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LANDSCAPE PLANNING AND SUSTAINABLE ECOLOGICAL MANAGEMENT OF NIGERIAN UNIVERSITIES: AKWA IBOM STATE UNIVERSITY EXAMPLE

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ABSTRACT*: The study was conducted in Obio Akpa Campus of Akwa Ibom State University located in Oruk Anam Local Government Area of Akwa Ibom State, Nigeria. The University campus is situated on a very beautiful physical terrain: undulating land surfaces inter spaced by a shallow valley. It has a very unique attractive appearance. However, it is this very nature of its environment that makes it highly sensitive and vulnerable to ecological hazards. Recently, the campus has experienced many new physical development projects such as construction of new class rooms, staff offices, laboratories, etc. It was observed that the land cover elements removed during the process of constructing these buildings were not replaced after the buildings completion. Consequently, the wash away effects of the heavy and frequent incidence of rainfall in this ecological zone are taking serious toll on the University environment, even posing danger of sudden collapse to some buildings. The aim of the study was to demonstrate the use of landscape planning as a tool to check further degradation of the University environment and its neighborhood. The Geographic Information System (GIS) methods were adopted to generate the data. The study has identified areas requiring very urgent landscape attention. A space view image of this section of the campus was processed and presented. Also, a model landscape design was prepared and presented. Landscaping of the surroundings of all the buildings and the entire university surroundings, provisions of paved driveways, walkways, parking areas and coordinated rain water drain channels were among the recommendations.*

KEYWORDS*:* Landscape planning, ecological management, Akwa Ibom State University, Nigeria.

INTRODUCTION

Landscape planning which is an aspect of beautification is a precondition for environmental sustainability. It is a process of articulating existing open spaces for the purpose of enhancing the quality of the environment. The articulation process may include the rehabilitation of the open spaces as well as the coordination of existing relationship between and among them (Magnus, 2005).

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According to the Webster Dictionary (2013), a typical landscape product is a picture representing natural scenery. Therefore, landscape can be depicted as the act of improving or changing the natural features or appearance of a terrain. It encompasses the techniques of making use of available landscape elements or characters in order to enhance the quality of the environment. Landscaping is therefore an innovative method of urban planning and management (Festus, 2014).

According to Oyesiku (2015), the development of an aesthetically pleasing landscape is a pre-requisite to a sustainable environment. The researcher recognizes landscape planning as a major tool in the achievement of environmental sustainability. According to the author, landscape planning helps in city development, it helps to avoid unbalanced, unhealthy and unsustainable growth of human settlements. All Nigerian University campuses can be considered as mini cities, because of the rapidly increasing population in the various campuses. The university campuses perform major functions which towns serve, such as; transportation, security, administration, finance, recreation, education, health care and religion in addition to other infrastructural facilities distributed and developed. The increasing and expansive use of the land for roads, offices, classrooms, laboratories, research farms, sport facilities, business centres, hostels, etcetera are rapidly changing the physical natural landscape of the environment of these areas. The adverse environmental effects of these developments are already well evident, requiring immediate intervention and control to ensure a sustainable development. This is the area landscaping is relevant.

Statement of the Problem

Obio Akpa Campus of Akwa Ibom State University as an example is currently experiencing massive physical development projects. This is indeed good news. Nevertheless, it is important and very necessary to draw attention to the ecological challenges already facing the physical and socio-economic environment of this university campus at this early stage of the university development in order to ensure a sustainable development.

The University Campus is located on a very beautiful physical terrain: undulating land surfaces inter spaced by a shallow valley (see Appendices I & II). Its location gives the campus a very unique attractive appearance. However, it is this very nature of its environment that makes it highly sensitive and most vulnerable to ecological hazards presented by the ongoing development projects. As an example, the land cover elements removed during the process of constructing buildings needed replacement, but were not replaced after their completion. The land cover element which would have protected the soil from the wash away effect of the heavy and frequent incidence of rain fall in our ecological zone is already taking serious toll around many newly completed buildings as shown in Appendices III, IV, V, & VI. The Information Technology Centre (ITC) building in particular is vulnerable to sudden collapse. This is because, after each incidence of rainfall, volumes of rain water usually deposit around the frontage of the building for several hours (see Appendix VII). The water, though disappears later, actually percolates into the soil on which the building stands, thus posing the danger of sudden collapse to the structure. It is the urgent desire to forestall such dangers and check further degradation of the beautiful and healthy Obio Akpa Campus environment that necessitated this study.

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Aim and Objectives of the Study

The aim of the study was to demonstrate the use of landscape planning as a sustainable ecological management tool. In order to achieve the aim, at least three objectives were laid down as followings:

1. To identify critical areas in the University campus requiring urgent landscape planning attention.
2. To generate a space view imagery of the section of the university campus requiring urgent landscape planning attention.
3. To develop a typical landscape design for the section of the university campus.

The Study Scope

Obio Akpa campus of Akwa Ibom State University (AKSU), Nigeria was selected for the study. This campus of the University is located at latitude $4^{o}58^{l}13.48^{ll}$ North and longitude $7^{o}45^{l}24.76^{ll}$ East. It is the second campus of Akwa Ibom State University after the main campus located at Ikot Akpaden, between Eket and Ikot Abasi along East-West highway in Akwa Ibom.

Obio Akpa campus of Akwa Ibom State University as shown in Figure 1 is located along Abak - Ikot Okoro Road in Oruk Anam Local Government Area of Akwa Ibom State. It has a sub-urban setting, adjoining Abak town and is within twenty minutes drive from Uyo. The campus hosts the faculties of Agriculture, Arts, and Social & Management Sciences (AKSU Students' Handbook, 2014).

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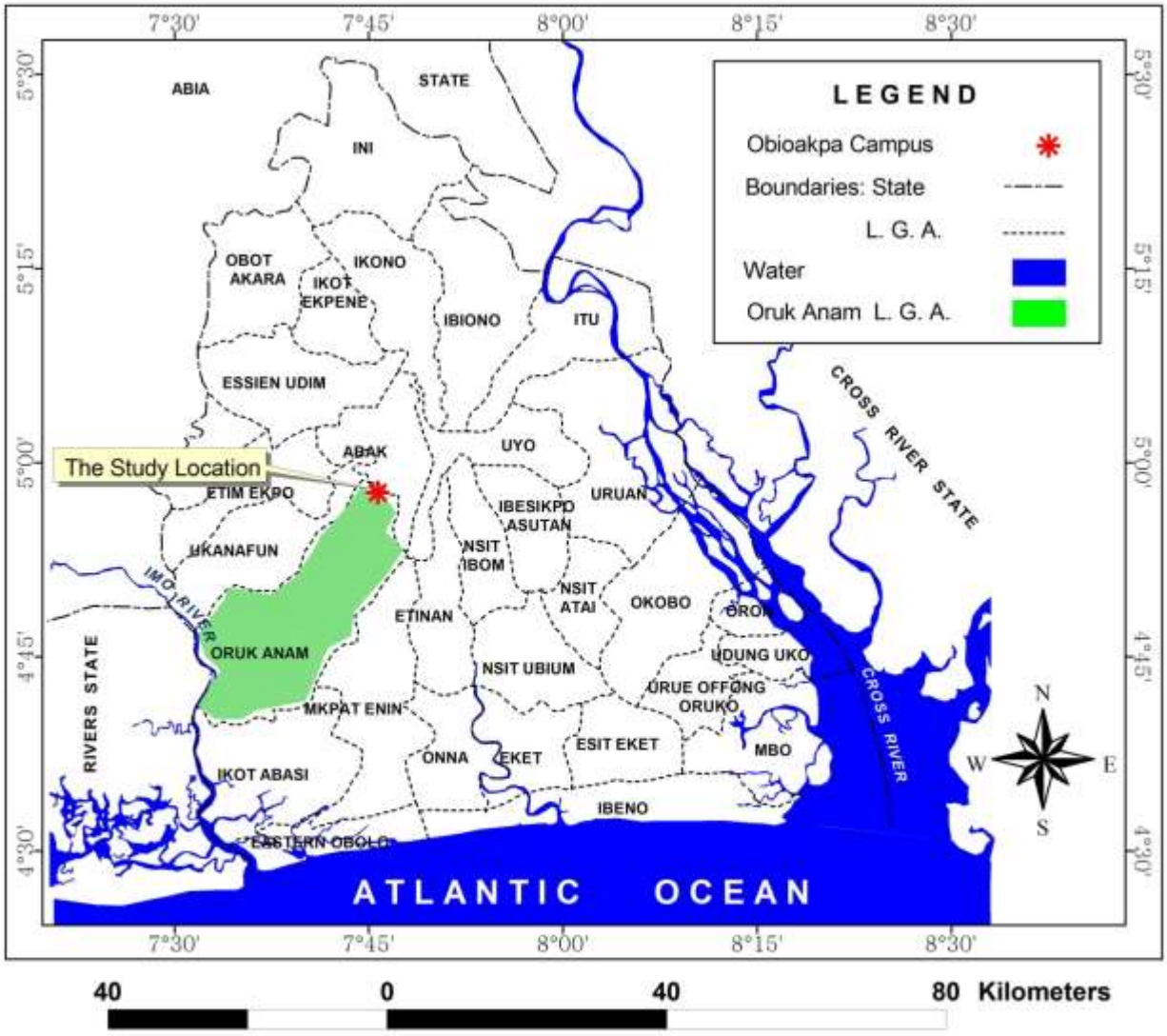

Fig. 1: The Location of AKSU, Obio Akpa Campus on the Map of Akwa Ibom State
[Source: Centre for General Studies (2017)]

Concept of Landscape ecology: The concept of landscape ecology explains the spatial relationship and functional interaction between the component patches of an extensive and heterogeneous land area, and how these bring about changes of structure and function in the ecological mosaic overtime. Thus, the emphasis is on structure, function and change. It also emphasizes inter-scale relationships between landscape, patches and organisms – integrating these into a hierarchical system and assuring that change at one level drives changes in others.

Selman (1993) advocated that landscape ecology should provide a basis for landscape planning and design. A basis for modeling future landscape is to establish clear planning objectives based on known requirements of key organism such as rare species, indicator species and pollinators. Marsh (1991) argued that the appropriate land (planning) unit should be that which satisfies the

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minimum habitat qualities and combinations necessary for the demographic and generic survival of a given species.

Daniel, Umoren & Ekanem (2016), considered vegetation as the most adaptable of the elements of the landscape and the most readily available of the materials. According to the researchers, what and where we plant, what and where we place landscape materials and by the way we control the growth, we can create the character of our landscape. Not only should the plants or materials please the eye, but planting and placement of landscape materials also give identity and meaningful realities to meaningless areas. These applications in their views, bring about not only a beautiful built environment but also a well ordered photogenic and acceptable environment.

Landscape planning

Landscaping is an innovative method of urban planning and management. In essence, landscaping encompasses the process of making use of available elements or characters in order to enhance the quality of the environment. To this end, Fatunsin (2011) defined it as the work of planning, designing, and supervising beautification works in the area usually containing a building. He opined that landscaping spaces are organized through the use of the basic principles of unity, balance, accents, focalization, scale, proportion, harmony and rhythm, variety, sequence and emphasis. He also classified the elements of landscape design under structural and plant materials. The structural materials include sculptures, rock outcrops, bricks and tiles, concrete, water fountains, walls and fences. On the other hand, the plant materials can be classified under the major groups of trees, shrubs, ground covers, palms, grasses, vines and hedges which are biological components. Our study applies elements in both classifications.

According to Bradley (2017), landscape design creates a visual representations of a site using scale dimensions. Landscape plans, according to the researcher include natural elements like flowers, trees and grasses as well as man-made elements such as lawn furnitures, fountains and sheds. Our design embraced these two elements.

From the foregoing, it can be opined that landscape applies to a portion of land (within our environment) which the eyes can comprehend in a single view towards a station. The ethics of landscaping connote the beautification of the environment. Singh (2009) views a landscape as a large area that includes one or more ecosystems. In his perception, the environment and invariably the ecosystem is something that should be taken care of and protected. Thus, landscaping according Singh (2009) is the act and process of taking care of the environment. The landscapes of care are spatial manifestations of the interplay between socio structural processes and structures that shape experiences and practice of care (Christine and Janine, 2010). The art of caring for the environment is a good method of making it sustainable.

Landscaping activities are carried out in open spaces, industrial, recreational, residential, commercial and institutional areas. In the process of landscaping of residential areas, cognizant is given to right of way, public and private spaces (which may extend to core semi-public and semi-private), service space, as well as outdoor living space. Whereas, landscaping of public areas, such as university campuses and industrial areas, preference is always given to driveways, walkways, parking, trees for shade, dividing islands of greenery, as well as boulevards.

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The term landscape planning has been used synonymously with other terminologies like landscaping and landscape design (Crowe, 1994). It refers to the functional arrangement of landscape elements or characters in order to attain efficiency, functionality, compatibility and aesthetics. It entails the human interference with the biotic and abiotic components of the environment. Hence, it is the art of tampering with the environment in order to suit man's purpose. Landscaping means the creation of an environment that is enabling, convenient and comfortable for living, working and circulation. It is on this premise that Tandy (1975) summed up the art of landscaping as the creation of a replica of paradise. That is, an environment that is full of delight, felicity and pleasure. Santra (2005) perceived landscape as a geographical and ecological integrity and resilience of a particular land area, including human, cultural

and traditional values that are associated with the land. Consequently, landscaping is the art of tampering with the environment in order to suit man's purpose. It involves the changing of natural features of the environment so as to make it more attractive. The fundamentals of landscaping include conservation, accentuation, destruction, and alteration.

In landscape planning, spaces are organized in order to create dynamic action, sensuous love, humility, pleasure, and gaiety. Essentially, landscaping deals with the protection and/or improvement upon the aesthetic value of the environment. Landscape planning is an appropriate way of conserving the biodiversity and other components of the landscape. That is why Kanagabsabai (2010) perceives landscaping as a means of maintaining a healthy, clean and pure environment. He emphasized the importance of involving people actively in the protection of the environment and the management of the natural resources. Also, from ecological point of view, Jay and Scott (2011) declared that the landscape structure affects the abundance, distribution, and interaction of organisms. Hence, he concluded that landscape planning is useful for scientists, citizens, planners, and policy makers in planning for sustainable regional development.

In landscape planning and environmental impact design, spaces are contrived in order to suit man's taste. In this process, as many characters as possible are used. These elements are classified under hard and soft impressions. Broadly speaking, they include buildings, plants, water, railings, cenotaphs, sculptures, and other art works. They are used in landscape planning and environmental impact design in order to achieve some required functions like softening, accent, shading, and framing. All these are used in putting forward proposals for future developments of the landscape. They are arranged in order to produce standardized environment (Oyesiku, 2015).

According to Festus (2014), landscape planning is not only about flowers or parks and gardens, it also deals with architecture of beauty, remodeling of houses, roads, and other engineering components of the environment. It is concerned with the seasoned wisdom of how to carefully beautify our environment with the most cheerful landscape elements. It involves the creation of breath-taking vistas with symmetric and asymmetric volumes. Landscaping encompasses the accentuation, conservation, destruction or alteration of environmental component in order to create a positive and promising artificial landscape. Appropriate landscape design makes planning proposal to be more analytical, it is used to measure minimum and maximum standards, and it indicates the need for the respect, upbringing and maintenance of environmental ethics and values.

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Landscaping, Environmental Impacts and Sustainable Development

There are always economic, physical, socio-cultural, psychological, and environmental impacts of landscaping, but they vary both in scale and intensity depending on the magnitude of landscaping projects and the elements that are used for environmental beautification. The priority areas in landscape planning and environmental management include water resources management, transport, waste management, maintenance, as well as the overall design for sustainable development. Landscaping has both negative and positive impacts on the environment. The negative impacts include deforestation, pollution (air, water, and land), as well as the modification of the ecosystem. The positive impacts of landscaping include environmental conservation, initiatives for waste management, improved concern for the condition and appearance of the built environment (John & Adeoyo, 2013). The researchers, citing many environmental impact assessment, auditing and quality control initiatives, has proved that advantages of landscaping in terms of physical, biological, social, economic, psychological and infrastructure by far outweighs its negative consequences.

Harris (2006) established that there is a significant relationship between landscape planning and environmental impact design. He opined that landscape protection is a possible way of combating the changing perspectives on the earth, as well as the associated problems like pollution, depletion of earth's protective ozone layer, deforestation, species extinction, global warming and climate change. Landscape planning is very important in order to cushion the effects of environmental hazards and risks. It affects the well being of man and his environment. It also affects the psychological and physical health of man.

Several authors that have used the Environmental Cost Benefit Analysis (ECBA) to evaluate landscaping projects have discovered the potential gains resulting from landscaping that have outweighed the capital cost of such projects (Howard; 1946; Jellicore and Jelicoe, 1971; Rapuanco, 1984; Goldfinger, 1991; Aherm, 1995 and Countryside Agency, 2002). According to the researchers, landscaping projects have caused tremendous improvements on transport networks, deteriorated urban structures, as well as decayed buildings. In developed countries, landscape planning and environmental impact design go hand in hand with the provision of basic amenities like parking areas, external lighting, street furniture and utilities, sanitation and engineering services like water supply, sewerage and sewage treatment, refuse disposal, electricity supplies, communication system and underground utilities. Given the importance of landscaping to the society, it is not surprising that the need to incorporate landscape consideration into environmental decision-making has been recognized for some time. It has however grown in importance as the emphasis on sustainability has increased (Countryside Agency, 2002). Landscaping helps in the reduction of urban heat island, green house effect, pollution, thermal stress, and other environmental hazards, enhances people's comfort through improved environment quality and is a catalyst to sustainable environment and development (Ogunsote and Prucnal, 2004).

The Concept of Sustainability

Sustainable development is the capacity to improve the quality of human life while living within the carrying capacity of supporting ecosystems. The aim of development is to improve the quality of human life. Therefore, development is real only if it makes lives better in all respects.

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Sustainable development must balance the needs of society, the economy and the environment (Ivbijaro, 2013).

The most comprehensive and probably the most commonly used definition of sustainable development was given by the World Commission on Environment and Development (1987) as that which meets the needs of the present without compromising the ability of future generations to meet their own needs. This definition makes sustainable development to be relevant in all sectors of the economy-social, cultural, economic, environmental, industrial, institutional, recreational, and agriculture. This study demonstrates with a landscape design model, the sustainable ecological management of Obio Akpa campus of Akwa Ibom State University – the process of restoring, upholding, supporting, keeping up or maintaining the healthy state of all elements of the campus environmental (the land, the scenery, the fauna and the flora) in a manner that does not eliminate or degrade any aspect of them.

METHODS AND MATERIALS

Satellite Imagery of the study area was obtained from the Google Earth Company using "Google Earth" software version 5.0.11337.1968. The Image is dated 1/13/2014. Ground confirmations were carried out using the Garmin Global Positioning System (GPS) 72 H model. The imagery was geo-referenced using Geographic Tie-point coordinate approach in the "Integrated Land and Water Information System (ILWIS) environment. The geo-referenced image was thereafter exported to the Arc View 3.2 Extensions environment where the rest of the project tasks were done. The demonstration site layout data were obtained from direct measurement and observation methods. The Information Technology Centre (ITC) and Education Trust Fund (ETF) Office Block were selected and included in the model plan.

The process of generating digital data for the study included the following:

1. Head-up screen digitizing.
2. Creation of Feature themes
3. Creation of Attribute Tables.
4. Adding of Data fields etc.

The satellite imagery of Obio Akpa campuses was obtained in the Department of Geography and Regional Planning, University of Uyo. The map was scanned and imported into ILWIS 5.2 Academic software environment. It was in this environment that the map was geo-referenced using the universal Transverse Mecator (UTM) coordinate system. 'ILWIS Tiepoint' geo-referencing approach was selected and used. After geo-referencing, the raster map layout was exported to ArcView GIS software environment where the rest of the plan design and layout were done.

Planning Space Standards

The recommended parking Space area for public establishment in Nigeria of 400 square feet (37.16 square meters) to a car was applied in the study (Obateru, 2005).

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THE RESULTS AND DISCUSSION OF FINDINGS

The study has identified the Information Technology Centre (ITC) Building, the Faculty of Arts Block and Education Trust Fund Lecture Hall as buildings requiring urgent landscape planning attention. At the ITC building for example, after each incident of rain fall, a large pool of water usually deposits around its frontage for several hours after the rain had stopped. Also, the soil elements around the building are gradually eroding exposing the foundation. The building is thus rendered most vulnerable to sudden collapse. A space view image was generated showing this section of the University campus and it is presented in Figure three. This also formed the basis upon which the model landscape design was prepared. The landscape design model developed in the study is shown in **Figure two**. The landscape elements included in the model were; buildings, open stone interlock spaces, green spaces, parking spaces, drive-ways, and walk-ways. The model design covers a total area of 3597.37 square metres of the university land. The land areas allocated to the various elements are shown in **Table 1**. The parking spaces shall accommodate a minimum of 17 cars. In the green spaces, there are provisions for a minimum of 21 shade trees and multiple shrubs which should be native trees and shrubs to provide fruits and serenity. They would also provide sit out areas to the students, staff and visitors to spend their free and break hours. Concrete drain channels are proposed in the design to drain rain water during the rainy months gently down to the natural stream system of the area through existing valley opposite the demonstration site. As mentioned earlier, the campus is located on an undulating land surfaces inter spaced by a shallow valley which gives the campus a very unique attractive appearance. But, it is this very nature of environment that makes the campus highly sensitive and most vulnerable to ecological hazards such as gully. Therefore, the model design ensures that no open space of land is allowed bare. All open spaces are either covered with grasses or solid surfaces (concrete surface or stone interlocked surface). This protects the soil from erosion that could lead to the development of gully in this type of environment.

This innovation as opined by Fatunsin (2011) makes use of the existing available elements as shown on the space imagery in **Figure 3** such as the roads and buildings in combinations with plant materials such as trees, shrubs and grasses to enhance the quality of the environment. The functional arrangement of the landscape elements when implemented will bring about efficiency, functionality, compatibility and aesthetics (Crowe, 1994). The implementation of the proposal will create an environment that is enabling, convenient and comfortable working and circulation, an environment that is full of delight, felicity and pleasure (Santra, 2005).

The provision of parking areas and their locations achieve multiple benefits which include the protection and conservation of the green areas. Also, parked vehicles are in constant view of the owners as the parks are located amid the two office blocks, thus the safety and security levels of vehicles are enhanced. This is in accordance with the opinion of Festus (2014) that environmental quality initiatives should prove that the advantages of the physical, biological, social, economic, psychological and infrastructure outweigh any negative consequences.

The landscape planning initiative presented in this study provides the process of restoring, upholding, supporting, keeping up and maintaining the healthy state of all elements of the campus

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environment which include the land, the scenery, the fauna and flora in the manner that does not eliminate or degrade any aspect of them. It is therefore a sustainable development initiative for it provides people with better life without sacrificing or depleting resources or causing environmental impacts that will undercut the ability of future generations to meet their needs. It bestows the opportunity to use the environment resources in perpetuity of existence (Gabriala and Ronnie, 2009).

Fig. 2: Model Landscape Design for a Section of the Faculty of Social and Management Sciences, Obio Akpa Campus, AKSU
SCALE 1:250. Source: Author's Ingenuity (2016)

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Table 1: Space Distribution Table

S/N	LANDSCAPE ELEMENT	LAND AREA(m^2)	PERCENTAGE
1.	Built Areas	824.49	26.59
2.	Green Areas	1068.62	34.47
3.	Drive way	806.45	26.01
4.	Parking Area	293.22	09.46
5.	Walk Way	107.62	03.47
Total		3100.40	100.00

Source: Author's Ingenuity (2016)

Fig. 3: The Landscape Design Area on the Satellite Imagery of a Section of Obio Akpa Campus, Akwa Ibom State University
Source: Google Earth (2014).

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CONCLUSION

The landscape model was designed to support environmental, social and economic sustainability. It is a model development demonstrating sustainable practices in this design, construction, operation and maintenance. It is intended to provide recreational, educational and cultural amenity for members of the university community as well as neighbours and visitors.

The researchers commend the university management for the massive physical development projects going on in Obio Akpa Campus of the university. Nevertheless, this paper has drawn the attention of the University Management to the ecological challenges facing the physical and socio-economic environment of Obio Akpa Campus of the University at this early stage The study has proposed a landscape model and made other recommendations that if adopted and implemented will save the university from future environmental calamity.

Recommendations

1. The land cover removed during the process of constructing a building should be replaced immediately after its completion. This will protect the soil from the wash away effect of the heavy and frequent incidence of rain fall in our ecological zone
2. In order to check further degradation of the beautiful and healthy Obio Akpa Campus environment the following actions should be taken as a matter of urgency on the University campus:

(a) Landscaping of the surroundings of all the buildings and the entire surrounding of the campus.
(b) Discourage parking of vehicles in the green areas of the campus.
(c) Discourage walking across the green areas of the campus which has been imposed by the university management.
(d) Provide additional paved parking spaces.
(e) Provide paved drive ways and walk ways around the campus.
(f) Provide coordinated rain water concrete drain channels.

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APPENDICES

Appendix I: A Section of the Physical Scenery of Obio Akpa Campus

Source: Authors' Fieldwork (2015)

Appendix II: A Section of the Physical Scenery of Obio Akpa Campus

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Source: Authors' Fieldwork (2015)

Appendix III: A Surrounding of the 2011/2012 ITC Building Requiring Urgent Replacement of Removed Land Cover

Source: Authors' Fieldwork (2015)

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Appendix IV: A Surrounding of the 2011/2012 ETF Lecture Hall Requiring Urgent Replacement of Removed Land Cover

Source: Authors' Fieldwork (2015)

Appendix V: A Surrounding of the 2011/2012 ETF Lecture Hall Requiring Urgent Replacement of Removed Land Cover

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Source: Authors' Fieldwork (2015)

Appendix VI: A Dangerous Sign of Environmental Degradation on the Campus

Source: Authors' Fieldwork (2015)

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Appendix VII: Rain Water Deposit around the 2011/2012 ITC Building

Source: Authors' Fieldwork (2016)

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