Volume 4, Numbers 1&2, 2020

JOURNAL OF CONTEMPORARY RESEARCH IN THE BUILT ENVIRONMENT (JOCREBE)

ISSN: 2636-4468

PUBLISHED BY
DEPARTMENT OF BUILDING
FACULTY OF ENVIRONMENTAL STUDIES
UNIVERSITY OF UYO,
P. M. B. 1017, UYO, NIGERIA

Journal of Contemporary Research in the Built Environment

Volume 4, Numbers 1&2, 2020 ISSN: 2636-4468

Journal of Contemporary Research in the Built Environment
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Editorial Objectives and Scope:
The Journal of Contemporary Research in the Built Environment (JOCREBE) is an interdisciplinary peer-reviewed journal dedicated to publishing papers which advance knowledge on the practical and theoretical developments as well as original research work in all aspects of sustainable built environment, encompassing all capital projects including buildings, civil engineering as well as repair and maintenance of sustainable infrastructures. That is the journal covers all aspects of science, technology, business and management concerned with the whole life cycle of the built environment, from the design phase through to construction, operation, performance, maintenance, conservation and its deterioration and demolition.

Frequency of Publication
The Journal publishes two issues in one volume yearly with the first issue published in March and the second in September.

Subscription and Advertisement
The subscription and advertisement rates can be obtained from the Editor-in-Chief or the Managing Editor.

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PUBLISHED BY
Department of Building
Faculty of Environmental Studies
University of Uyo, Uyo, Nigeria

Journal of Contemporary Research in the Built Environment ISSN: 2636-4468
Volume 4, Numbers 1&2, 2020 © Department of Building, University of Uyo

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Journal of Contemporary Research in the Built Environment ISSN: 2636-446
Volume 4, Numbers 1&2, 2020 © Department of Building, University of Uyo

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Journal of Contemporary Research in the Built Environment ISSN: 2636-4468
Volume 4, Numbers 1&2, 2020 © Department of Building, University of Uyo

EDITORIAL

Dubem Isaac Ikediashi
Editor-in-Chief

It is with great pleasure that I welcome you to the first and second issues of the fourth volume of the Journal of Contemporary Research in the Built Environment (JOCREBE). This volume, in line with previous editions and scope of this journal, presents multi-disciplinary perspectives on contemporary issues associated with the Built Environment. On behalf of the editorial team, I wish to appreciate our worthy contributors for well researched and articulated papers. There are nine (9) papers in this edition and are hereby summarised for you. Enjoy your reading.

The first paper by Ekanem, Opawole and Adewuyi evaluated the effects of road construction delay on cost performance and developed a model for predicting the cost performance of road projects in the Niger Delta region, Nigeria. Primary and secondary data were analysed using a descriptive method, multiple regression analysis, and Kruskal Wallis H test for the hypothesis. Secondary data were obtained from initial and final costs and durations of 136 Niger Delta Development Commission (NDDC) road projects procured between 2008 and 2018. The results revealed that the significant effects of delay on cost performance are inflation of currency/exchange rates, corruption, total abandonment, under-development, and dispute and claims/bad reputation. However the test revealed a significant variation between Delta and Cross River States and between Edo and Cross River States. According to the study, the source of variation might be attributed to frequent patronage of the same contractors and consultants, high rate inflation and fraudulent/corrupt practices in the procurement and execution of the projects.

The second paper by Olatunji, Oladinrin and Jegede examined factors influencing the use of E-procurement in the Nigerian construction industry. The mainly quantitative data were collected from construction professionals. The data were analysed using Mean Item Score (MIS) and Kruskal-Wallis H Test. The results shows that the most important risk factors influencing e-procurement in the Nigerian construction industry are safety and insecurity issues, the unreliability of technology, reduced level of personal contact, resistance to change among others. It was also established that E-procurement implementation can be expensive among construction firms in Nigeria. The factors influencing the use of E-procurement in the Nigerian construction industry include the ease of transitioning from paper to electronic systems as the most important factor influencing the adoption of e-procurement followed by availability of policies to promote e-procurement, and then by the cost of e-procurement technology.

The third paper by Ujene and Inyang provided insight into how procurement methods could influence the effectiveness of risk management practices of housing projects in Akwa Ibom State. The objectives of the study were to evaluate the effectiveness of risk management methods of traditional, direct labour, and labour only procurement methods with a view to enhancing construction projects delivery in Akwa Ibom state and Nigeria

in general. A cross-sectional survey approach was used for the study. Ninety-nine (99) questionnaires were retrieved from purposively selected contractors operating in the study area. Data collected were analysed using mean item score and Kruskal Wallis was used to test the hypotheses. The results indicate that Consulting with experts, past experience and brainstorming were the most moderate effective risk identification techniques employed by the respondents across the three procurement methods while risk analysis was rarely done. Risk response techniques shows 93.75% moderate effectiveness, with avoidance/prevention, transfer and mitigation were mostly employed, while risk retention was never used. Risk assessment was ineffective, while risk monitoring was of moderate effectiveness. Furthermore, the findings revealed that there is no significant variation in the level of effectiveness of risk management methods among risk identification, response, monitoring among the delivery systems, but a significant variation in risk assessment. The study concluded that there is a general lack of knowledge of structured risk management practice by the respondents in housing projects.

The fourth paper by Adeogun, Yusuf, Bako, and Akinsola assessed the effect of urbanization on vegetation cover in the Minna metropolis, Niger State, Nigeria. The remote sensing Quick Bird satellite images of Minna for the year 2010, 2015 and 2020 were used to obtained land use information change. Remote Sensing Data Image (RSDI) was processed using GIS Arc Map 10.1 for digitization and calculation of built up areas and the land use change. Two neighbourhoods were chosen for examination and analysis, Tayi village neighbourhood and old Advanced Teachers' College (ATC) layout; presently called Zarumai New Extension Neighbourhood, all in Minna, Nigeria. The results indicated that study areas have grown double between 2010 and 2020, while speedy urban development due to population increase led to massive de-vegetation. It was also discovered by the study that as at 2010, the built-up area in Tayi was 20%, but by 2020, built up area has increased to 46%. Besides, the old ATC in 2010 was 30.8% but as at 2020 the built-up area has grown to 82.8%.

The fifth paper by Inyang and Ujene provided insights into how several factors influence the effectiveness of risk management practices of housing projects procured by traditional, direct labour and, labour only methods with a view to enhancing construction projects delivery in Akwa Ibom State. A cross-sectional survey approach was used for the study in which ninety-nine (99) copies of questionnaire were retrieved from purposively selected representatives of construction firms operating in the study area. Twenty-five factors were identified from literature and presented for respondents' assessment. Data collected were analysed using relative influence index, while Kruskal Wallis was used to test the hypothesis. Findings from the study established that the five most important factors influencing the effectiveness of risks management in traditional, direct labour and labour-only procurement methods are; timing, environmental factors, funds allocation for risk exercise, complexity and top management support. The result also shows that 4.0% of the whole factors has very high influence, 60% have high influence, while 36% of the evaluated factors have moderate influence on the effectiveness of the procurement methods, with all the methods exhibiting similar influence. The study recommended that advanced formal and informal training in risk management and prioritization of the control of the factors influencing their effectiveness should be regularly conducted among the stakeholders involved in the delivery of housing projects in the study area.

The sixth paper by Umoren and Essien assessed the city centre redevelopment of Ikot Ekpene Urban and its socio-economic implications. The study covered core area of about 14,000 m^2 and expanded area of about 3 km^2 from the city centre. A sample size of 400 respondents was taken from the projected population of the study area by the application

of Taro Yamane sample size technique. A total of 400 questionnaires was administered using both simple random and purposive sampling technique to respondents in the study area. The result revealed that there is a positive relationship. The RSI indicated that 75.75% respondents were satisfied with the redevelopment project in the city centre, 17.17% partially satisfied and 7.08% were not satisfied with the redevelopment project. The study revealed the redevelopment of the city centre therefore represent a strong revitalization strategy in an overall land use planning. The study therefore recommended the introduction of the concept of pedestrianisation, disembarkation point and a lot more which will lead to a total transformation of the study area.

The seventh paper by Asuquo, Oladokun, and Adelakun investigated the concept of the fourth industrial revolution and digitalisation within the Nigeria construction industry from the construction firm's perspective. The study adopted a qualitative research approach through the interview carried out among eight case companies in Abuja, Nigeria. Thematic analysis using conversational model was used in analysing the data generated. The study revealed that fourth industrial revolution systems and processes such as: RFID, BIM, and cloud computing have 87.5% level of adoption; internet of things witness 100% level of adoption; drones with 75% level of adoption and Big data witness 62.5% level of adoption. However, augmented reality, robots and 3D printing have 37.5%; 12.5% and 0% level of adoption respectively, indicating a low level of adoption of the systems and processes that constitute fourth industrial revolution. The study concluded that the adoption of the fourth industrial revolution and digitalisation in the construction industry has started but its full adoption has been slow and foreign construction firms have adopted more of the systems and processes of the fourth industrial revolution when compared to indigenous construction firms.

The eight paper was carried out by Allu-Kangkum and Chong and contextualised the "draw in order to see" innovative reformation in the Nigerian sustainable architectural education. The recent 12 points/Ways identified to Reform Architectural Education by Hewitt's book titled "Draw in order to see" were adopted by the study in addition to a review of other related literature to form the theoretical underpins. Also, perceptions were collated through hard copy questionnaire and monkey online survey amongst architects within Nigeria in December 2020. A total of 129 responded but only 123 completed the survey questions. Findings suggest that history, site visits, collaborations and abstract critical thinking remain very relevant. Whilst virtual representations of designed environment are opined to be necessary to the architectural education in the Nigerian context.

The last paper by Ujene and Otali examined the extent to which some factors influence the effectiveness of inventory management, as well as the level to which the inventory management affect the performance of firms operating in the construction industry in south-south, Nigeria. Data for the study were collected from 204 small and 46 medium construction industry firms selected using stratified purposive sampling techniques. The relationships and hypothesis proposed in the conceptual framework were tested using structural equation modelling (SEM). Finding from the study shows that the identified factors have positive relationship with the efficiency of inventory management techniques. Besides, it was discovered that a positive relationship exists between efficient inventory management techniques and construction industry firms' performance in terms of time, cost, quality and profitability, while an indirect positive relationship also exists between the identified influencing factors and the construction industry firms' performance.

Journal of Contemporary Research in the Built Environment ISSN: 2636-4468
Volume 4, Numbers 1&2, 2020 © Department of Building, University of Uyo

EVALUATING THE EFFECTS OF URBANIZATION ON VEGETATION IN MINNA METROPOLIS: GIS APPROACH

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ABSTRACT

Purpose: The growth of urban areas is one of the major factors that leads to cutback of vegetation. This paper is set to assess the effect of urbanization on vegetation cover in the Minna metropolis, Niger State, Nigeria.

Design/Methodology/Approach: The remote sensing Quick Bird satellite images of Minna for the year 2010, 2015 and 2020 were used to obtained land use information change. Remote Sensing Data Image (RSDI) was processed using GIS Arc Map 10.1 for digitization and calculation of built up areas and the land use change. Two neighborhoods were chosen for examination and analysis, Tayi village neighborhood and old Advanced Teachers' College (ATC) layout; presently called Zarumai New Extension Neighborhood, all in Minna, Nigeria.

Findings: It was found that study areas have grown double between 2010 and 2020, speedy urban development due to population increase led to massive de-vegetation, as at 2010 the built-up area in Tayi was 20%, but by 2020 built up area has increased to 46% while in old ATC in 2010 was 30.8% but as at 2020 the built-up area has grown to 82.8%.

Research limitation/implications: In evaluating the influence of urbanization on vegetation in the study areas, selected neighborhoods were examined by segmenting eleven years into two at the interval of six years and five years, that is, 2010 to 2015 and 2016 to 2020 respectively. Therefore, the gradual effect of urbanization on vegetation was examined from 2010 to 2020.

Originality and Value: The study revealed that, the method of land acquisition is through customary and informal purchase, less concentration was given to open space development and management and the relationship between built up areas and vegetation cover was opposite, as built-up areas enlarged, the vegetation covers decreased.

Keywords: GIS; remote sensing; satellite image; urbanisation; vegetation.

1. INTRODUCTION

Globally, people living in urban are more than people living in rural areas, according to 2014 World Record, about 54% of the population of the world are residing in urban

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areas. The world report stated that, (30%) of the world's population was urban, and 66% per cent of the population in the world is projected to be urban by 2050. According to World Urbanization Prospects (WUP, 2014) only three countries were identified- China, India, and Nigeria overall are predictable to explain for 37% of the expected growth of the world urban population, India it is projected to add 404 million urban dwellers between 2014and 2050, 292millinoin China while Nigeria is projected to add 212 million. The challenges of urban development have been doggedly faced by developing African countries and still fight with colossal financial resources, investing in urban infrastructure, urban governance transformation, management of the urban environment, social services provision and handling the adaptation of mitigating the urbanization threats.

According to World Bank (2005) the awful conditions of built environment can be attributed to rural urban migration, uncontrolled urbanization, urban infrastructure decay, continuous economic downturn and poor housing quality. In some under-developed nations, most especially in Nigeria, there is distorted urbanization process and this has led to a problem with respect to the provision of adequate houses, basic infrastructure and amenities (Osuide and Dimuna, 2005). This has therefore contributed to numerous urban environmental problems in Nigerian cities. Several studies have shown that the problem of vegetation destruction is prevalent, it is however more severe in developing countries with Nigeria inclusive (Eric*et al,* 2010; UN, 2005; 2006; 2014; World Bank, 2008; Lawanson 2015).

The challenge of vegetation degradation in under-developed nations is due to over population in an urban setting Lawason (2015). Mostly, urban poor is most crucial, however the colossal increase of the urban population is as a result of increase in population growth rate and uncontrolled incessant rural-urban migration which have contributed to the vegetation degraded condition. Nigeria, among other developing countries in the world has highest urban growth rate which is the reason for the prevalent vegetation degradation trends and this is making Nigeria to have been experiencing the challenges of fastest rates of urbanization in the world. (Benna, and Benna, 2017).

In most developing nations of the world, unrestrained urbanization and unplanned neighborhood have been acknowledged as major problem of sustainable vegetation and urban improvement. In the 1950s and rapid urbanization growth had been identified as an outbreak in terms of vegetation degradation (Eric*et al,* 2010). Okoye (2009) further observed that "speedy urbanization and reduced economic growth have compounded the problems of vegetation degradation in the environment of Nigeria (Akinbode & Ugbomeh, 2006), hence the need to study and investigate how the vegetation has been (especially in the selected neighborhoods of the study area) influenced by urbanization in Minna metropolis.

Owolabi (2017) pointed out that as "countries continue to urbanize, westernize and civilize, the vegetation especially those in the rainforest environment will be in turn altered and degraded over time leaving the environment bare, thereby prone to environmental hazards. The influence of human activities (such as bush-burning, construction of buildings, mining, lumbering and timbering) on the environment affects the vegetation of that area".

Rapid urbanization exerts strong impact on the vegetation. Urban problems are similar to the rural poor that lack access to clean water, sanitation and adequate housing. Urban situation is compounded by overcrowding, exposure to domestic waste and urban pollution. Because of the need to meet the increasing demand and aspiration of a rapidly growing population in terms of food production, improving human settlement and

associated element to enhance living conditions led to some notable negative impacts on the vegetation in particular and the environment in general.

For instance, world report of 1990 noted that the current de-vegetation trend due to urbanization put the lives of 50 million Nigerian's into jeopardy and this trend must be checked so as to ensure sustainable development. The rapid urbanization in under-developed countries in general and Nigeria in particular has been of immense interest in the past. It is of concern however in the past, urbanization has been seen as a process of urban growth only. This is however now being replaced by a concept, which sees it as a process of social change and development. One of the purely natural phenomena that actually reduce the amount of greenhouse gases in the atmosphere is vegetation. Through the process of photosynthesis, plants draw down more carbon dioxide than anything else.

Urbanization has significant impact on vegetation and the ecosystem. When people develop cities, forests are cut, shrubs are removed and much of the ground is paved. The only vegetation left standing afterward is typically the standard urban fare of grass, loosely scattered trees, and hedgerows. The soil, which tends to be some of the most productive in a given region, is often severely degraded. Consequently, once an area has been urbanized, it is very difficult to bring the land back to its natural state.

Over the next century, urbanization is predicted to rise at a very high rate. In fact, it was estimated that worldwide the migration towards the cities has been moving at three times the rate of population growth. Only a third of the planet's population lived in urban areas 10 years ago. Now it is up to 50 percent and researchers believe that in 10 more years it will be up to two third. When you consider that the human population will grow from six billion to 10 billion over the next 50years, an enormous amount of land is likely be urbanized in a relatively short time.

Consequently, Minna as an urban area is growing horizontally and the level of urbanization has much impact on most of the vegetal cover within Minna metropolis and environs. The uncontrolled growth of Minna metropolis in the last ten to eleven years culminated into massive removal of vegetation for developmental purposes. This has led to widespread environmental problems, such as increase in urban heat, pollution, soil erosion, flooding among others. Most of the unique vegetal cover in the (study) area has vanished and high-quality agricultural lands are acquired for development. The value of urban forest and woodlands (vegetation) lies in protecting watersheds. This augments urban water supplies, reduces urban heat and reduces flood hazards. Hence the need to study the extent of urbanization on vegetation. As such, the objective of the study is to assess the trends in urbanization on vegetation cover in the study area.

2. Review of Related Literature

2.1 Urbanization

Urbanization or urban drift refers to the process by which rural areas take on urban characteristics. It is an index of transformation from traditional rural economy to modern industrial one and thus a progressive concentration of population in urban unit. (Davis, 1965)

Urbanization is also defined by the United Nations as movement of people from rural to urban areas with population growth equating to urban migration (United Nations, 2008).

The urbanization process is much more than simple population growth; it involves changes in the economic, social and political structures in a region. While the current pace of urbanization is not unique in human history, the sheer magnitude is unprecedented. Rapid urban growth is responsible for many environmental and social changes in the urban environment and its effects are strongly related to global change issues. The rapid growth of cities strains their capacities to provide essential services such as energy, education, health care, transportation, sanitation and physical security. Cities have become areas of massive sprawl, serious environmental problems and widespread poverty. The intense concentration of population, industry and energy use has led to severe local pollution and environmental degradation.

Urbanization can describe a specific condition at a set time, i.e. the proportion of total population or area in cities or towns, or the term can describe the increase of this proportion over time. The term urbanization can represent the level of urban relative to overall population, or it can represent the rate at which the urban proportion is increasing. Urbanization occurs naturally from individual and corporate efforts to reduce time and expense in commuting and transportation while improving opportunities for jobs, education, housing, and transportation (Slemp, 2012).

McDonald, Kareiva, & Forman (2008) emphasized that "Urbanization is the physical growth of urban areas as a result of rural-urban migration and even sub-urban concentration into cities, particularly, the very largest ones". Urbanization is not merely a modern phenomenon, but a rapid and historic scale, where predominantly village culture is being rapidly replaced by urban culture. Urbanization according to Varshney *et al.* (2013) can either be planned and/or referred as an organic urbanization.

Living in cities permits individuals and families to take advantage of the opportunities of nearness and accessibility, diversity and market place competition. People move into cities to seek economic opportunities. In rural areas, often on small family farms, it is difficult to improve one's standard of living beyond basic subsistence means of sustenance. Farm living is dependent on unpredictable environmental conditions, and in times of drought, flood or pestilence, suryival becomes extremely problematic. In modern times, industrialization of agriculture has negatively affected the economy of small and middle-sized farms and strongly reduced the size of the rural labor market. The most adversely affected in this regard are the urban poor, who constitute the majority in the developing countries of Africa and Asia wherein, according to a UN Report, consists of cities which now account for over 90% of the world's urban population growth (UN –Habitat, 2007).

Existing studies have shown the rate at which urban growth are increasing in most African countries including Nigeria, and the major factors for these rapid increases is relative to large-scale migration into the urban centers for employment and wealth acquisition, natural increase of the population, and lopsided concentration of investments by both governments and private organizations (Jiboye & Omoniyi, 2010).

2.1.1 Trends in urbanization

Urbanization trend may best be appreciated by examining the degree of urbanization in terms of indices such as the "proportion urban," the rate of urbanization and rate of urban population growth over a specified period of time. Cities are currently absorbing two third of the total population increase in the developing world (McMichael 2000).

Conningham, (2001) opined that, close to two billion will populate the urban areas of developing countries by the years 2010, with some 600 million of this number being added during the current decade alone. Another two billion people are expected to be added to the urban population of the developing countries between 2000 and 2025: moreover, the

majority of these new urban residents will be living in large cities. Today half of the population is located in some 360 cities of over half a million inhabitants each. In 1950, the world total urban population was 734 million, of whom 448 million were in the developed countries and 286 million in the developing countries. The share between the two changed in1980 when the developing countries made up 985 million of the world's urban population of 1.8 billion, this proportion is expected to gallop to 2.3 billion and by the year 2025 the developing countries will have 4.4 billion of the world total urban population of 5.5 billion (Carle 1997).

Estimate and projections suggest that during the 75 years from 1950-2025 the proportion of the world's urban population will have doubled, while the absolute world population will have increased nearly seven folds. It is evident that the developing countries are urbanizing faster than the developed countries. This is as a result of the rapid population growth in developing countries, which triggers demographic forces responsible for rapid urbanization (Carle 1997).

During the period 1985-1990 the growth rate of the world's urban population was 3.1 percent per year (0.8% in the developed countries and 4.5% in the developing countries.

Currently, Africa exhibits the highest urban growth rates, projected to persist up to the year 2010 and beyond. The projected scenarios are higher, but declining growth rate in the developing regions, which will contrast sharply with the already declining growth rate (expected to plummet further) in the developed world. Yet it must be stressed that the projected declines in growth rate will be occurring in the context of much larger urban populations thereby compounding urban problems of the 23 countries with the highest rate of urbanization in the range of 3.0 and 7.9% per annum. Of these 18 are in Africa alone, the rest being in Asia. Conversely of the 25 countries with lowest urbanization rates (-0.9 - .03% per annum), 10 are in Europe, nine in Asia, two in north America, two in Asia and one each in Africa and Latin America. From this account, it is evident that urbanization of further will be an Africa phenomenon, given that African cities or agglomeration are yet to reach the sizes of their Asia or Latin American counterparts (Silitshena 1996).

2.1.2 Factors influencing urbanization

According to Conningham (2001) a variety of factors have combined to influence the rapid growth of urban population. However, the factors are numerous, complex and vary in their importance from one part of the world to another. Some of the main factors include agricultural improvements, industrialization, market potential, increased service activities, transport improvement, social and cultural attraction, increased education and natural population growth.

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 productions and released labor for work in industry thereby sustaining a larger percentage of non-agricultural population.

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 multiple accordingly. Large-scale output requires large amount of labor and as output rises, the demand for labor rises also. Furthermore, with rising population, market-oriented industries are also located in such areas where labor for industries can also be found.

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

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.

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.

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.

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.

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.

2.2 Vegetation

Thus, vegetation can be defined as the plant life or the forms, structure, spatial extent or any other species botanical or geographic characteristics (Ossola, Hahs, Nash & Livesley, 2016). It is broader than the term flora which refers exclusively to species composition, but vegetation can and often does refer to a wider range of spatial scales than that term does, including scales at large as the global primeval redwood forest, coastal mangrove stands, sphagnum bogs desert soil crust roadside weed patches, wheat fields, cultivated gardens and lawns, all are encompassed by the term vegetation which literally means the earth's flora (Drillet, Fung, Leong, Sachidhanandam, Edwards, & Richards, 2020).

According to Monk-house (2004), "vegetation is defined as the living layer of flora which covers much of the land surface forming an important part of the physical environment. It is a major component of the Biosphere; the word vegetation is a broad term that is used to specify the floristic composition of the ecosystem. Vegetation is usually described by reference to its flora or floristic (species) composition and its structural characteristics. The most abundant species in any plant community which also exercises the greatest influence on the inhabitant is referred to as the dominant, while other species are secondary".

Various vegetation types provide contrasting suites of ecosystem services disservices (Delshammar, Östberg & Öxell 2015). For instance, "vegetation reduces air temperatures by up to 3.9 ◦C more than turf (Fung & Jim, 2019), furthermore, Ossola, Hahs, Nash & Livesley (2016) were of the view that vegetation types with a higher understory volume have higher soil decomposition rates. According to Lyytimäki, Petersen, Normander and

Bezák (2008) the balance of services and disservices provided by urban vegetation has a strong influence on how urban greenery is experienced, used, and valued by people".

2.3 Effect of Urbanization on Vegetation

Urbanization is increasingly homogenizing the vegetation of less developed countries. Even though urban sprawl is a worldwide problem, most studies on the effect of urbanization, and the conceptual model have focused on the developed countries. Most of the developing countries are experiencing rapid and uncontrolled growth. Pavements replace native ecosystems and buildings and what is left of the natural soil is covered with green areas dominated by non-native ornamental species. Wetland and other peri-urban ecosystems are rapidly being destroyed, fragmented or invaded by non-native species. It was found that from a study area of 32,000 hectares, there was a net loss to urbanization of 1734 hectare of wet lands (23% of original) and 1417 hectare (9%) of agricultural, forest and shrub land cover types between 1975 and 2000. (David, 2001).

The environmental associated with the clearance of native vegetation for the purpose of urbanization are significance and include:

- Loss of habitat for native plants and animals;
- Potential loss of plant species and reduction in population size of plant and animal species with an increased potential for local extinctions associated with single event such as urbanization;
- Increase salinity problems associated with the removal of deep-rooted perennial plants;
- Increase vulnerability of weed invasion;
- De-stabilization of soil, leading to wind and water erosion;
- Impact on the health of catchments;
- Changes in water flow patterns and hydrology;
- Increase greenhouse implications (removal or vegetation inhibits the absorption of carbon dioxide from the atmosphere. (Natural Management Ministerial Council 2001).

2.4 Importance of Urban Vegetation

One of the primary challenges to understanding the dynamics of the earth system is an accurate assessment of relationship between the human population and other component of the system. Recent estimate indicates that over 45% of the world's human population now lives in urban area with over 60% projected by 2030 (Beery 1983). The global rate of urbanization is expected to continue to accelerate in the near future with emergence of large urban agglomeration in developing counties (Berry, 1983).

The spatial temporal distribution of vegetation is a fundamental component of the urban/suburban environment. Vegetation influences urban environmental conditions and energy fluxes by selective reflection and absorption and by modulation of evapotranspiration (David, 993). The presence and abundance of vegetation in urban areas has long been recognized as a strong influence on energy demand and development of urban heat island (Christopher, 1997). Urban Vegetation abundance may also influence air quality and human health because trees provide abundant surface area for sequestration of particular matter and ozone.

Research has shown that properly placed trees and landscape planting can save 20 to 25 percent energy use in the home. In neighborhoods with large trees, there will be significant effect on temperature and energy use in buildings (Daine, 1996). Without the cooling and moderating effect of vegetation and green space in our urban environments, urban areas grow hotter and dryer – a heat island approximately five to ten percent of the current electric demand in cities is spent to cool buildings, just to compensate for the heat island effect. In Los Angeles, this translates to $150,000 per hour and in Washington DC, close to $40, 000 per hour during peak times. Nationally the hourly cost may be as high as $1 million (Jeremy 2006).

2.5 Conceptual Framework

The framework for this study is urbanization as the independent variable and vegetation is the dependent variable.

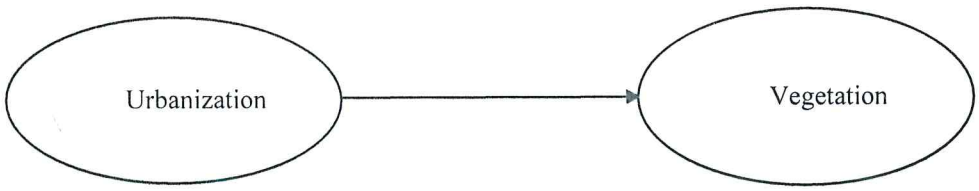

Figure 1: Framework

3. Research Methodology

3.1 Profile of the Study Area

Minna is the capital of Niger State in Nigeria. The study area lies between latitude 9°26'41N to 9°28'16N and longitude 6° 40' 12E to 6° 43' 37E on a geological base of undifferentiated basement complex of mainly gneiss and magnetite. At the North- east corridor of the town lays a continuous steep outcrop of granite, which form a limitation towards physical development in that axis. In the present political zoning system, it is within the North Central Zone, and occupies an area of about 884 hectares. It is about 145 kilometers by road from Abuja, the Federal Capital of Nigeria. The Minna metropolis has grown to engulf suburbs settlements such as Bosso, Maitunbi, Dutsen Kura, Kpakungu, Shango and Chanchaga. The city is presently widely disposed along the main spine road from Chanchaga in the south to Mainkunkele in the north, a distance of about 20 kilometers. Immediately to the north of rail tracks are the high density quarters, Sabon-Gari, and the Main market neighborhoods. Figure 2 shows a map of the study area.

3.1.1 Climatic Profile

The climate of Nigeria is characterized by distinct wet and dry season. The wet (rainy) season starts in April and ends in October, with a maximum rainfall occurring in August. Presently, Tayi and old ATC enjoys a climate typical of the middle belt zone, Guinea savannah with distinct wet and dry seasons. The rainy season starts around April and last till October; it has a mean annual rainfall of about 1334mm (52inches) with September

recording the highest rains of about 3 00mm. The mean monthly temperature is highest in March at 35°C and lowest in August at 22.3°C. The mean monthly relative humidity is highest in August at 60% and lowest in January at 19% respectively

3.1.2 Soil

The soil type is primarily the result of the interaction between climate, flora and fauna, parent materials and geomorphic factors over varying period of time. Soils are developed from Precambrian basement complex rock comprising granite, schist, genesis, and amphiboles. The soil belongs to the Minna association, which occurs on an undulating welling dissected plain, developed on deferential basement complex consisting mainly of granites rock, gneiss and schist. The surface soils are usually loamy sand to sandy loam. Most of these soils are gravely except the soils formed on colloidal materials. Drainage may be poor in areas with high clay or where the soil in shallow. The soils are moderately deep and well drained.

3.1.3 Vegetation

The vegetation of Minna consists of open savannah. The Fadamas of the larger rivers support savannah with occasional streams covered with dense riparian woodlands or forested area. The grasses are between 0.8 to 3.5m height. The trees are scattered, short brand with some up to 16.5meters height. The trees include shear butter (Bytyra Spemum Parki), locust bean (Tamarindus Indica), Baubles silk cotton and bleb palms that are common along valleys of rivers which are identified by dense growth of woodland. The composition of the vegetation and its character are often caused by variations in soil types, topography, groundwater situation and human interference.

3.1.4 Topography

The topography of Minna consists of hills and mountains especially towards eastern and western part of the area. Because of these gigantic rocks, development has been restricted towards the eastern and western parts. All developments follow the line of the rock, which was halted by flat rock out crop at the extreme north. The basic geology of the study area is a mixture of rock granites. In most of the areas, the surface is decomposed of laterite, erosion and small stream that cut deep gullies leaving the residual crops generally eaten away by natural forces, such as rain and wind

3.2 Research Methods

Field survey was conducted in this study, observation and measurement was carried out as noticed, data collected through this method include; identifying, Measurement, Mapping and calculation of built-up areas and open spaces (vegetation) on new developed areas, two neighborhoods faced with rapid development as a result of urbanization in Minna, Nigerian were considered for this study. Following Jenerette and Potere (2010) and Liu, Yang, Tian, Zhang, Bo and Gu (2014) remote sensing Quick Bird satellite images of Minna for the year 2010, 2015 and 2020 were used to obtained land use information change. Remote Sensing data image was processed using GIS Arc Map 10.1 for digitization and calculation of built up areas and the land use change. Digital processing of data was being done using MS Excel computer software for cross tabulation, simple correlation and plotting of chart to show the trends in the in urbanization and its negative impact on the environment.

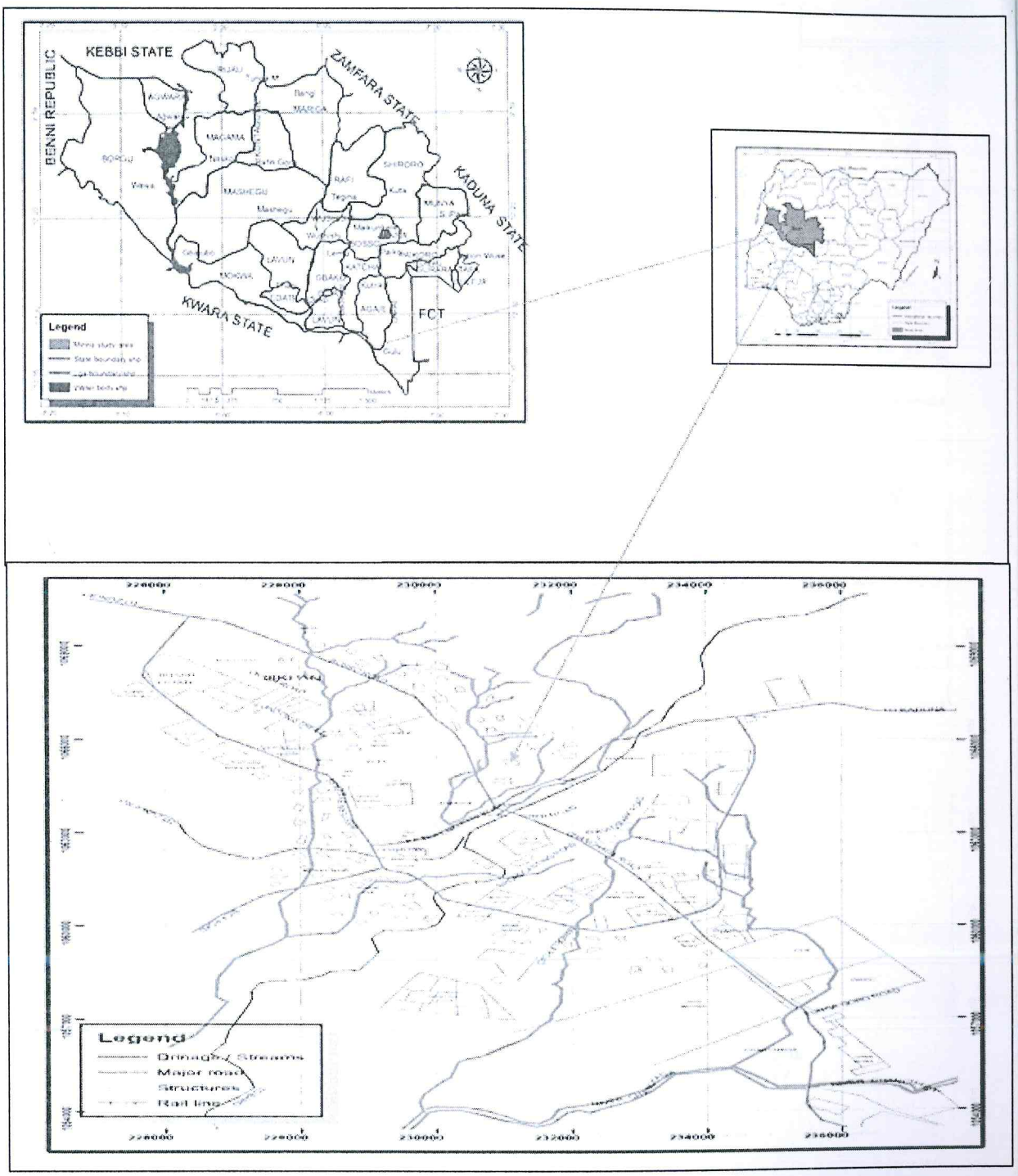

Figure 2: Minna Township Map
Source: DataNET Cartographic Consult Minna, 2019

4. Data Analysis, Results and Discussion of Findings

The data is obtained using the Quick Bird satellite image to identify the land use change as presented below:

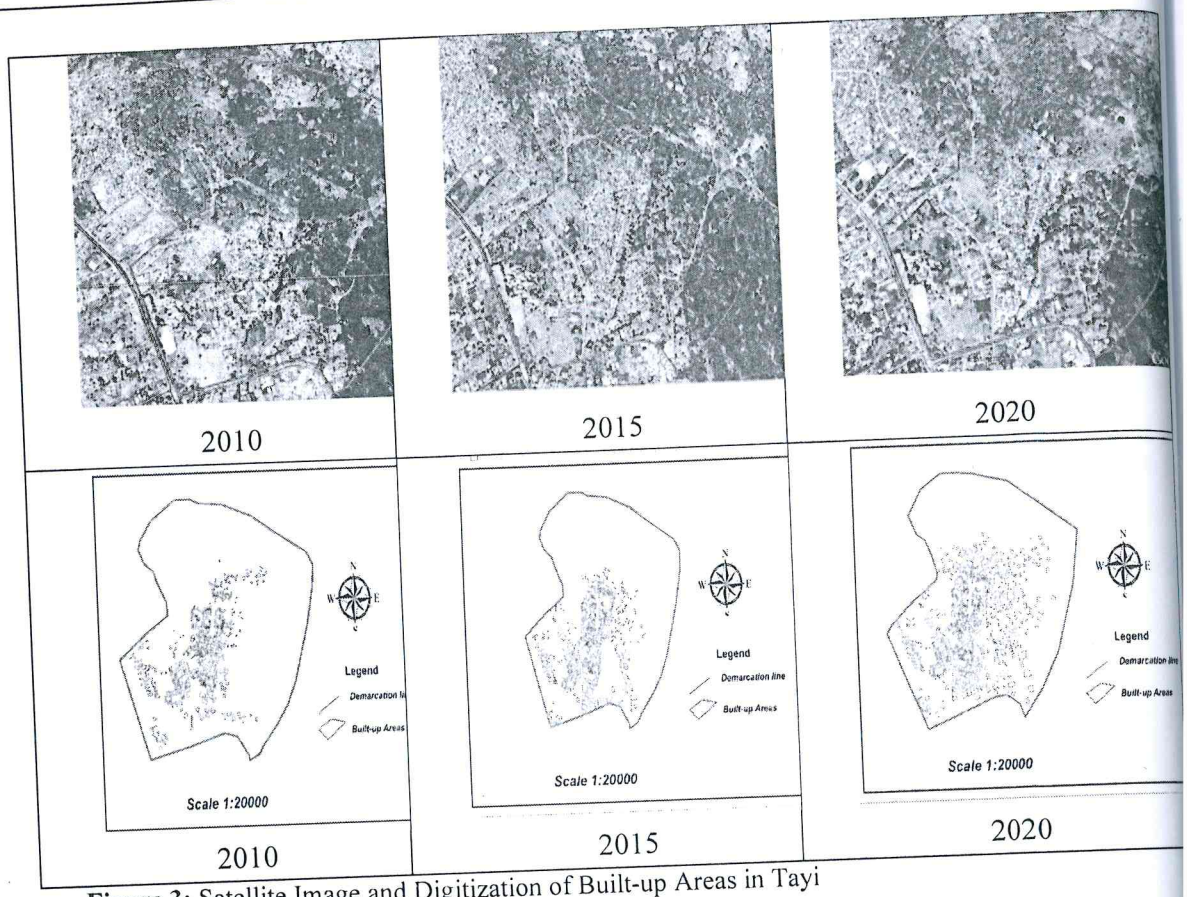

Figure 3: Satellite Image and Digitization of Built-up Areas in Tayi

Figure3 above shows the satellite imagery of Tayi neighborhood and digitization of built-up areas. It was discovered that, as at 2010 the development was not enormous but rapid development of built up areas started in 2015, and it was indicated selected neighborhoods experienced sporadic and high urbanization in 2020 and this led to massive destruction of the vegetation in the study area.

Figure 4 below is the satellite imagery and digitization of the effect of extent of urbanization on vegetation in the study area over the years under study. As at 2010 there were few developments, by 2015 the development was on the increase as a result of population and socio-economic activities. In 2020 virtually, the area was almost developed without considering vegetation.

Table 1: Trends (in percentage) of built-up Areas (urbanization) between 2010,2015 and 2020

YEAR	TAYI BUILT-UP AREA/HECTARE	PERCENTAGE (%)	OLD ATC BUILT - UP AREA /HECTARE	PERCENTAGE (%)
2010	50,749	20	14,695	30.8
2015	88,723	35	26,400	55.5
2020	116,395	46	39,400	82.7

Table 1 above shows the trend of built-up areas per hectare and percentage as at 2010, 2015 and 2020.



Figure 4: Satellite Imagery and Digitization of Built-up Areas at old ATC

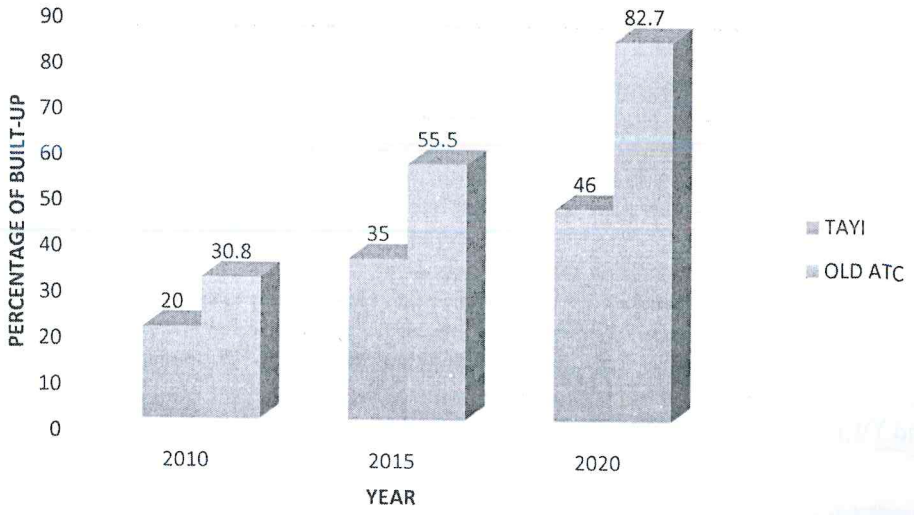

Figure 5: Chart showing the trend of built up areas.

Figure 5 above is a chart indicating the trend of urbanization in the selected areas of Minna metropolis. The study discovered it that, as the years go by, more areas are being developed and the natural vegetation is destroyed without consideration for re-vegetation.

4.1 Summary of Findings

The following findings are obvious from the study carried out: The study area has grown twice within eleven years under study, that is, between 2010 – 2020 and this indicates rapid urban development due to population increase and has led to massive de-vegetation in the study area.

It was also discovered that, mode and method of land acquisition in the selected neighborhoods of the study area are through customary and informal purchase. Also, adequate attention has not been given to open space development in the study area.

There is inadequate intervention by the communities and the government in arresting the de-vegetation problem, no adequate measure on replanting of trees, re-vegetating and creation of enabling environment for green area development. The effects of both the communities and government are not being felt on the above listed areas to the environment from de-vegetation.

The study found out that, urban expansion is responsible for vegetation change in the study area and there is inverse relationship between built up area and vegetation cover. As built-up area increases, the vegetation covers declines.

4.2 Discussion of Results and Findings

The growth of Minna has been rapid over the last two decades. This is reflected not only in population but also in built up area development, which affect vegetation changes over the years. These changes are better appreciated with in residential neighborhoods Hence two neighborhoods have been chosen for further examination and analysis. These are Tayi village and old ATC layout all in Minna, Niger State, Nigeria. Changes are observed between 2010- 2020. These neighborhoods were mapped out using Quick Bird satellite images, digitized and calculated the built up.

It was found that vegetation covers at Abattoir Tayi village by 2010, the neighborhood was small with only small built up areas, few roads and large open space (vegetation cover). The total land area of the neighborhood was 252,000 hectares then the built-up areas was only 50,749 hectares or 20%. But as shown in figure1 vegetation changes in abattoir Tayi village as at 2015, the built-up area was 88,723 hectares representing 35%. The area has been redefined and the growth of the area was high, residential and commercial layout was prepared, road network, the built-up area as of2020 became 116,395 hectares (46%) and the open space or vegetation in the neighborhood was destroyed as a result of urbanization this is consistent with the study of (Qiu, Song, & Li, (2017) and Chao & Zhang, (2014).

The study also revealed that old ATC layout as at 2010, the neighborhood was vegetated with few roads and scattered built up area. The total area demarcation was 47.600 hectares. The built-up area then was 14.695 hectares or 30.8%. But by 2015 the built-up area has been increased leading to a reduction in vegetal cover. As can be seen in figure2. By 2020 the built-up area was 39,400 hectares or 82.7.5%. More land has been developed without considered the conservation of urban open space, more areas were developed and more roads were constructed within the neighborhood the built-up area was 39,400 hectares or 82.7% living vegetation with only 8,200hectares or 17.3%. The study reveals that the extent of urbanization on vegetation is high this is in line with the study of Li,Chen,Yan and Yu (2014); Li, at el (2017) and Liu et al. 2015.

4.3 Research Implications

This research has made both theoretical and practical contributions. The theoretical implication of this study is that, the framework scrutinizes relative influences of urbanization on vegetation and it provides a direction for future studies and contribution to knowledge because it demonstrates an adequate understanding of the relevant literature in the field of urban development.

The practical implication of the study is that, it will help stakeholders in urban development and management (urban developers and urban managers) in appropriate policy and decisions making regarding the urbanization. This study will in the same way help the real estate investors and professionals in built environment to understand the implications of vegetation availability and its functionality on property investment returns.

5. Conclusion and Recommendations

Series 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 without regard for sustainable development. Example of such environmental problems are: flood, urban heat island, pollution, soil erosion, drought, and desertification. These disasters have led to destruction of lives and properties.

The problems arise from the intensity of the variables as a result of urban de-vegetation, which varies with time, whether this is true of other environmental problems require further research. However other environmental problems that merit further research in the urban center include flood, soil erosion, waste disposal system, urban traffic problem which are beyond the scope of this study. It is convinced that, if all the recommendations are adhered to, the scores between urbanization and vegetation will effectively be settled.

Following the findings and conclusions from this research work, it is therefore recommended as follows: method of land acquisition should be properly checked and make it conform to the provision of the Land Use Act 1978. Recreational land use or open space development should be encouraged by both government and non-governmental organizations. Also, it is recommended that, adequate intervention measures should be put in place by the communities and government to arrest the problems, by replanting of trees and creation of green areas and development should be done considering the preservation and conservation of vegetation. Good management of parks and garden should be put in place and more green areas should be created and maintained properly especially by professional Estate Surveyor and Valuer or any qualified Facilities Manager. It is also recommended that, environmental education, awareness of good vegetative cover and enforcement of environmental legislation as a measure by both community, government and other relevant agencies in arresting the situation should be put in place.

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