the socio-system. These are the anti-urbanization groups.

Building from the aforesaid, Ayeni (1999) supported the anti-urbanization thought; he enthused that no continent of the world has felt the negative impact in the world like Africa. And this predicted growth of population, has lead to the growth of megacities such as Lagos, in Nigeria, Cairo, Algiers, Johannesburg. e.t.c.

While Ohirin (1990) established the assertion that urbanization is a major factor through which the physical landscape is altered and that the activities of man has a different consequence on the environment, bearing the fact that qualitative viewing of urban dwellers can not be divorced from pollution, sprawl, slums and all other negative physical environmental problems.

In recognition of role of cities as engine room of economic development, there is the need for coping with rapid urban growth and maximization of the benefits there in. bearing this in mind however, the challenges no longer on how to stop urbanization but how to inco-operate it into the quality of living of the urban man and this is why Ayeni (1978) made a broad classification of urban problems in Nigerian urban centers into four classes. These include

Problem of unemployment

Management problems

Serviceability and

Livability.

Apparently, the unemployment problem is consequent upon the influx of rural migrants into the urban areas, the serviceability problem stems from the failure of infrastructure and inadequacies in the provision of facilities manageability relates to planning issues and keeping up with the facilities maintenance and public utilities and facilities.

et al (1989) viewed the expansion of urbanized area as a phenomenon that degrades the environment in form of inefficient land use air and water pollution. He also related that this process of urbanization often leads to uncontrolled development of floodplains, wet lands, steep slopes and marginal lands. This type of inefficient growth of urbanized area often presides in a haphazard manner thereby creating small patches of vacant land amidst new development.

However, this is consequent upon these processes of urbanization that the different spatial changes witnessed in Minna is anchored. Urban spatial change, therefore, frames the vulnerability of urban groups or area to various risk specific locations, whether from crimes, evictions or disasters.

As noted below, location in place is not necessarily coincident with the jurisdiction of urban institutions in ensuring safety and security while the issue of institutional capacity is important at various levels. It's particularly lacking at both the metropolitan and municipal level, especially in developing countries. The institutional framework governing cities is complex, with national institutions, often establishing norms for example, for infrastructural standards. Local institutions

in developing countries really have the capital for investments in large scale infrastructural provision such as water supply and electricity.

2 Human Growth as an Environmental Issue.

Melson et al (1995) describes various human growth as the cost of different urbanization problem when it happens in an uncoordinated manner thereby leading to pollution and environmental degradation. Though the urban area does not have a monopoly of the problems but the problems are more evident in the urban areas.

The expansion of urbanized area does impact on the quality of the environment. It often degrades the environment in the form of inefficient land and air or water pollution. When lands are not efficiently used, growth of urbanized areas often becomes uncontrolled and often penetrated into environmentally sensitive areas such as floodplains, wetlands, and others. Growth of urbanized areas increases the amount of air and water pollutions that eventually have impact on the quality of our environment. [Urban growth modeling and environmental impact analysis, Jay et al (1999)

Urbanization and environmental degradation do not take place in urbanized areas like that, they are usually the most intense and evident in cities and neighboring environment.

Therefore, concentration of population, indiscriminate waste disposal are distinctly urban in nature. There are two types of spatial changes that have become a problem to the public in developing countries.

Urban population growth: - this describes the rate and magnitude of population increase in urban countries. Rapid growth threatens to degrade the natural environment and urban services.

2. **Spatial growth:** - This is an equally important problem that concerns the inconvenience and inefficient land use pattern of contemporary cities. This low density of spatial growth arrangement of urban activities have widely separated places of residence from recreation, employment, shopping and other centres at the expense of personal convenience and travel cost. The cost of spatial growth in terms of access to urban land use has been well documented (Council on Environmental quality 1975 and Nelson et al 1995).

The concern for the protection of the natural environment and the maintenance of existing parts of the community has caused basic philosophic shift in people's attitude to the alarming growth of the society. Human Growth itself is not always undesirable, but desirable urban growth is often associated with economic growth that is socially and environmentally sustainable, balancing economy and ecology. Two major environmental concepts that influence contemporary thinking about sustainable development [Ledec and Goodland 1988] the traditional concept is one of the environmental services, those beneficial functions [like maintenance of water-flow pattern and recycling of water for the consumption of man in its environment] that natural areas perform. The new concept is one of the biological diversity, the range of genetic diversity and ecosystem in which both concepts are threatened by development of urbanized areas because, they are public goods that don't carry market price tag. Development is environmental interaction that may be positive and negative. But, it's rarely neutral. Negative impacts of development are those that maintain biological diversity and environmental services.

Negative impact of development is thus, that damages biological diversity and environmental services. They may include

- 1 displacement or damage of natural areas by intruding development and
- 2 Pollution of environmental media [air water and land] by such urban residual residuals as storm water runoff and industrial emissions.

In the case of displacement or damage, the primary remedy is to locate and manage future urban land uses so as to maintain the natural function and biological diversity of the environment. In the case of pollution, the primary remedy is to reduce the generation of pollutants at the source as well as mitigate their environmental effects.

To further understand the impact to our environment by undesirable spatial growth and how it can be managed, it is necessary to overview the various approaches being proposed and in some cases, tested. An early example of spatial growth control approach was the response to the rapid suburbanization of the 1950s. This type of zoning regulation was for the express purpose of preventing overtaxing of public schools and public utilities and for retaining the character of sparsely low density owners in the countryside. In reality, the practice was also for class and socio-economic segregation.

Cluster development evolved as another alternative settlement pattern in growth control, adapted in the 1970s. Clustering was not originally conceived as a design technique where dwellings were arranged around cul-de-sacs, the common application of the term in contemporary subdivision practice. Dwellings were usually arranged in small clusters to facilitate utility construction, rather than scattered about on large tracts. Clustering did not propose a higher gross density per square

mile than those authorized under large lot zoning, but gave room for an increase in net densities so that open space could be held in common large tracts, by protecting open space. [Urban growth modeling and environmental impact analysis, Jay et al. 1999]

2.3 Effects of Human Growth on Vegetation .

Human growth has effect on the social impact of an environment. Concerns over the spatial growth and its consequences are now new to us, this phenomenon has been a subject to be considered by academics, social critics and public policy makers since there is a shift of people and economic activities beyond city cores intensified after 1945. There have been various opinions about social and economic impact of spatial growth as been divided.

2.4 Concept of Vegetation Degradation

The natural vegetation over a geographical area is essentially a response to the climate in that area. Nigeria's vegetation belts reflect this very close link between vegetation and climate. Hence, the similarity in the west-to-east zone of both climate and vegetation. With the south to north progressive decline in total rainfall and length of wet season, vegetation belts are demarcated on west-to-east zone pattern characterized by transitional zones from one belt to another.

Nigeria has two broad belts of vegetation types, namely, the forest and savannah types. There is, however, also the mountain vegetation of the isolated high plateau regions in the central and far western parts of the country.

Forests: Forests are vegetation types or plant formations in which trees are the dominant species.

Nigeria has a heavily forested coastal south where humid tropical conditions favour tree growth.

Three forest zones can be sub-divided, from the coast inland, viz:

1. Saline water swamp
2. Freshwater swamp
3. Tropical evergreen rainforest.

Saline Water Swamp: This vegetation type is restricted to the coastal strip, which varies in width from less than 1.5km in the Badagry and Lekki peninsula areas to over 50km in the Sapele area. It is pronounced where the fresh water from the rivers meets and mixes with the salt water from the sea, forming brackish swamps. The low-lying nature of the Nigerian coastal zone allows for the influx of saline water through tidal movements into the lagoons, creeks and extensive brackish wetlands. This has encouraged the growth of different species of mangrove vegetation, typical in the wetlands of the backshore areas.

The mangrove vegetation is a hydromorphic forest type characterised by an entangled dense growth of stems and aerial roots behind the stretch of coconut palms overlooking the Atlantic Ocean. A good example is the Lekki Peninsula area east of Lagos.

Freshwater Swamp Forest: This vegetation belt, on freshwater wetlands, occurs further inland beyond the reach of tidal waters. Here, there is an enormous supply of freshwater from the inland rivers and run-off from abundant rainfall in the area.

Vegetation degradation is the deterioration of the environment through depletion of resources such as Vegetation, air, water and soil; the destruction of ecosystems and the extinction of wildlife.

Vegetation degradation is one of the ten threats officially cautioned by the High Level Threat Panel of the United Nations. The World Resources Institute (WRI), (the United Nations Environment Programme) UNEP, (the United Nations Development Programme) UNDP and the World Bank have made public an important report on health and the environment worldwide on May 1, 1998.

Environmental Change and Human Health, a special section of World Resources 1998-99 in this report describes how preventable illnesses and premature deaths are still occurring in very large numbers. If vast improvements are made in human health, millions of people will be living longer, healthier lives than ever before. In these poorest regions of the world an estimated one in five children will not live to see their fifth birthday, primarily because of environment-related diseases. Eleven million children die worldwide annually, equal to the combined populations of Norway and Switzerland, and mostly due to malaria, acute respiratory infections or diarrhoea — illnesses that are largely preventable.

2.5 Environmental Degradation

Environmental degradation is a result of the dynamic inter play of socio-economic, institutional and technological activities. Environmental changes may be driven by many factors including economic growth, population growth, urbanization, intensification of agriculture, rising energy use and transportation. Poverty still remains a problem at the root of several environmental problems.

2.6 Social Factors of Vegetation

Population is an important source of development, yet it is a major source of environmental degradation when it exceeds the threshold limits of the support systems. Unless the relationship between the multiplying population and the life support system can be stabilized, development programmes, however, innovative are not likely to yield desired results. Population impacts on the environment primarily through the use of natural resources and production of wastes and is associated with environmental stresses like loss of biodiversity, air and water pollution and increased pressure on arable land. India supports 17 per cent of the world population on just 2.4 per cent of world land area. It's current rate of population growth at 1.85 per cent continues to pose a persistent population challenge. In view of the linkages between population and environment, a vigorous drive for population control need hardly be over emphasised. Poverty 40. Poverty is said to be both cause and effect of environmental degradation. The circular link between poverty and environment is an extremely complex phenomenon. Inequality may foster unsustainability because the poor, who rely on natural resources more than the rich, deplete natural resources faster as they have no real prospects of gaining access to other types of resources. Moreover, degraded environment can accelerate the process of impoverishment, again because the poor depend directly on natural assets. Although there has been a significant drop in the poverty ratio in the country from 55 percent in 1973 to 36 percent in 1993-94 , the absolute number of poor have, however, remained constant at around 320 million over the years. An acceleration in poverty alleviation is imperative to break this link between poverty and the environment. Urbanization Lack of opportunities for gainful employment in villages and the biological stresses is leading to an ever increasing movement of poor families to towns. Mega cities are emerging and urban slums are expanding.

There has been an eightfold increase in urban population over 1901-1991. During the past two decades of 1971-91, India's urban population has doubled from 109 million to 218 million and is estimated to reach 300 million by 2000 AD. Such rapid and unplanned expansion of cities has resulted in degradation of urban environment. It has widened the gap between demand and supply of infrastructural services such as energy, housing, transport, communication, education, water supply and sewerage and recreational amenities, thus depleting the precious environmental resource base of the cities. The result is the growing trend in deterioration of air and water quality, generation of wastes, the proliferation of slums and undesirable land use changes, all of which contribute to urban poverty.

2.7 Economic Factors of Vegetation

To a large extent, environmental degradation is the result of market failure, that is, the non-existent or poorly functioning markets for environmental goods and services. In this context, environmental degradation is a particular case of consumption or production externalities reflected by divergence between private and social costs (or benefits). Lack of well defined property rights may be one of the reasons for such market failure. On the other hand, Market distortions created by price controls and subsidies may aggravate the achievement of environmental objectives.

The level and pattern of economic development also affect the nature of environmental problems. India's development objectives have consistently emphasised the promotion of policies and programmes for economic growth and social welfare. Between 1994-95 and 1997-98, the Indian economy has grown a little over 7 per cent per annum: the growth of industrial production and manufacturing averaging higher at 8.4 per cent and 8.9 per cent respectively

during these years. The manufacturing technology adopted by most of the industries has placed a heavy load on environment especially through intensive resource and energy use, as is evident in natural resource depletion (fossil fuel, minerals, timber), water, air and land contamination, health hazards and degradation of natural eco-systems. With high proportion fossil fuel as the main source of industrial energy and major air polluting industries such as iron and steel, fertilizers and cement growing, industrial sources have contributed to a relatively high share in air pollution. Large quantities of industrial and hazardous wastes brought about by expansion of chemical based industry has compounded the wastes management problem with serious environmental health implications.

Transport activities have a wide variety of effects on the environment such as air pollution, noise from road traffic and oil spills from marine shipping. Transport infrastructure in India has expanded considerably in terms of network and services. Thus, road transport accounts for a major share of air pollution load in cities such as Delhi. Port and harbor projects mainly impact on sensitive coastal eco systems. Their construction affects hydrology, surface water quality, fisheries, coral reefs and mangroves to varying degrees.

Direct impacts of agricultural development on the environment arise from farming activities which contribute to soil erosion, land salination and loss of nutrients. The spread of green revolution has been accompanied by over exploitation of land and water resources, and use of fertilizers and pesticides have increased many fold. Shifting cultivation has also been an important cause of land degradation. Leaching from extensive use of pesticides and fertilizers is an important source of contamination of water bodies. Intensive agriculture and irrigation contribute to land degradation particularly salination, alkalization and water logging.

2.8 Institutional Factors of Vegetation

The Ministry of Environment & Forestry (MOEF) in the Government is responsible for protection, conservation and development of environment. The Ministry works in close collaboration with other Ministries, State Governments, Pollution Control Boards and a number of scientific and technical institutions, universities, non-Governmental organisations etc. Environment (Protection) Act, 1986 is the key legislation governing environment management. Other important legislations in the area include the Forest (Conservation) Act, 1980 and the Wildlife (Protection) Act, 1972. The weakness of the existing system lies in the enforcement capabilities of environmental institutions, both at the centre and the state.

There is no effective coordination amongst various Ministries/Institutions regarding integration of environmental concerns at the inception/planning stage of the project. Current policies are also fragmented across several Government agencies with differing policy

mandates. Lack of trained personnel and comprehensive database delay many projects. Most of the State Government institutions are relatively small suffering from inadequacy of technical staff and resources. Although overall quality of Environmental Impact Assessment

(EIA) studies and the effective implementation of the EIA process have improved over the years, institutional strengthening measures such as training of key professionals and staffing with proper technical persons are needed to make the EIA procedure a more effective instrument for environment protection and sustainable development.

2.8.1 Agricultural Improvement:

One of the fundamental factors that have influenced urbanization is agricultural improvement such as mechanization and the use of improved agricultural inputs. These increased food production and released labour for work in industry thereby sustaining a larger percentage of non-agricultural population.

2.8.2 Industrialization:

This implies the concentration of factories near the source of raw materials or power. Dependence of manufacturing on raw materials and power supplies (e.g. coal) leads to the clustering of factories in relatively few locations. The resulting agglomerations create external economies of scale and industries grow and multiply accordingly. Large-scale output requires large amount of labour and as output rises, the demand for labour rises also. Furthermore, with rising population, market-oriented industries are also located in such areas where labour for industries can also be found.

8.3 Tertiary Activities:

Rising standard of living has led to increased demand for consumer goods and other personal services. These services are best co-ordinated in urban areas thereby leading to further population growth.

8.4 Market Potential:

The development of light industry leads to an increase in the importance of market-oriented locations. Towns provided large, ready-made market for consumer goods and therefore attract new industries. These new industries bring with them new labour supplies which in turn increase

the size of the potential market, the snow ball effect being set in motion and urban growth becoming self-sustaining.

2.8.5 Increased Service Activities:

Tertiary and veterinary industries grow due to increased trade, higher standard of living and the need for greater economic and social organization. Many services, by their very nature, tend to be centralized in towns: retailing, entertainment, catering and administration.

2.8.6 Transport Improvement: Improved transport has led to the expansion of towns along major routes as well as encouraging mobility of population. People are able to move from countryside to towns more quickly and easily than before, so that net immigration into urban areas goes up. For example, rural urban migration is one of the major factors influencing urbanization in Africa.

2.8.6 Social and Cultural Attraction:

Towns especially if they are large, old or cultural may act as magnets to their surrounding population because of their social facilities; cinemas theatres art galleries and so on. Many people simply enjoy being near the center of urban life.

2.8.7 Increased Education:

As people become more knowledgeable, their ambition grows. Towns are seen as centers where opportunities abound and success is more attainable. The mass media have helped to distribute knowledge over a wide range of area and may have made some people more aware of the inadequacies or limitations of their lives.

2.9 Effect urban on Vegetation

Like all other aspects of human activity, urban settlements are distributed irregularly over the earth's surface and owe their locations to numerous and diverse factors: relief, climate, mineral deposit communication, trade patterns, historical evolution and culture some towns have special sitting requirements like mining and quarrying towns, tourists, resorts, seaports, and strategic basis: some were built to preconceived plans; and some appeared almost by change. (Hammond 1979).

Today, the rules by which cities thrived (or failed) were the rules of commerce and finance. The questions now are: could the city expand and accommodate new industries and businesses? Where was the city positioned relative to resources and competition? Among the most basic qualities of a city are their sites and its situation and these are crucial in the new modern age.

Site: The site of a towns or city can be a major factor in its development. The term refers to the actual physical qualities of the place the city occupies: whether it lies in a confining valley, on a section of a coastal plain, on the edge of a Plateau or perhaps on an island. In Europe, a site's defensibility often was an important factor in the development of cities. A good example is that of Venice, a coastal settlement at the load of the Adriatic Sea that grew into a city of wealth and splendor.

Another example of the role of site in the emergence of a major city is Paris. The capital of France was founded on an Island in the middle of the Seine River, again a place where security and defence were enhanced and also a place where the seine could be crossed and the cross traffic controlled.

2.10 Management of Urban Vegetation

The management of vegetation is a major challenge in the urban environment. Residential and business development can have significant adverse effects on the extent and condition of urban vegetation.

Urban vegetation includes individual trees and groves of trees, areas of bush, "green belts", parks, and reserves. It includes vegetation in either public or private space and, in some instances, the combination of these areas (i.e. the streetscape). Urban vegetation is essential for visual amenity and landscape enhancement and for ecosystem services - the functions performed by ecosystems that ensure natural cycles (of water, oxygen, carbon, soil etc) continue to provide an environment conducive with quality of life, including human life (Parliamentary commission for the environment 1998).

In early 1997 the Parliamentary Commissioner for the Environment received thirteen expressions of concern about the management of urban vegetation in the North Shore area. These concerns related to both the management of urban vegetation and the protection of significant urban vegetation (e.g. notable trees and areas of regenerating bush) by the North Shore City Council. After conducting initial inquiries, the Commissioner decided to investigate the wider issue of the management of urban vegetation in North Shore City, particularly from the long-term perspective. Trees are often recognised as contributing to landscape and amenity values in an urban area, but their role in maintaining life-supporting processes and assisting the functioning of the urban ecosystem is seldom recognized (Parliamentary commission for the environment 1998).

2.11 Nature of Urban Vegetation

Urban vegetation includes individual trees and groves of trees, areas of bush, “green belts”, parks, and reserves. It includes vegetation in either public or private space and, in some instances, the combination of these areas. Reasons for maintaining urban vegetation include:

- Enhancement of visual amenity and landscape;
- Provision of screening, shade and shelter;
- Absorption of pollutants and carbon dioxide;
- Enhancing soil and water conservation to assist sustainable land management and limit erosion and sedimentation of watercourses and marine areas;

Provision of ecosystem services

Provision of habitat for birds and insects; and

Protection of natural heritage values.

The relative importance of these reasons will change depending on the species, size and location of the urban vegetation.

Urban vegetation can also have negative or adverse effects on surrounding properties including:

Blocking views;

Blocking sunlight and daylight to a property;

Root damage to roads, paths, pipes and foundations; and

Adding to maintenance costs.

The balancing of these positive and negative effects is at times a difficult judgment for decision makers and those seeking to manage urban vegetation. It is even harder if decisions are made in isolation from the consideration of ecosystem services (Morgan 1998).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Data Collection

The research tool employed for the collection of data for the purpose of this research includes the primary and secondary data source.

The primary source of data is the first-hand data. It provides the researcher with data that are directly related to his interest. In this light the following methods were employed.

Field survey: This is a method in which the researcher made observation and engaged in ground truthing. This method include; identifying, Specific physical structures, Measurement, Mapping and calculation of built-up areas and open spaces (vegetation) on new developed areas, marginal urban land under urbanization, exotic areas undergoing urban invasion.

Questionnaire Method: Prepared questionnaire were administered to residents within the study area (Suleja) and responses were recorded. For the purpose of this study 100 copies of the questionnaire were administered at selected three neighbourhoods namely: Bakin Iku (Angwan asarawa), Chéchenia and Kurmin Sarki. Data obtained include socio- economic characteristics, household's information such as (household size, age groups, occupation and income), building information and information on vegetation, among others.

Four hundred (400) copies of the questionnaire were distributed, out of which three hundred and seventy five were returned and form the basis of this data analysis. The distribution of these respondents according to age group is indicated in Table 1.

c. **Interview:** Interview was conducted with organizations responsible for planning and management of the environment, which the Niger State Urban Development Board (NUDB), Niger State Ministry of Housing and Environment, Department of Forestry, Ministry of Agriculture and Natural Resources Suleja and Niger State environmental Protection Agency (NISEPA). Information obtained includes urban land development, method of management of urban vegetation, government effort towards conservation programme or preservation of urban vegetation.

Secondary data Sources: These are ready materials from different relevant fields. These include textbooks, thesis, seminar papers, reports, published and unpublished materials, maps from different areas.

For the purposes of making the research as logical as possible, the secondary data for this research was obtained from National Population Commission on population growth in Suleja, local maps from Department of Lands and Survey from Governor's office Suleja.

Remote Sensing Data: Suleja Landsat ETM 1992 and QuickBird Imagery of 2005 were used to obtain land use information change. The imagery has been used by government, commercial, industrial, civilian, and educational communities in the United States and worldwide. These data are being used to support a wide range of applications in such areas as global change research, agriculture, forestry, geology, resource management, geography, mapping, water quality, and oceanography. Landsat Image data have potential applications for monitoring the conditions of the Earth's land surface. The images can be used to map anthropogenic and natural changes on the Earth over periods of several months to several years. Examples of changes that can be identified include agricultural development, deforestation, natural disasters, urbanization, and the development and degradation of water resources.

Landsat Enhanced Thematic Mapper (ETM) was also obtained from Global Land Cover Facility on the internet. The Landsat ETM satellite has seven (7) bands like the land sat TM but carries an additional panchromatic band. Landsat ETM have a spatial resolution of 30m and the panchromatic band has a 15m spatial resolution. The ETM has a temporal resolution of 16 days.

Table 3.1 The Wavebands of land sat ETM

BANDS	WAVELENGTH (UM)	SPECTRAL LOCATION
	0.45 0.52	Blue
	0.52 0.60	Green
	0.63 0.69	Red
	0.76 0.90	NR
	1.55 1.25	MR
	10.4 12.5	Far
	2.08 2.35	IR
	0.52 0.90	panchromatic

Source Harris 1987

The data in table 3.1 can be used for the following purposes:

- To give advance warnings of **natural disasters** like floods, earthquakes, volcanic eruptions and storms.
- To Access waste management and manage occurrence of **man-made disasters** like oil pollution, desertification, erosion, forest fire, and deforestation,

- In **agriculture**, for mapping, land use planning, management of sustainable grazing, forest logging, planning a forestation programs, crop inventory and yield forecast.
- Water resources development and management, including assessment of the quantity and quality of surface and underground water, rainfall prediction, as well as integrated water resources management on drought and other disaster forecast.
- Solid mineral exploration and exploitation, including general geological mapping and map update or revision, as well as differentiating host mineral areas in oil, gas and solid mineral exploration.
- Ecosystem: Evaluation and monitoring of vegetation and land use as well as the aquatic system.
- Local and regional planning for tourism and its potentials.
- Demographic uses such as mapping and planning of population surveys, census enumeration areas, as well as mapping, planning and monitoring of rural and urban growth.
- Mapping of state and international boundaries, planning and mapping of terrain traffic for defense and security purposes, as well as identification and neutralization of international criminals.
- It would be used in **public health delivery** to establish the relationship between malaria vectors and the environment that breeds malaria, while its remote sensing technology can be used to give early warning signals on future outbreaks of meningitis.
- To provide the technology needed to bring education to all parts of the country via distant learning.

3.3 Geo-Referencing

Handling spatial information requires the establishment of a *spatial reference system* to which all spatial measurements must relate. The primary function of the map is to portray accurately real-world features that occur on the curved surface of the earth. Geographic referencing, which is sometimes simply called *geo-referencing*, is defined as the representation of the location of real-world features within the spatial framework by which the positions of real-world features are measured, computed, recorded and analyzed. In practice, geo-referencing can be seen as a series of concepts and techniques that progressively transform measurements carried out on the irregular surface of the earth to the flat surface of a map, and make it easily and readily measurable on this flat surface by means of a coordinate system. Map data are different from all other forms of data by this characteristic of geo-referencing and, the ability to manipulate and analyze geo-referenced spatial data is what distinguishes GIS from CAD and other types of computer graphics systems. The concept of representing the physical shape of the earth by means of a mathematical surface and the realization of these concepts by the definitions of the 'geoids' and the *ellipsoid* are fundamental to geo-referencing.

Image Classification

Image classification refers to computer-assisted interpretation of remotely sensed images. Classification is the process of developing interpreted maps from remotely sensed images. As a consequence, classification is the most important aspect of image processing to GIS. Additionally, classification was achieved by visual interpretation of features and the manual delineation of their boundaries. However with the advent of computers and digital imageries, majority attention has focused on the use of computer-assisted interpretation. Although the

human eye still brings a superior set of capabilities to the classification process, the speed and consistency of digital procedures make them very attractive. As a consequence, the majority of classification projects today make use of digital classification procedures, guided by human interpretation.

There are two basic approaches to the classification process: supervised and unsupervised classification. They differ in how the classification is performed. In the case of supervised classifications, the software system delineates specific land cover types based on statistical characterization data drawn from known examples in the image (known as training sites). With unsupervised classification, however, clustering software is used to uncover the commonly occurring land cover types, with the analyst providing interpretations of those cover types at a later stage.

A description of each land use category is given below, for a better understanding of what each category represents.

- a. **Intensive Built-up Area:** This comprises of all types of buildings close together, the study area was a clustered area and this is identified by appearance of rooftops. The ground features in this mapping unit consisted of individual homes, and commercial buildings such as big and small enterprises such as market, bank, hair salons, tailoring shops etc were found here.
- b. **Vegetation:** Smaller areas occupied by scattered tree crowns with medium texture and medium toned, but the area was predominantly grass and shrubs.

- c. **Water Bodies:** Downstream of the lake, Smaller water bodies flowing into the major river. Appearing very thin and more curvilinear than the Major River and dark toned in some areas where vegetation is dense along the course of the river.

3.5 Software Used

Basically, five software were used for this project viz;

- (a) ArcView 3.2a -- this was used for displaying and subsequent processing and enhancement of the image. It was also used for the carving out of Suleja region from the whole Niger State imagery using both the admin and local government maps.
- (b) ArcGIS – This was also used to compliment the display and processing of the data
- (c) Idrisi32 – This was used for the development of land use land cover classes and subsequently for change detection analysis of the study area.
- (d) Microsoft word – was used basically for the presentation of the research.
- (e) Microsoft Excel was used in producing the bar graph.

CHAPTER FOUR

4.0

RESULTS

This chapter attempts to discuss the devegetation process of Suleja with a view to assessing its impact on the environment. During the field survey carried out in three selected areas in Suleja (Angwan Nassarawa, Chechenia and Kurmin Sarki), it was discovered that urbanization has serious effects on vegetation. The analysis of data would be based on the objective of the study.

4.1: Socioeconomic and Demographic Characteristics

Table 4.1: shows the socio-economic and demographic characteristics of the respondents, from the analysis, it shows that 40% of the respondents are between the age of 31-40, 19% between 20-30 years, 25% between 41-50 years and 16% 51 years and above.

Table 4.1: Age-group of the respondents

Age-group	No of respondent	
Percentage		
20 – 30 Years	70	19
31 – 40 Years	150	40
41 – 50 Years	95	25
51 and above	60	16
TOTAL	375	100

4.2: Origin of People

From table 4.2, it shows that higher percentage of the respondent are indigenes with 67% while 33% are immigrants from different part of the country.

Table 4.2: Origin of people

Age-group	No of respondent	Percentage
Indigenes	250	67
elsewhere immigrants	125	33
Total	375	100

4.3: Level of Education

From table 4.3, it shows that higher percentage of the respondent are attend secondary education with 52% followed by primary school with 27% and by illiterate with 16% and tertiary with 5%.

Table 4.3: Levels of Education

Level of education	No of respondent	Percentage
Illiterate	60	16
Primary	100	27
Secondary	195	52
Tertiary	20	5
Total	375	100

4.4: Occupation of the People

From table 4.4, it shows that higher percentage of the respondent are farmers with 32%, followed by self employed with 25% and civil servant with 23% and trading with 20%.

Table 4.4: Occupations

	Total respondent	Percentage
Self employed	95	25
Farming	120	32
Trading	75	20
civil servant	85	23
Total	375	100

4.5: Level of Income

The analysis shows that higher percentage of the respondent received N10,000+ with 31% and end with 4% with 30,000+

Table 4.5: Levels of income

Income per month	No of respondent	Percentage
less than ₦5, 000	20	5
₦5, 000+	95	25
₦10, 000+	115	31
₦15, 000+	75	20
₦20, 000+	55	15
₦30, 000+	15	4
Total	375	100

4.6: Area of Residence

From table 4.6, it shows that majority of the respondent stays at Angwan Nassarawa with 36% while 32% of the respondent stays in Chechenia and 32% in Kurumi Sarki.

Table 4.6: Areas of Residence

Area	Total no of respondent	Percentage
Anguwan Nassarawa	145	36
Chechenia	115	32
Kurumi Sarki	115	32
Total	375	100

4.7: Years of stay in Suleja

From table 4.7 shows that higher percentage of the respondent stays in the study area for about 21-30 years, 31% stays between 11-20 years, 26% stays for 1-10 years while 11% since birth.

Table 4.7: Years of stay in Suleja

Duration	No of respondent	Percentage
1-10 years	96	26
11-20 years	115	31
21-30 years	121	32
Since Birth	43	11
Total	375	100

4.8: Methods of Land acquisitions

Table 4.8 shows that higher percentage of the respondent with 34% purchase their land, 29% from customary, 16% lease, 12% from Government, 5% as a gift and 4% as pledge.

Table 4.8: Methods of land acquisitions

	No of respondents	Percentage
Customary	110	29
Purchase	126	34
Lease	60	16
Government	44	12
Gift	20	5
Pledge	15	4
Total	375	400

4.9: Uses of building

From table 4.2, the analysis shows that higher percentage of the respondent uses their buildings for residential purposes with 73% while 23% for commercial buses, 3% for public uses and only 1% for agricultural purposes.

Table 4.9: Uses of buildings

Use of building	No of respondent	Percentage
Residential	275	73
Commercial	85	23
Public	10	3
Agricultural	5	1
Recreational	nil	0
Total	375	100

4.10: Presence of vegetation prior to development

From the above analysis the effect of human activities on natural resources was clearly seen, with 99% of the respondent agree with the presence of vegetation prior to development while only 1% says no.

Table 4.10: Presence of vegetation prior to development

Presence of vegetation	No	of Percentage
	respondent	
Yes	370	99
No	5	1
Total	375	100

4.11: Causes of devegetation.

From table 4.11, it was seen that 75% of the respondent destroyed vegetation for building purposes while 24% for fuel wood demand and only 1% for other purposes.

Table 4.11: Causes of devegetation.

Cause of devegation	No of respondent	Percentage
construction work	280	75
fuel wood demand	90	24
Others	5	1
Total	375	100

4.12: Sources of energy for cooking

From the above analysis it was seen that higher percentage of devegetation was as a result of fuel wood with 45%, char coal with 32%, kerosene with 19% and others with 1%.

Table 4.12: Sources of energy for cooking

Sources of energy	No of respondent	Percentage%
Fuel wood	170	45
Kerosene	70	19
Gas	10	3
Char coal	120	32
Others	5	1
Total	375	100

4.13: Planting of tress

From table 4.13, it shows that higher percentage of the respondent do not plant tree with 53% while 4% plants.

Table 4.13. Planting of trees

	No of respondent	Percentage %
Planted trees	155	4
Do not plant trees	320	53
Total	375	100

4.14: Purposes of planting trees

From table 4.2, it shows that higher percentage of the respondent plants trees for aesthetic purposes with 63% while 31% for shade purposes, and 5% for economic purposes and 2% for others.

Table 4.14: purposes of planting trees

Purpose	No of respondents	Percentage
Shade	55	31
Aesthetic	110	63
Economic	8	5
Medicinal	0	0
Others	2	1
Total	375	100

4.15: Government efforts on vegetal cover

The analysis above shows that no government efforts in planting of trees in the areas, only 13% agrees with government efforts, while 87% do not.

Table 4.15: Government efforts on vegetal cover

	No of respondents	Percentage
Effort	50	13
No effort	325	87
Total	375	100

4.16 Assessing Level of Vegetal Degradation

One of the objectives of this research work is to assessing vegetal degradation using digital techniques of Remote Sensing data to examine the extent of vegetation damaged in the study area and to produce map to show the landuse variances in the area and also to suggest possible way of preventing vegetation damages. Data availability has always been the major limitation of project development and this limitation resulted in the streamlining of data used for the project. The data used were selected based on their ranking importance and their impact on the objectives of this research work. Landsat ETM imagery and Quick bird Imagery were analysed, were the following themes generated; vector map showing Settlements, water body, vegetation and roads.

Land uses classification was generated from the imagery and it shows five different themes generated from the imagery.

Table 4.16: Image variance in classes from Landsat

LANDUSE	PERCENTAGE
Intensive Built-up	28%
Farmland	49%
Wet Vegetated	11%
Land	
Water body	12%
Total	100

The above chart interpret land use variance from the imagery generated.

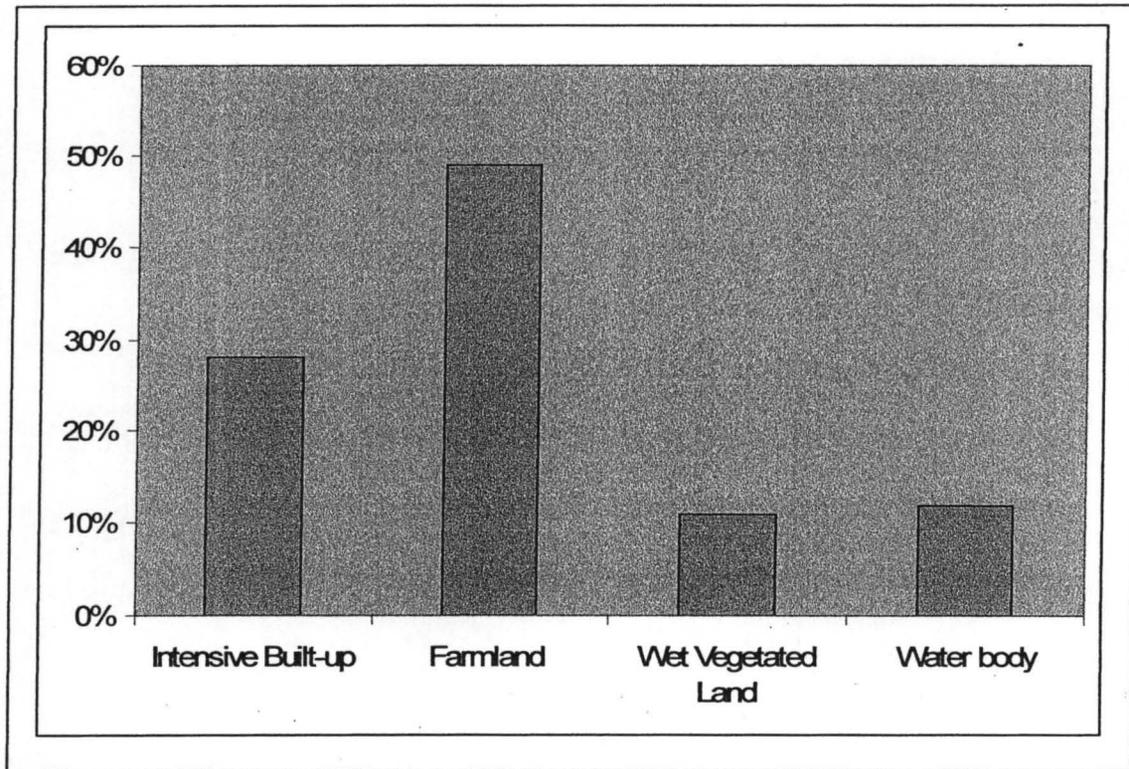


Fig. 4.2: Chart showing Land Variance as at 1992

4.17 Interpretation of Quickbird Image 2005

The QuickBird imagery was divided into three sections, due to the scale and resolution of the imagery, it was therefore divided for better visualization and the three section covered the study areas.(Angwan Nassarawa, Chechenia and Kurumi Sarki). Appendix ii, iii and iv

The following themes classes were generated from the QuickBird imagery of 2005, and it shows the following table below:

Table 4.17: Image variance in classes QuickBird Imagery 2005

Landuse	Percentage
Intensive Built-up	55%
Farm land	29%
Wet Vegetated Land	4%
Water body	12%
Total	100

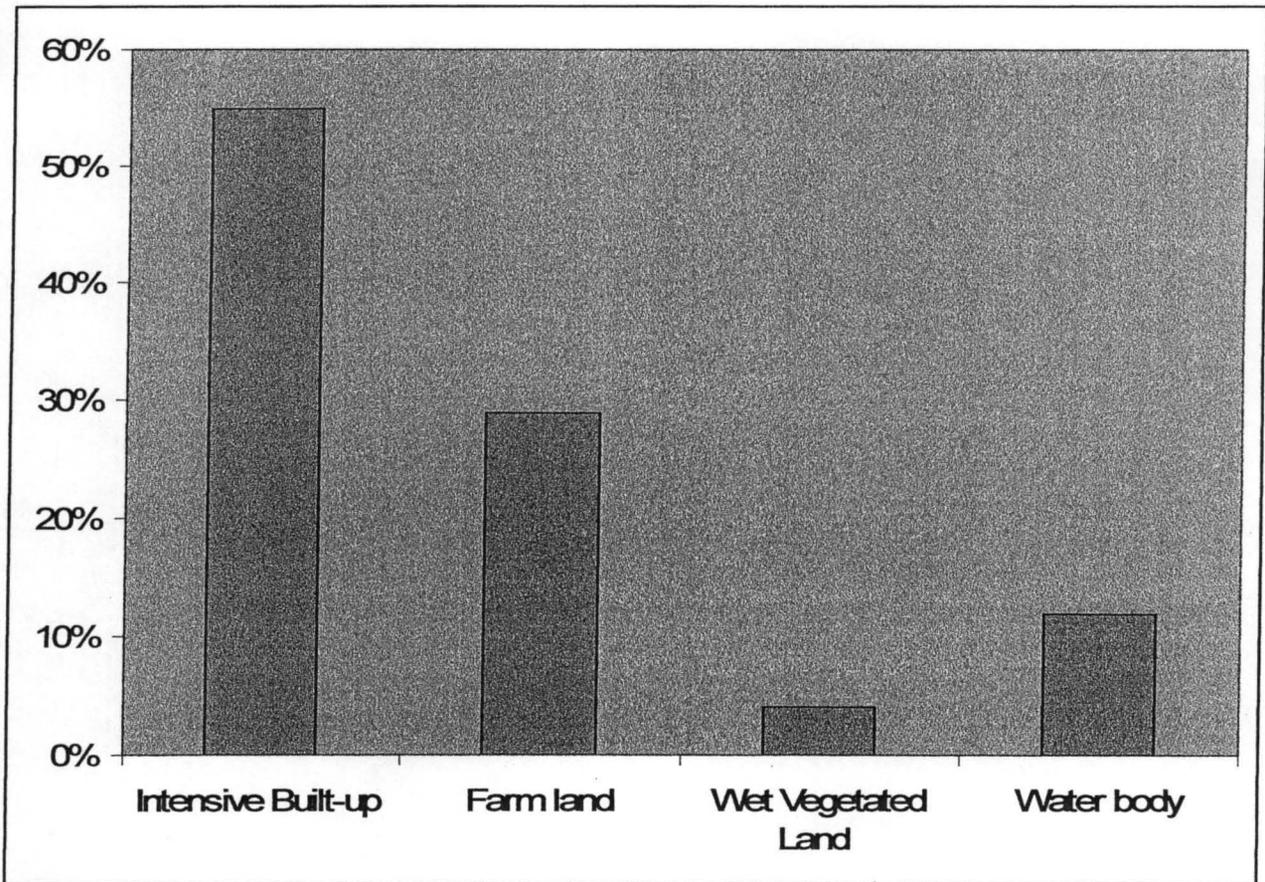


Fig. 4.4: Chart showing Land Variance as at 2005

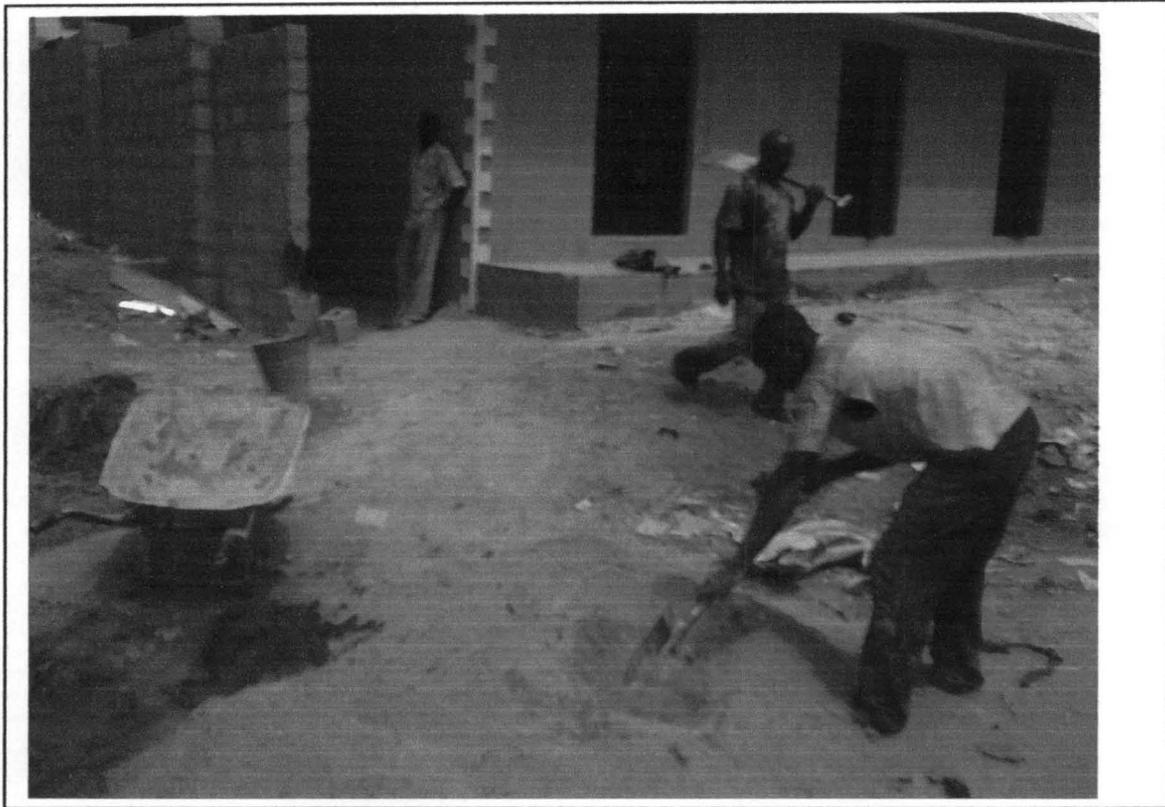


Plate I: Building taking over Vegetated Land at Chechenia area in Suleja



Plate II: Vegetated / Farm land converted to building in Chechenia area of Suleja



Plate III: Building on farm lands at Kurmin Sarki in Suleja

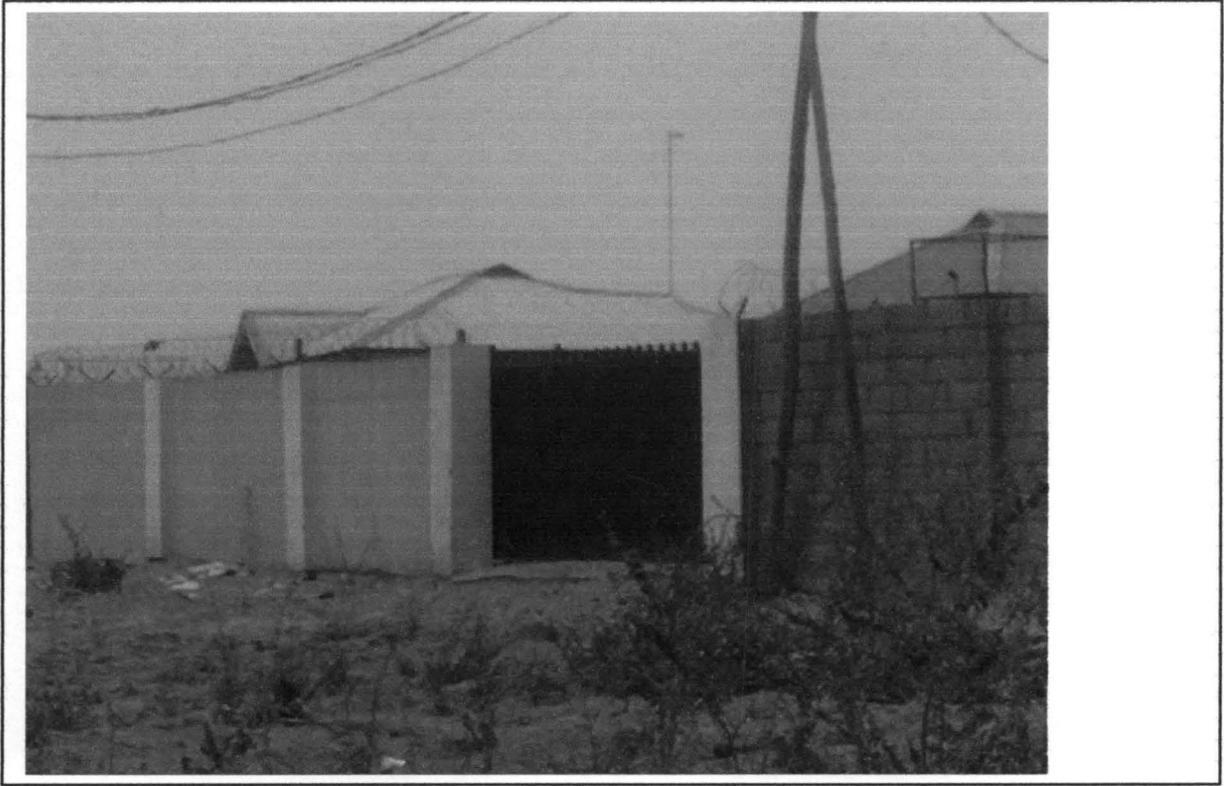


Plate IV: New building on farm land area Kurumin Sarki in Suleja



Plate V: Vegetation being Destroyed for building purposes at Angwan Nassarawa in Suleja

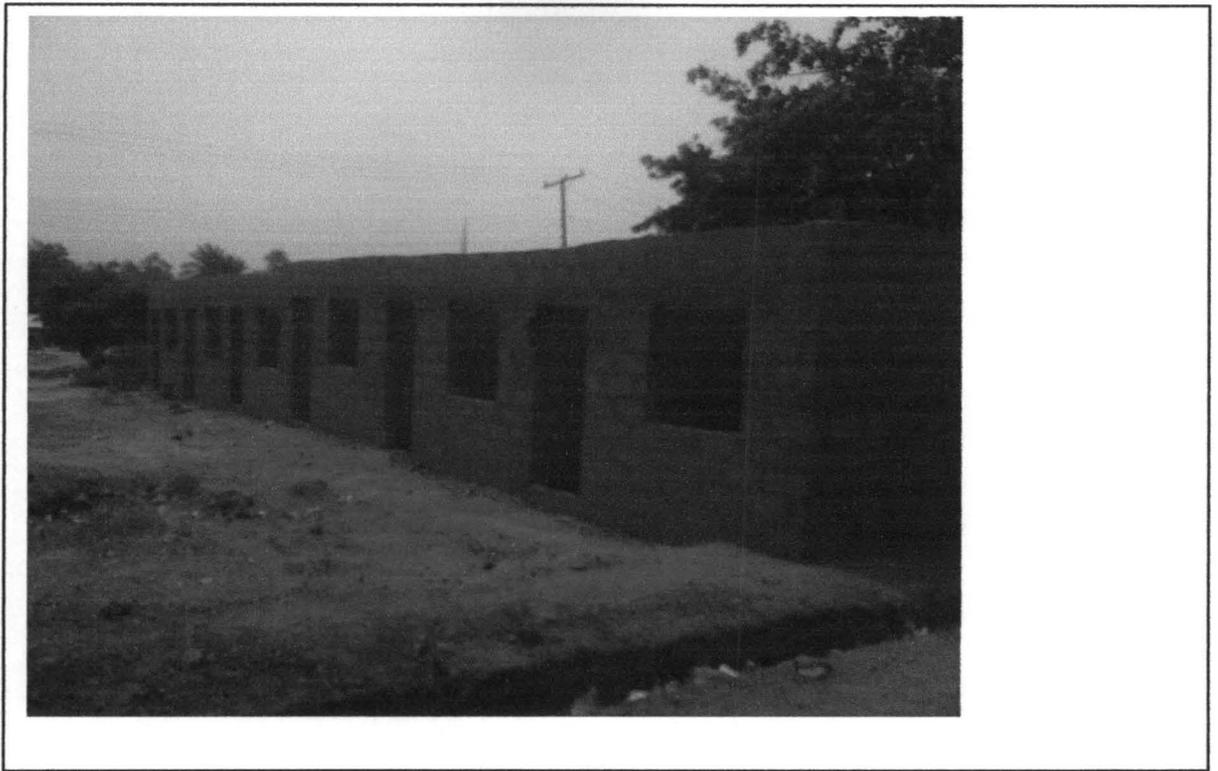


Plate VI: Vegetation area being converted to plots for building purposes at Angwan Nassarawa in Suleja

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Discussion

Figure 4.1 indicates that the percentage of those between the ages of 20-30 years is 19 percent, those between the ages of 31-40 years are 40 percent, those between the ages of 41-50 years are 20 percent and those who are 51 and above are 16 percent. Out of the number 80 percent are males, 20 percent females. This however indicates that, majority of the house hold heads interviewed are males and fall between the ages 31-40 years.

The total respondents who are indigenes of Suleja are 250 or 67 percent while 125 or 33 percent are immigrants. This shows that the population of the study area made of both indigenes and immigrants from other parts of the state and the country in general. But the indigenes are in the majority.

Figure 4.3 indicates that the total respondents who are illiterate are 60 (16.2) out of 375 those with primary education are 27 percent, secondary education are 52 percent and tertiary education are 12 percent respectively.

This means that, the majority of the respondents are educated to secondary school level.

Figure 4 indicates that, the total respondents who are self employed are 95 out of 375 (that is 25 percent), farmers constitute 32 percent, traders constitute 20 percent and civil servant are 85 (23 percent).

This means that majority of the respondent are self-employed, in farming, trading and other small-scale economic activities

However, the level of income of the respondent's who earn less than ₦5, 000 per month is 20 out of 375 or 5 percent, those that earn ₦500 plus are 25 percent, ₦10, 000 plus per month are 31 percent, respondents that earn ₦15, 000 plus per month are 20% percent, ₦20, 000 plus are 15 percent and ₦30, 000 plus are 4 percent respectively. This is an indication that majority of the respondents are medium income earners.

Table 6: indicates that, out of the total number of 375 respondents about 24 percent are from Gwan Nassarawa, the Chechenia had 26 percent, while Kurmi Sarki area constitutes 24 percent

Table 7: shows the length of stay in Suleja. According to the table only 26 percent of the respondents have stayed in Suleja for between 1-10 years, 31 percent have stayed between 11-20 years, 30 percent stayed for between 21-30 years and 11 percent were born and in Suleja.

2.2: Level of Vegetation Degradation

A ground truth was carried out despite the fact that the image used were more than a decade old, using physical features (river and routes) as sample points. The interpreted image showed that vegetation covers about 420 hectares which made up the of the largest landuse category, The built-up land comprises of industrial land which covers about 218 (ha), clustered and scattered residential lands This interpretation showed the nature of the landuse type in 1992

Aerial Image of 2006 shows serious changes in the landuse as a result of urbanization, vegetation has damaged, water body and has reduced due to human activities, development has taken over part of vegetated land and wet lands have vanished as a result of human activities. The classification showed that Farmland and wet land reduced which includes scattered cultivation and plantation has drastically reduced, Built-up areas have increased from 28% to

%, and this shows evidence of urbanization changes in terms of built-up areas. Table 6 shows the percentage distribution of landuse categories for 2005

Figure 4.17 shows the differences in landuse category of each classification, and figure 7 shows a histogram chart that represents the level of each landuse category changes within the period under study.

. Summary

From the study undertaken so far, the following are apparent

1. The study area has grown almost 2 times between 1992 – 2005
2. There is rapid urban development due to human activities that led to massive deforestation in the study area.
3. Methods of land acquisition in the study area are through customary and informal purchase.
4. Attention is not given to open space development in the study area.
5. There are inadequate intervention measures by both the community and the government in arresting the problem by replanting of trees, re-vegetating the destroyed vegetation or creating green areas.
6. That construction work, fuel wood demand and charcoal to service the urban population are responsible for the destruction of vegetation in the study area.
7. Urban expansion is also responsible for vegetation change in the study area.
8. There is an inverse relationship between built-up area and vegetation cover. As built-up area increases, the vegetation cover declines.

3 Conclusion:

ries of research have been undertaken by contemporary urban geographers and environmentalists on the impact of urbanization on vegetation, and that the reduction of vegetal cover and high fertile agricultural land as a result of urbanization process, other factors such as land use, lack of political will of the government and the public at large only aggravate the problems. The negative impact of urbanization on vegetation are more than the positive effect, example of such effect are the environmental problems caused as a result of interference with nature by man for without regard for sustainable development. Example of such environmental problems are: flood, urban heat island, pollution, soil erosion drought, desertification. These disasters can led to destruction of lives and properties.

The problem arises from the intensity of the variables as a result of urban devegetation, which varies with time, whether this is true of other environmental problems require further research. However other environmental problems that merit further research in Suleja urban centre include flood, soil erosion, waste disposal system, urban traffic problem which are beyond the scope of this thesis

4. Recommendations

1. Method of land acquisition should be checked in the study area, it should be in conformity with the provision of the land use act 1978.
2. Adequate intervention measures should be put in place by both the community and the government in arresting the problems, by replanting of trees, re-vegetate the destroyed vegetation and creation of green areas.

3. Construction or development should be done taking into account the preservation and conservation of vegetation in the study area.
4. There should be construction of parks and garden, and green area with the metropolis.
5. Adequate intervention measures need to be put in place by both the community, Government and other relevant agencies in arresting the situation through environmental education, awareness and enforcement of environmental legislation.
6. Alternative source of energy like kerosene should be available and affordable as source of energy to prevent the destruction of vegetation in the study area

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FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.
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Questionnaires: For the Residence of Chechenia, Kurmin Sarki and Angwan Nassarawa in Suleja, Niger State.

Researcher Topic: **ASSESSING THE EFFECT OF URBANIZATION ON VEGETATION IN SULEJA METROPOLIS, NIGER STATE, NIGERIA**

A research work is proposed to be done on the above topic in pursuit of Degree of Master of Technology (M.Tech).

The aim of this preliminary survey is to obtain useful information needed for the success of the research. Therefore, your candid response to the inquiries is highly solicited for, as well as your co-operation for the next stage of the study. All information obtained would be treated with utmost confidentiality and respect for this research work only.

Date: _____ Houses No: _____ Street: _____

Instruction: Fill in the blank spaces or tick where necessary. To be completed by a Head of the family or entrusted representative only.

Section A

1. Age of the respondent

- (a) 20-30 () (b) 21-40 ()
(c) 41-50 () (d) 51 and above ()

2. Origin

- (a) Indigene ()
(b) elsewhere ()

3. Level of Education

- (a) Illiterate () (b) Primary () (c) Secondary ()
(d) Tertiary ()

4. Occupation

- (a) self employed () (b) Farming () (c) Trading (d) Civil servant ()

5. Income per month

- (a) #5,000 - 10, 000 () (b) 10, 001 - 15, 000
(c) 15, 001 - 20, 000 () (d) 20, 001 - 25, 000 ()
(e) 30, 000 ()

6. Area of Residence

- (a) Angwan Nassarawa
(b) Chechenia
(c) Kurimi Sarki

7. Years of stays in Suleja

- (a) 1-10 years
(b) 11-20 years
(c) 21-30years
(d) since birth

8. Method of land acquisition

- (a) Purchase
(b) Lease
(c) Government
(d) Gift
(e) Pledge

9. Planting Trees

- (a) Yes
(b) No

10. Purpose of planting Trees

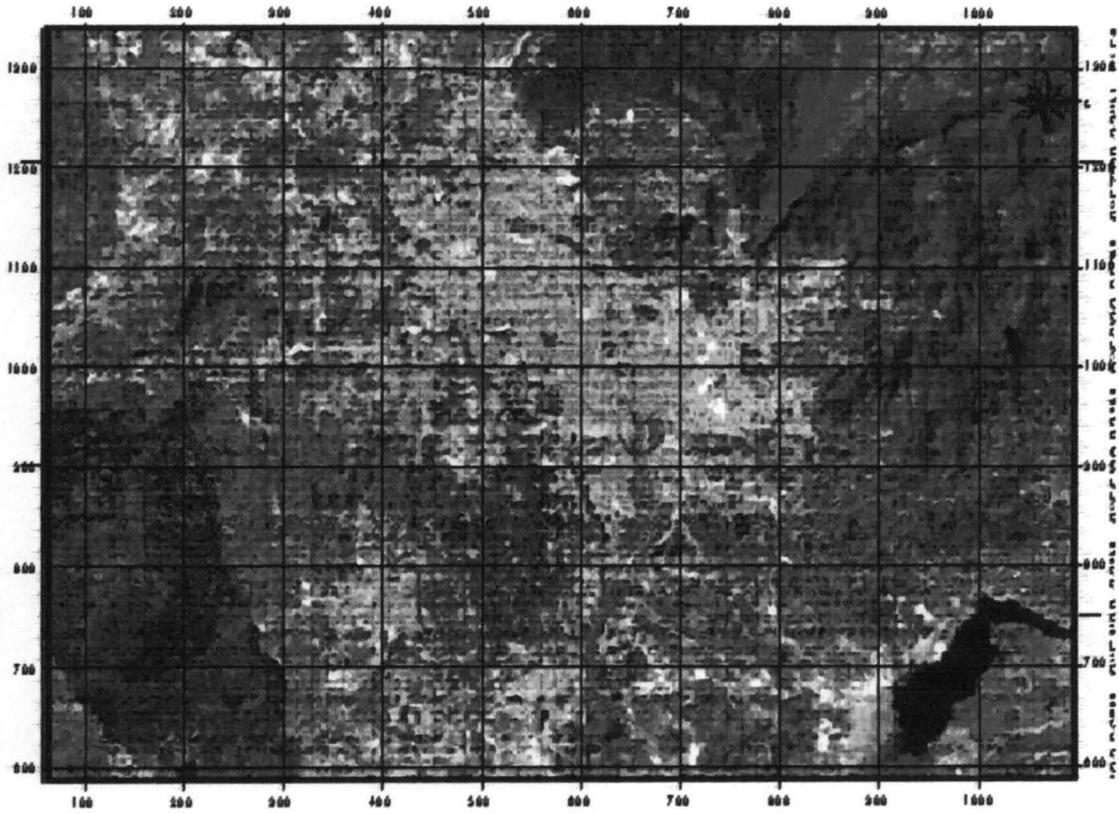
- (a) Shade
(b) Aesthetic
(c) Economic
(d) Medicinal
(e) Others

11. Government effort on vegetal cover

- (a) Effort
(b) No effort

MUSA, Ibrahim Jemaku

Appendix i



Landsat Satellite imagery of Suleja

Appendix ii



QuickBird Satellite imagery of Kurimi Sarki

Appendix iii



QuickBird Satellite imagery of Chechenia

Appendix iv



QuickBird Satellite imagery of Nassarawa Bakin Iku