

UNIVERSITY OF PORT HARCOURT

**TRANSITING UNHABITABLE HABITATS TO
SUSTAINABLE SMART URBANS:
*The Place of Geospatial Mapping and Technologies***

An Inaugural Lecture

By

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DEDICATION

All to the glory of God,
in whom I have moved, and lived and had my being.

ACKNOWLEDGEMENTS

*O Lord, thou art my God, I will exalt you,
I will praise your name.
For thou has done wonderful things, thy
counsel of old are faithfulness and true.
(Isai.25:1).*

My life story begin and end with unquantifiable gratitude and thanks to the LORD, the awesomely awesome God, the immortal, invincible and the only wise God, in whom I have lived and moved and had my being. I have always found strength and courage to continue trusting Him in the midst of all the thick and thin that I have to pass through in my career path this 27 years here in this university. Who is that man that questions God's faithfulness? Let him come to me and learn from my testimonies of how and why the faithfulness of God unto me has been and will ever remain my confidence and strength. To God be all the glory and praise.

The Vice Chancellor sir, kindly permit me to spend few minutes to acknowledge some persons who have played very significant roles at different junctions of my life journey, which has helped to shape my life and career. This I must begin with you our 8th Vice Chancellor, Prof. N.E.S. Lale, for being the one to harvest my ascendance to the rank of a professor in your tenure. I am equally grateful to your wife for her kind words of encouragement in those days of 'waiting' that turned to months and later to years while the assessment process lasted. I appreciate the Deputy Vice Chancellors, Professors R.E. Ogali and H.B. Fawehinmi for their love, the Registrar, Mrs. D.D. Otto and indeed the entire University Management for this gesture and for keeping the vision of inaugural lectures aglow in Unique Uniport.

I am deeply indebted to my late parents, Pastor Solomon Olaoluwa Obafemi and Deaconess Ruth Omoleke Obafemi, who toiled very hard to start me off on the right lane of life. They provided the atmosphere for me to aspire to be among the best. I also thank my siblings – Elder Jacob Obafemi, Mrs. Elizabeth Oluyomi, Mrs. Grace Eseyin as well as Mr. Enoch Adekunle and Margaret Obafemi (both late) - for being so wonderful in their care for me without any intention to spoil a last born. I am especially grateful to my senior brother, Elder Jacob obafemi for the sacrifices made to enable me have a sound and unbroken educational career. My gratitude also goes to Deacs. Julianah Obafemi, for her love and prayers for me.

Very early in my life, the following persons and families assisted my parents to give me a lifeline for a great future. They include the families of Overseer O.F. Aguda and Pastor S.S. Jemigbon (late), who showed particular interest in my education and spiritual well being, took me into their homes and cared for me. For all of these, I'm sincerely grateful. I appreciate P/Elder Olu Akinsanya, Deacs. Bisi Olowo, Justice Otta, Ovr. Ayo, Dr. Kola Olorunleke, Elder Ayo Dare, Barr. Femi Adegelu, Elder Joshua Samuel and Mr. Thomas Olaolu and their families. I'm equally grateful to Pastors John Larayetan, Gbenga Oyedapo, Tim Ogundele-Jesu, Abiodun Doherty as well as Late Pas. McJohn Olorunfemi and their families, for their prayers and encouragements in diverse ways. For my in-laws, Elder & Deacs. Folahan, Pas. Segun Folahan, Deacs. Yinka Olatunji – I say a big thank you for your love and faith in me.

May I also profoundly thank some of the academic mentors in whose footprints I stepped to excel to this level. I am grateful to late Dr. Rowland Oyegun who mentored and guided me to choose a career specialization in the final year of my first degree. While at the University of Lagos, Prof. A. Adalemo and especially Prof. O.Y. Balogun (my M.Sc. Thesis Supervisor) cultivated the academic and

professional potentials in me to spur me to be the best I should. The same goes for Prof. A. M. Adeyemo who supervised my M.Sc and PhD Theses here in this University. May Heaven remember you and your families for your guidance and love. I am sincerely grateful sirs. On my arrival at the University of Port Harcourt in 1992 to commence this journey in academics, I found love and care from these person and their families - Prof. Ademola & Oreoluwa Salau, Prof. Olatunde Ojo, Prof. Bosa & Nkechi Okoli, Prof. E.G.Akpokodje, Engr Igonibo & Josephine Igodo, and Mr. Sam Ayeni and their families. To the families of Prof. J.M. Kosemani, Dr. R. Odihirin and Elder Affia (all late), I lack words to render how grateful I am for the significant roles you played in my life. I am indeed grateful. I cannot also forget how some of my friends and brethren helped me to settle down quickly here in Port Harcourt to the extent that my siblings were wondering why I was not coming home. Many thanks to Dr. Jones & Felicia Ayuwo, Prof. Greg Awwiri, Prof. Ben Ndukwu, Prof. Ijeoma Kalu, Pastor Paul & Hannah Abraham, Pastor John & Sola Larayetan, Mr. Sunday Alabi, Evang. Joe Doole (late), just to mention a few for being such reliable friends.

I have also drawn a lot of spiritual and moral strength since I joined Our Saviour's Chapel, the Inter-denominational Protestant Chaplaincy of this University where my family and I worship. First, from the Chaplains that pastored me and then the other faithful believers and worshippers. Let me acknowledge Ven. O.S.C. Opara, Rev. Dr. W. Udoh, Rt.Rev. K.T. Francis, Ven. S.T.Nbete, Rev. F. Iduma (Late) and our current Chaplain – Rev. M. Idika and their families. I thank you for the atmosphere you created for me and my family to serve God with you and other committed brethren in MCF, WCF and RYF arms of the chapel. Very equally fulfilling and spiritually edifying is my association with TACSFON, FGBMFI,

Opendoors Christian Centre, and the Uniport Monday Prayer Group brethren. God bless you all.

With every sense of humility, I wish to thank those great minds who have through their leadership and academic mentorship touched my life in one way or the other. Your counsels and timely words of encouragement have kept me focused to attain this professorial rank you have always assured me that I can. I thank Prof. S.N. Okiwelu for having so much confidence and belief in my ability to give him the most appropriate maps often requested from me. Indeed, he ensured that unless most of his PhD supervisees' maps are produced by me, only then can he affirm they have the ideal maps and illustrations for their Theses. I am equally deeply grateful for the positive impacts I gained from my interactions with the likes of Prof. N.D. Briggs, Prof. Don Baridam, Prof. O. Akaranta, Prof. Chidi Ibeh, Prof. C.U.Oyegun, Prof. Bio Nyanayo, Prof. F.D. Sikoki, Prof. O. Ekanade, Prof. T. Ologunorisa, Prof.I.M.Aprioku, Rev. Dr. W.D.Wokoma, Prof. O.Olaniran, Rt. Rev. Prof. Dapo Asaju, Prof. J.F. Olorunfemi (aka Better by Far) and Prof A.A. Ogunsanya (late), Prof. S.O. Soneye, Prof. M.Oyinloye, Barr. M. Awe, Mr. Kayode Fagbemi, Dr.O.S.Eludoyin, Dr.M.Ogoro, Mr.&Mrs.A.Odubo, Dr. P. Bariweni and many more for want of space.

To all my colleagues in the Faculty of Social Sciences and especially in the department of Geography & Environmental Management, it's being a very fruitful academic journey with you all. I thank you for your immense contributions to make me a success I have become today. To my other friends and colleagues across other faculties, whom we shared academic and consultancy experiences, I thank you all for being there for me too. I wish to greatly appreciate my students in the department of Geography and Environmental Management, our mutual interactions in class during lectures have added so much value to my teaching career here in this university. In

recent years, my involvement with the graduate programmes of the Institute of Natural Resources, Environment and Sustainable Development (INRES), the Centre for Disaster Risk Management & Development Studies (CDRMDS) and the World Bank Centre of Excellence in Oil & Field Chemicals in IPS have afforded me to meet highly intellectual and great minds, whose sound contributions and inquisitiveness in class have continued to keep me in shape academically and professionally, with increasing capacity to enable me build capacity in them. Also to all of you that I am privileged to have supervised your Theses and Dissertations, your searching questions and readiness to carry out proper research have altogether being a source of encouragement to me. I thank you all.

In the very recent times that I met and interacted with these persons, I found humility and purposeful leadership personified. First is the Surveyor General of the federation (SGoF), Surv. Ebisintei Awudu (Fnis,mni), sir, I thank you for being a great encouragement to me and for creating a more inclusive atmosphere for Surveying and Mapping professionalism and Practice in Nigeria. Next is Surv. Alabo C.D.Charles, who is the current National president of Nigeria Institution of Surveyors (NIS), sir, I thank you for the wise words you share whenever I'm with you. Dr. Halidu Shaba, Director, Strategic Space Administration, NASRDA, Abuja, as well as Surv. Okokon Essien, Fmr. Surveyor General, Akwa Ibom state, Dr. Mathew Adepoju, GEOSON National president, Surv. Winston Ayeni, Fmr. SURCON Registrar, Prof. B. Fakae, fmr Vice Chancellor, RUST, Prof. Samuel Edoumiekumo, the Vice Chancellor, Niger Delta University, Wiberforce Island, you remain precious in my heart. I thank you all.

To my professional team members in the National executive council of Nigerian Cartographic Association (NCA), and indeed every member of the association, I thank you for always believing in me

and supporting me to pilot the affairs of NCA as your National president. Permit me to mention a few like my Digital Secretary General (Dr. Bello) and the Vice - Drs. Okwori, Profs. Nsofor, Ufuah, Rilwani, Njoku and Udoh. Others are Alh. Adebimpe, Mr. Falusi, Wale, Kabara, Madam Young, Surv. Nwakama and Idri Zarman, to mention a few.

It is simply deliberate to keep the recognition and my very special thanks to my immediate family the last, having also started first with the acknowledgement of my awesome and ever faithful God. To my wife, Dr. Mrs Temidayo Obafemi and our children, Praise Olaoluwa, Peace Oluwadamilola, Paul Oluwatobi and Peter Ayodeji Obafemi, your love, understanding and invaluable support have been phenomena. You've been there to share in my pain and joy, urging me like Ron Kenoly in his song "Go ahead, go ahead..." that with God on my side, I will make it. May the good Lord continually guide you, keep you and honour you, Amen.

For the mercies of God and His evident blessings I have tasted, my prayer for you is that:

*"There shall be showers of blessing, this is the
promise of God,
There shall be seasons refereshing, sent from
the Saviour above."*

I thank you all for coming.

ORDER OF PROCEEDINGS

2:45pm. Guests are Seated

3:00pm. Academic Procession Begins

The procession shall enter the Ebitimi Banigo Auditorium, University Park, and the congregation shall stand as the procession enters the hall in the following order:

ACADEMIC OFFICER
PROFESSORS
DEANS OF FACULTIES/SCHOOLS
DEAN, SCHOOL OF GRADUATE STUDIES
PROVOST, COLLEGE OF HEALTH SCIENCES
LECTURER
REGISTRAR
DEPUTY VICE-CHANCELLOR (ACADEMIC)
DEPUTY VICE CHANCELLOR (ADMINISTRATION)
VICE CHANCELLOR

After the Vice- Chancellor has ascended the dais, the congregation shall remain standing for the University of Port Harcourt Anthem. The congregation shall thereafter resume their seats.

THE VICE-CHANCELLOR'S OPENING REMARKS

The Registrar shall rise, cap and invite the Vice-Chancellor to make the opening Remarks.

THE VICE CHANCELLOR SHALL THEN RISE, CAP AND MAKE HIS OPENING REMARKS AND RESUME HIS SEAT.

THE INAUGURAL LECTURE

The Registrar shall rise, cap, invite the Vice-Chancellor to make his opening remarks and introduce the Lecturer.

The Lecturer shall remain standing during the Introduction. The Lecturer shall step on the rostrum, cap and deliver his Inaugural Lecture. After the lectures, he shall step towards the Vice-Chancellor, cap and deliver a copy of the Inaugural Lecture to the Vice-Chancellor and resume his seat. The Vice-Chancellor shall present the document to the Registrar.

CLOSING

The Registrar shall rise, cap and invite the Vice-Chancellor to make his Closing Remarks.

THE VICE-CHANCELLOR'S CLOSING REMARKS.

The Vice-Chancellor shall then rise, cap and make his Closing Remarks. The Congregation shall rise for the University of Port Harcourt Anthem and remain standing as the Academic [Honour] Procession retreats in the following order:

VICE CHANCELLOR
DEPUTY VICE-CHANCELLOR [ADMINISTRATION]
DEPUTY VICE-CHANCELLOR [ACADEMIC]
REGISTRAR
LECTURER
PROVOST, COLLEGE OF HEALTH SCIENCES
DEAN, SCHOOL OF GRADUATE STUDIES
DEANS OF FACULTIES/SCHOOLS
PROFESSORS
ACADEMIC OFFICER

PROTOCOLS

- **The Vice—Chancellor**
- **Previous Vice—Chancellors**
- **Deputy Vice—Chancellor (Admin and Academic)**
- **Previous Deputy Vice—Chancellor**
- **Members of the Governing Council**
- **Principal Officers of the University**
- **Provost, College of Health Sciences**
- **Dean, Graduate School**
- **Dean of Faculties**
- **Directors of Institutes, Centres and Units**
- **Heads of Departments**
- **Distinguished Professors**
- **Visiting Academic and Colleagues**
- **Esteemed Administrative Staff**
- **Presidents of Professional Associations**
- **Heads of Parastatals & Captains of Industries**
- **My Cherished Family, Friends and Guests**
- **Unique Students of UNIPORT**
- **Members of the Press**
- **Distinguished Ladies and Gentlemen**

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BACKGROUND AND PREAMBLE

I count it a very rare privilege to be fulfilling destiny and Scripture today as I stand before you to deliver the 158th inaugural lecture series of this great and unique university. I owe it all to the mercies and grace freely obtained from the King of kings and the Lord of lords, who found and saved me, guided and helped me this far. In Him I have lived, moved and had my being - all because of His love for me. In the same vein, I am indeed very grateful to the Vice chancellor for granting the approval for me to be listed to deliver this inaugural lecture today.

At the onset of nurturing the idea of presenting inaugural lecture and a suitable topic to speak on, there were several topics that kept jumping out at me. But what eventually navigated me to the choice of the topic I am addressing today can be weaved around three marked impressions I had at different junctions on my journey of life. The first has to do with my early encounter in my first year as a Geography student. Next is the path and tunnel which academic (through research and teaching), professional experience and engagements had taken me through over the years. The last has to do with my recent frontiers and involvement with other professionals involved in local, regional and global campaign for a healthy, liveable, Smart and Sustainable cities.

As a greenhorn on the university campus, delighted to study Geography, one of the famous narrative and concept that fascinated me, early in my year one, was the famous traditional geographic question - *'What is Where?'* I learnt that it was the fundamental pillar of inquiry in Geography popularized by scholars like Harvey, Abler, Adams, Gould and others. I also learnt that, one of the most profound or best way to provide a fast explanation to spatial phenomena that are distributed and patterned in various complex ways, and which helps the geographer to proffer answer to the question of "Where is What located or found?" is through the use of MAPS.

In my pursuit to know more about maps - what they are, how they are made, and what they are used for, the Introduction to Cartography class provided the platform to have my inquisitiveness resolved. At this point, little did I know or realized that I was already pace setting a career for myself, with a determination to be a solution provider to the ubiquitous geographic question – What is Where? I got increasingly interested in this sojourn in mapping career when I learnt that it's the Cartographers that are trained and thus equipped to make maps, that further created the hunger for me to desire to learn Cartography. By Cartography, I am simply talking about the art, science and technology of making maps.

The third issue was based on my passion as an Urban Geographer, seeking for plausible road map for effective urban planning strategies that would make our urban centers livable and habitable. In recent times, I had to align myself with the global campaign for healthy, smart, and sustainable cities championed by the United Nations (UN) through its several organs and activities like UN-Habitat, World Urban Day and World Cities Day Celebrations, Sustainable Development Goal (SDGs) and the “Urban Thinkers Campus” network. Also involved in this global campaign is the “Economist Intelligence Unit” (EIU) through its annual Global Liveability Ranking / Livability index survey of World Most or Least Liveable cities. The primary mission of these bodies has been to create awareness and promote actions to make cities livable and habitable.

This new frontiers got me involved in following global campaigns such the New Urban AGENDA 2030 (otherwise known as Habitat-III) centered on a new paradigm tagged – “The City We Need 2.0” and the “Urban Thinkers Campus” - a World Urban Campaign project of the United Nations Human Settlements Programme, with the campaign slogan or manifesto - *“the battle for a more sustainable future will be*

won or lost in cities”. The most recent one is the Sustainable Development Goals (SDG) with Goal 11(SDG11⁺) focusing on Resilient cities. My analytical perspectives on the various reports, actions and activities of these bodies made me to ponder over the situation of our cities in Nigeria, especially on HOW and WHEN we can come out of the wood. It is however sad to note that our preparedness efforts at running along with the others on delivering sustainable, affordable, healthy, resilient and habitable habitats especially for the most vulnerable of the population is yet a mirage. This is arguably some of the last straws that quicken the decision to end my voyage in search of a suitable inaugural lecture topic I am speaking on today.

The Vice Chancellor sir, and my very distinguished audience, while I was still contemplating on how to sharpen my inaugural lecture topic and focus, I came across a story that caught my attention and really touched my heart. It was a story in which the “Springfield Habitat for Humanity” on October 3, 2017 shared during the 2017 World Habitat Day (WHD) campaign. This story goes to further reveal the reality of inadequate habitable shelter for our ever growing population. This story was demonstrated with a dramatic scenario viz:

Tonight, a family of five will huddle on tattered blankets, which are the only thing between them and a dirt floor. A mother will say a prayer that no one sneaks into her shack through its open doorway. And a father will lie awake, hoping the roof will hold out one more month and wondering how he will afford all of the other repairs his house so desperately needs. They are just a handful of the many people around the world living in inadequate housing. Without a safe place to live, they are less likely to be healthy, less likely to be educated, and less likely to be able to take advantage of

employment opportunities that could pull them out of poverty.

It is all of these issues combined that have motivated me to settle for this topic – *TRANSITING UNINHABITABLE HABITATS TO SUSTAINABLE SMART URBANS : **the Place of Geospatial Mapping and Technologies.*** I imagined this title to fit into a contemporary problem-diagonizing and solution proffering theme, with the rider (*the Place of Geospatial Mapping and Technologies*) as indispensable tools to effectively drive or power a 21st Century Smart and Sustainable City or Urban and Regional Planning initiatives. It is equally my expectation to use this lecture to x-ray the Urbanization profile in Nigeria and its attendant woes among which shelter inadequacies and deplorable conditions of the living environment most especially in our cities and urban areas have become the most culprit. The appraisal of the features and examples of the World ranking of Cities to ‘Most’ and ‘Least’ Liveable, the New Urban Agenda, and the Campaign for Sustainable, Smart and Resilient Cities in this lecture, were all intended to compare notes on where we are presently and where we should be seen to be transiting or headed, for which the use of appropriate maps and geospatial technologies could serve as veritable decision support tools for efficient planning of our cities.

INTRODUCTION

The issue of habitat and most especially the human habitat which constitute the core of this lecture has been of concern to researchers from time immemorial. The fact that the United Nations has to devote a lot of attention to it further speaks of its contemporariness. Several other institutions, organizations and even academic disciplines have had course to converge in conferences and seminars over matters of habitat. This has therefore resulted to a widened perspective of conceptualizing and defining habitat.

1.1 Habitat in Perspectives – Defined and Conceptualized

For the purpose of this lecture, we have made attempt to provide perspectives about the subject matter of a habitat. To put it very succinctly, the place where something lives is called its habitat. A **habitat** (which is a Latin word for "it inhabits") is an ecological or environmental area or location where a particular species of animal, plant or other type of organisms are found, lives or inhabits. In other words, it is the natural environment in which an organism lives, or the physical environment that surrounds (influences and is utilized by) a species population.

From this ecological or environmental point of view, it is safe to quickly cite examples of such natural habitats. For instance, God has so designed it that a live fish can only survive and enjoy livability inside water. Despite that, the condition of such water body to a great extent determines how habitable such environment will be to the fish. In the same vein, it should be noted also that different species of fishes in their known natural habitat (which is water) are to a great extent habitat or location specific.

Human habitat, which is subject matter of this lecture, simply implies the environment in which human beings exist, interact, live or dwell. Generally speaking, human habitat has been expressed in various ways and dimensions. More so, the human habitat we are looking at in this lecture is much more than just a house or place where human beings live in, but includes the physical and environmental characteristics of that location and all the conditions that make the place regarded as livable or otherwise. Human habitats

are therefore associated with numerous and complex environmental, pollution, and living condition problems for which planning and management have become indispensable.

Geographers have often considered human settlements to exist in different form, size, age, locations and in hierarchy, which they have broadly classified into two namely urban and rural settlements. These habitats are expressed in form of farmsteads, fishing ports (as in the riverine areas), hamlets, villages, towns and cities. As cities expands over time, it grows to become a metropolis, from metropolis to megapolis and then to conurbation. For most geographers, the rural habitats ranges from farmsteads, fishing ports (as in the riverine areas), hamlets to villages, while the urban habitats on the other hand includes towns and cities, metropolis, megapolis and then conurbation.

Settlement geography recognizes that in the evolution of human habitats, one thing add to another and what used to be a hamlet suddenly grows over time to become a village, a village to a town, and so on. It is also a fact that, whereas, the rural or village culture is characterized by common bloodlines, intimate relationships, and communal behavior, the urban culture is characterized by distant bloodlines, unfamiliar relations, and competitive behavior. Permit me to briefly highlight few characteristics that help to differentiate these various habitations in their hierarchy, functions and morphology.

Here in an ascending order are brief descriptions of the human habitats:

- A *hamlet*, which is arguably ranked the smallest of the human habitats has been described as a settlement with group of houses often fewer than that of a village. It is also referred to as a small settlement, with a small population which is usually under 100, in a rural area, or a component of a larger settlement or municipality. Hamlets are typically unincorporated communities with a population varying from one country to another..
- A *village* is a collection of dwelling houses, larger than a hamlet but smaller than a town. It is a clustered human

settlement or community, larger than a hamlet but smaller than a town, with a population ranging from a few hundred to a few thousand.

- A **town** is a human settlement larger than a village and smaller in size and have less functional complexities than that of the city, thus denoting an assemblage of buildings, public and private, larger than a village and having more complete and independent local governments. However, the size definition for what constitutes a "town" varies considerably in different parts of the world.
- A **city** is largely regarded as a very big town or urban center with permanent human settlement. It is a place that is larger than a town in which people live and work. The city is also a place said to be inhabited by a large population, offering and performing diverse functions which are not available in the town or village.
- A **metropolis** is formed when a city grows and engulfs its surrounding urban centres. Metropolis could therefore be described as a large city or urban area providing significant economic, political, and cultural centers for a country or region, and could assume an important hub for regional or international connections, commerce and communications.
- A **megapolis** is referred to as a very large city, an Urban complex or an urban region, especially one consisting of several large cities and suburbs adjoining each other.
- The term "**conurbation**" was first coined in 1915 by Patrick Geddes in his book *Cities in Evolution*, in which he described a conurbation as a region (a continuous stretch) comprising a number of cities, large towns, and other urban areas that, through population growth and physical expansion, have merged to form one continuous urban or industrially developed area.

1.2 The Concept of 'Urban' and 'Urbanization' and their features

The concept of 'Urban'

Having conceptualized the meaning of habit with particular attention to the human habitat, we shall equally discuss what constitute the urban or urbanized areas. Urban is one of those words that you are sure you can define until you have to do it. Hence, the definition and what constitute an urban or urbanized area and indeed the reality of what is urban are not static but are continually being changed by new conditions, thus changes from time to time and varies from place to place. In most cases, it is usual to explain the concepts in terms of the increasing quantum of their demographics and the gradual or rapid physical expansion in the land coverage or size.

An urban or urbanized area therefore simply refers to human settlement with a continuously built-up urban landscape defined by high densities of built-up infrastructures and population. With no reference to the political boundaries of the city; it may contain a central city and many contiguous towns, cities, suburbs and metropolitan areas. According to Carter (1981), the criteria frequently used in delimiting an urban area include:

- (i) Size of population
- (ii) Density of population or of housing
- (iii) Predominant type of economic activity
- (iv) Urban characteristics other than (i) to (iii) above or unspecified urban characteristics,
- (v) Administrative functions or structure, e.g. type of local government, etc.

The United Nations has recommended that countries regard all places with more than 20,000 inhabitants living close together as urban; but nations compile their statistics on the basis of many different standards. The United States and Mexico, for instance, uses "urban place" to mean any locality where more than 2,500 people live. This is however among other additional requirements regarding population size, population density, and specified urban

characteristics. In the case of Nigeria and Japan, the demographics adopted to describe the hierarchy in classifying urban areas include among other things a population of about 20,000 and 50,000 persons respectively. For other countries like Canada and New Zealand, they are places of 1,000 or more persons, while in Argentina, the criterion for urban centre is for populated centers with 2,000 or more persons. But for Peru, the criterion is based on dwellings and hence recognize a place with 100 or more dwellings as an urban centre

Urbanization

Urbanization basically refers to the gradual increase in the proportion of people living in urban areas, and the ways in which each society adapts to this change. In other words, it is the process of transformation of a population from rural to urban status, or by which towns and cities are formed and expand to become larger as more people begin to live and work in them. Hence, Brockerhoff (2000) described it as the share of country's population that lives in the urban areas. Urbanization is not merely a modern phenomenon, but a rapid and historic transformation of human society on a global scale, whereby predominantly rural culture is being rapidly replaced by predominantly urban culture.

Since urbanization can be quantified either in terms of, say, the level of urban development relative to the overall population, or as the rate at which the urban proportion of the population is increasing, hence, urbanization can be seen as a specific condition at a set time (e.g., the proportion of total population or area in cities or towns), or as an increase in that condition over time. It should be noted that urbanization can be differentiated from the term *Urban growth*. In other words, while urbanization is "the proportion of the total national population living in areas classed as urban", urban growth on the other hand refers to "the absolute number of people living in areas classed as urban".

1.3 The functions of Urban Areas

- Administrative and government functions for both public services and corporations, providing employment in the industry and public services
- Higher Educational opportunities and facilities. Offer specialist public services, such as tertiary education and health care (e.g Universities , teaching or specialist hospitals, etc.)
- Improved and available diverse Transportation choices, major transport hub or route centre
- Serves as hubs for Telecommunication and information technology services
- Recreational; pools, parks, golf courses, marinas and other tourist attractions centres, hotels and hospitality services.
- Center of Trade, Commerce and industrial - shopping centres, shop fronts, market squares., banking and other financial institutions
- Sea and Air Ports – providing cargo, cranes, containers, large ships, marinas, etc.
- Services; hospitals, police stations, government offices.
- Open spaces; car parks, playing fields, river/ mountain walks.
- Social and Religious centres and activities – dominant of places of worship and even pilgrimage such as Mecca or Jerusalem
- Serves as cultural and entertainment centre, for example offering things like cinemas, sporting attractions, shopping areas, restaurants,
- Offers in Multifunctional dimensions functions ranging from Transport, Residential, Industrial, Retail, Port, Religious, Educational, tourism and hospitality.

1.4 The Positive and Negative Creations of Urbanization and Urbanized Environment

As urban areas continue to grow in leaps and bound through the process of urbanization, the development would normally create some positive and negative effects as highlighted below.

(a) *The positive creation of urbanization*

- Urbanization brings *transformation of human society* on a global scale, whereby predominantly rural culture is being rapidly replaced by predominantly urban culture.
- *Employment opportunities* - With rising urbanization and industrialization, the urban centers remain the havens of migrant job seekers who see the cities as the place of fulfilling their hopes for new well-paid employment. In other words, it provides greater opportunities for access to the labor market, and even reduce the time and expense of commuting and transportation
- *Urban greening and landscaping* - Urbanization has equally resulted into the creation of more sustainable land use as well as creates ways to protect the biodiversity of natural ecosystems within the city. This is being achieved through different kinds of “urban greening”.
- *Sustainable city development* – This provides for the needs of people today (housing, jobs, transport etc) whilst not overusing resources, damaging the environment and putting the needs of future generations at risk. This consciousness is being promoted to keep the urban growth smart, resilient and sustainable.
- *Social and Economic benefits* - Living in an urban area or city can be beneficial in various ways in which social infrastructure and services are readily accessible. This could come inform of better education, housing and safety conditions, especially when compared with the conditions of the facilities available in the rural areas. Furthermore, conditions such as density, proximity,

diversity, and marketplace competition all constitute the positive elements of an urban environment.

- *Industry, Trade and Commerce* - The growth of an urban area can sometimes be measured by the corresponding growth in its commerce and industry. Businesses, Money, services, wealth and opportunities which provide jobs and exchange of capital, are more concentrated in urban areas. Trade or eco-tourism offered through the ports or banking systems, services of foreign money exchange and flows into a country etc, are commonly located in cities.
- *Specialist services* - With planned growth and urbanization, Cities offer a larger variety of services, including specialist health and educational services not found in rural areas. These services requires workers, resulting in more numerous and varied job opportunities, varied and high quality educational opportunities as well as the opportunity to join, develop, and seek out social communities. Since urban centres are home to such specialist services, many rural inhabitants come to the city to seek their fortune in other to alter their social position, while others come to seek specialized academic and professional programmes.
- The urban centre provides an opportunity for sustainability with the “potential to use resources more efficiently.

(b) *The negative creation of urbanization include*

- *Urban decay* – This phenomena could manifest in several ways such as Poor housing, traffic congestion, unemployment and a lack of services cause certain areas to be unattractive to live in which causes it to be deserted. Poor waste management in many urban areas continues to contribute to urban blight and poor sanitary conditions. Rise in slum areas and squatter settlement with increasing poor living environment

- *Urban sprawl and its attendant problems* - The rapid growth of housing and other infrastructural development from the city centre outwards into the suburbs often lead to urban farmland being displaced for building purposes. Surrounding villages are swallowed up which results in chaotic traffic induced by the sprawl developments.
- *Inadequate infrastructure and services* – One of the first casualty of uncontrolled urbanization is that existing social infrastructures which suddenly become inadequate.
 - ✓ Our urban centres have become known for *poor transportation services* partly due to the upsurge in vehicular activities, which soon leads to traffic jam, with more people and vehicles on the city roads.
 - ✓ *Public water supply and services* becomes poor and acute.
 - ✓ *Educational facilities* also become overstretched with overcrowded enrollment in schools, which at times could result in falling education standards.
 - ✓ *Health care delivery and services* suffers when the rate of urbanization outmatch that of the health care infrastructures. Just as the health centers becomes inadequate, the health personnel and of course the quantum of drugs and medication that is accessible to the inhabitants become increasingly inadequate. This soon impact negatively on the general health condition of the urban dweller.
- *Urban Environmental pollution effects* - The reality of the existence of urban heat islands formed when industrial and urban areas produce and retain heat has become a growing concern over the years. This has become inevitable with the growing urbanization and industrialization, coupled with rising use of fossil fuel to power the energy demands of vehicular transportation activities and the plants in the industries. Today, vehicles, factories / industrial and domestic heating and cooling units release even more heat thus resulting to cities becoming warmer than surrounding landscapes

- *Global warming, air and acoustic quality of the urban environment* - Besides the heating from global warming especially through carbon dioxide emissions, the air and acoustic qualities of the urban environment has worsened over time. The various sources of noise pollution are responsible for the seemingly high noise levels, as well as the polluted air. All of these have very negative implication on the health of urban dweller whose life expectancy continue to fall with exposure to these health and stress worsening pollutants.
- *Crime and criminality* - Of course, crime and criminality not often associated with rural living is almost a constant in the urban, with diversity of crime committed daily for which policing equally remain inadequate owing to rising urbanization. It is evident from various findings, that there is an increase of crime in urbanized areas linked to some factors such as income inequalities, and overall population size, unemployment rate, decreasing police expenditures and so on. It has also been established that the presence of crime also has the ability to produce more crime, especially in areas with less social cohesion and therefore less social control.
- In spite of the several economic benefits that the urban areas offers to its dwellers, urbanization has led to *increased cost of living of goods and services* that are connected to an urban way of life. Most times, this dramatic increase and change in costs, often price the local working class out of the market. Some are therefore forced to change their accommodation which may end up in the city ghettos out of their will.
- Other *social problems* created by urbanization include stress, insecurity and eroding of family values and ties. Gender competition in the city sometimes put some women at a disadvantage due to their unequal position in the labour market, as well as their inability to secure assets independent of male relatives and exposure to violence. Changes in social group level related to urbanization are thought to contribute to social

disintegration, disorganization and even mental health conditions. These macro factors contribute to social disparities which affect individuals by creating perceived insecurity. Research has also confirmed that certain changes in social organization due to urbanization could lead to reduced social support, increased violence, and overcrowding. It is these factors that are thought to contribute to increased stress.

2.0 HABITABILITY AND LIVEABILITY OF HABITATS

2.1 Habitability and Livability of Habitats

The issue of whether a human habitat is habitable or not is partly a function of what characteristics drives the functionality of such places especially within the context of rural or urban habitats. In all, it should be appreciated that the perceived requirements that defines a habitable place varies between rural dweller and the urban or city dwellers. Although, this lecture do not intend to drive deeper into the fundamentals that differentiate livability functionalities of rural and urban centres, we all must know that since the factors that defines the contentment levels and perspectives of rural living in the developing nations like ours are poles apart from that of city life, then, how habitable or uninhabitable a place is could depend on whether it is a rural or an urban center.

Liveability, which also used to connote “habitability” simply refers to the degree to which a place is suitable or good for living in. In other words it is a measure of how suitable, habitable or comfortable a place is for living in or how habitable an environment is (Veenhoven, 2000). It is a coinage from the adjective word, liveable, which implies fit or suitable to live in or with; " livable conditions" (Webster, 2016). Essentially, Liveability is about building stronger local communities and enhancing quality of life through action to improve the quality of local environments and the places where people live. It has also been viewed as an assessment by individuals of environmental features most relevant to their lives, as well as the degree to which resources of the place meet the needs of residents

and as satisfaction with the person–environment relationship (Biswas-Diener and Diener, 2009; van Kamp et al. 2003).

2.2. Measures of Liveability

The liveability of a place is generally measured by a number of different factors relating to quality of life. It should however be noted that people’s views about the liveability of a place often vary depending on their age, income, cultural background, lifestyle choices, values and beliefs. According to Easton *et al* (2016), the factors that influence people’s ideas on liveability can be measured in two ways namely the objective factors and subjective factors. Objective factors they noted are things that can be measured and expressed as numbers. The main examples of objectives factors include, climate, cost of housing, Environmental quality, infrastructure, safety and stability, access to health and education, etc. The subjective factors on the other hand are those personal and emotional factors that are not easily measurable by quantifying them. Such examples include personal likes or dislikes, feelings of connections to friends and family, and traditions and spiritual connections.

Each year, the results of a number of surveys are reported using a range of factors to measure the liveability of place by several organisations. Each of these organizations deploys either the objective or the subjective factors in their surveys. For instance, while the Economist Intelligence Unit (EIU), which publishes an annual list of rankings of cities based on liveability, rank cities based on a set of criteria using objective factors; Mercer and the Organisation for Economic Cooperation and Development (OECD) incorporates more subjective factors into their surveys.

(a) *The Economist Intelligence Unit (EIU) annual Global Liveability Ranking*

Since 2008, the Economist Intelligence Unit (EIU) has been carrying out assessment of cities which can be regarded as world most or least liveable. Besides the EIU, other surveys have also attempted to measure the quality of life of residents in these cities using various

parameters. For instance, the EIU publishes an annual Global Liveability Ranking, which ranks 140 cities for their urban quality of Life based on assessments of

- *stability,*
- *healthcare,*
- *culture and environment,*
- *education, and*
- *infrastructure*

In other words, each year, 140 cities were often surveyed and ranked on factors such as safety, healthcare, educational resources, and infrastructure. Other factors normally considered in the survey include the city's culture, environment, crime rates and levels of corruption. Each factor score is rated as: acceptable, tolerable, uncomfortable, undesirable or intolerable.

Specifically, the EIU Liveability survey according to Adelaide Capital City Committee – ACCC (2012) ranks 140 cities over 30 criteria in five categories:

- *Stability* (25% weighting) – prevalence of petty crime, prevalence of violent crime, threat of terror, threat of military conflict, threat of civil unrest/conflict
- *Healthcare* (20% weighting) – availability of private healthcare, quality of private healthcare, availability of public healthcare, availability of over the counter drugs, general healthcare indicators (World Bank Data – quantitative)
- *Culture & Environment* (25% weighting) – Humidity/temperature rating (quantitative), Discomfort of climate to travellers, Level of corruption (Transparency International data) Social or religious restrictions, Level of censorship, Sporting availability, Cultural availability, Food & drink, Consumer goods & services
- *Education* (10% weighting) – availability of private education, quality of private education, public education indicators (World Bank data)
- *Infrastructure* (20% weighting) – quality of road network, quality of public transport, quality of international links,

availability of good quality housing, quality of energy provision, quality of water provision, quality of telecommunications.

(b) *The Quality of life (QOL) Survey*

This is another periodic assessment of liveability similar to the first but geared towards achieving the same goal of assessing the general well-being of individuals and societies, outlining negative and positive features of life. According to Barcaccia (2013) and *Singer* (2011), *QOL* observes life satisfaction, including everything from physical health, family, education, employment, wealth, safety, security to freedom, religious beliefs, and the environment. According to Conger (2016), the ranking of cities in a given quality of live index (QLI) is impacted by how cities are selected, what data are used and how these data are organized and weighted.

It is to this extent Mr. Vice Chancellor, ladies and gentlemen, that I do believe and would also want you to know that what will make living or dwelling places or environment habitable are very specific and hence identifiable. This has been attested to by several urban studies and related surveys that have tried to provide indices that could help to measure or gauge how livable or habitable a city and an urban area could be. One of such survey was that carried out by the Public Policy Institute (PPI) in 2015 which came up with the result of a Livability Index Survey. The survey was based on seven broad categories of community livability namely:

- (i) housing,
- (ii) environment,
- (iii) neighborhood,
- (iv) health,
- (v) opportunity.
- (vi) transportation, and
- (vii) engagement,

We shall briefly examine these indices to see how the metrics of each of them contribute to habitability discuss.

(a) Housing Metrics

- *Housing accessibility in terms of Zero-step entrances*
- *Housing options in terms of Availability and access to multi-family housing*
- *Housing affordability in terms of Housing cost and the burden, as well if subsidized housing are available.*

(b) Environment Metrics

- *The environmental quality assessment in terms of Drinking Water quality: Drinking quality*
- *Air quality: Regional air quality , Near-roadway air pollution, other Local pollution induced by industrial and socio-economic activities*

(c) Neighborhood Metrics

- *The emphasis here is Proximity to destinations from where one is. This has been measured from the perspectives of accessibility in terms of Access to park, grocery stores and farmers' markets , workplace by transit and also to libraries or place of worships*
- *Proximity to Mixed-use neighborhoods for Diversity activities and even search for job vacancy of destinations*
- *The level and access to Personal safety in terms of crime rate*

(d) Health Metrics

- *This measure essentially the Healthy behaviors of the residents in terms of : Smoking prevalence, Obesity prevalence ,*
- *Access to exercise opportunities*
- *Access to health care in terms of Health care professional shortage areas , the Quality of health care, the rate of Preventable hospitalization, and over all Patient satisfaction of health care*

(e) Opportunity Metrics

- *Equal opportunity in terms of Income level inequality*
- *Available Economic opportunities,: Jobs per worker*
- *Care for the elderly in Multi-generational communities setting and age diversity*
- *Educational Opportunity in terms of access to High school and the rate of graduation*

(f) Transportation Metrics

- *Convenient transportation options in terms of Frequency of local transit service*
- *Accessibility to stations and vehicles*
- *Convenient transportation options like Walk trips and bicycling, Household transportation costs, void of Congestion*
- *Safe streets in terms of Speed limits and Crash rate*

(g) Engagement Metrics

- *Internet access in terms of brand, Broadband cost and speed*
- *Civic engagement as regards Opportunity for civic involvement, Voting rate and political participation.*
- *Social and Cultural engagements in terms of the Social involvement index, Cultural, arts, and entertainment institutions*

2.3. The World Most and Least Liveable Cities Profile and Ranking

2.3.1. Most Liveable Cities Profile and Ranking

The most liveable cities are adjudged to be the cities that rank highest in the annual Global Liveability Ranking of 140 cities when scored over 100 percent using the parameters or factors chosen for the purpose. People who live in the world's most liveable cities often have access to good health-care services (including doctors), public and private hospitals, specialist clinics and over-the-counter drugs. They also have access to a range of schools and other education facilities, such as training centres and universities. In many liveable cities, including those in Australia, education is not only compulsory; it is also free. Often, cities in Canada, the USA, Australia and Western Europe rank high for health care and education, while African cities are the lowest ranked in the world for these services.

When examining the top cities, it is apparent many are mid-sized cities in reasonably wealthy countries with relatively low population densities. These types of cities have a tendency to offer stable governments, stable economies, high levels of recreational and cultural services without high levels of crime, inconvenience and overburdened infrastructure such as roads and public transport systems. By 2018 ranking, apart from New Zealand, Seven of the top ten scoring cities are in Australia and Canada, with population densities of 2.88 and 3.40 people per sq km respectively, and all the top 10 cities posting an average score of between 95 to 98%. The possible justification for the performance of these top 10 cities is said to be a reflection of three main themes namely, their widespread availability of goods and services, low personal risk, and cities with most effective infrastructure.

Table 2.1: Profile and Characteristics of the World Most and Least Liveable Cities from 2009-2018

Top 10 in 2009	Bottom 10 in 2009	Top 10 in 2010	Bottom 10 in 2010
<ol style="list-style-type: none"> 1. Vancouver, Canada 2. Melbourne, Australia 3. Vienna, Austria 4. Toronto, Canada 5. Perth, Australia 5. Calgary, Canada 7. Helsinki, Finland 8. Geneva, 9. Sydney, Australia 10. Zurich, Switzerland 	NA	<ol style="list-style-type: none"> 1. Vancouver, Canada 2. Melbourne, Australia 3. Vienna, Austria 4. Toronto, Canada 5. Perth, Australia 6. Calgary, Canada 7. Helsinki, Finland 8. Geneva, 9. Sydney, Australia 10. Zurich, Switzerland 	NA
Top 10 in 2011	Bottom 10 in 2011	Top 10 in 2012	Bottom 10 in 2012
<ol style="list-style-type: none"> 1. Vancouver, Canada 2. Melbourne, Australia 3. Vienna, Austria 4. Toronto, Canada 5. Calgary, Canada 6. Adelaide, Australia 7. Sydney, Australia 8. Helsinki, Finland 9. Perth, Australia 10. Auckland, New Zealand 	<ol style="list-style-type: none"> 1. Damascus, Syria 2. Tehran, Iran 3. Douala, Cameroon 4. Tripoli, Libya 5. Karachi, Pakistan 6. Algiers, Algeria 7. Harare, Zimbabwe 8. Lagos, Nigeria 9. Port Moresby, PNG 10. Dhaka, Bangladesh 	<ol style="list-style-type: none"> 1. <u>Melbourne</u>, Australia 2. <u>Vienna</u>, Austria 3. <u>Vancouver</u>, Canada 4. <u>Toronto</u>, Canada 5. <u>Calgary</u>, Canada 6. <u>Adelaide</u>, Australia 7. Sydney, Australia 8. <u>Helsinki</u>, Finland 9. <u>Perth</u>, Australia 10. <u>Auckland</u>, New Zealand 	<ol style="list-style-type: none"> 1. Abidjan, Cote d'Ivoire 2. Tehran, Iran 3. Douala, Cameroon 4. Tripoli, Libya 5. Karachi, Pakistan 6. Algiers, Algeria 7. Harare, Zimbabwe 8. Lagos, Nigeria 9. Port Moresby, PNG 10. Dhaka, Bangladesh
Top 10 in 2013	Bottom 10 in 2013	Top 10 in 2014	Bottom 10 in 2014
<ol style="list-style-type: none"> 1. <u>Melbourne</u>, Australia 2. <u>Vienna</u>, Austria 3. <u>Vancouver</u>, Canada 4. <u>Toronto</u>, Canada 5. <u>Calgary</u>, Canada 6. <u>Adelaide</u>, Australia 7. Sydney, Australia 8. <u>Helsinki</u>, Finland 9. <u>Perth</u>, Australia 10. <u>Auckland</u>, New Zealand 	<ol style="list-style-type: none"> 1. Tehran, Iran 2. Douala, Cameroon 3. Tripoli, Libya 4. Karachi, Pakistan 5. Algiers, Algeria 6. Harare, Zimbabwe 7. Lagos, Nigeria 8. Port Moresby, PNG 9. Dhaka, Bangladesh 10. Damascus, Syria 	<ol style="list-style-type: none"> 1. Melbourne, Australia 2. Vienna, Austria 3. Vancouver, Canada 4. Toronto, Canada 5. Calgary, Canada 6. Adelaide, Australia 7. Sydney, Australia 8. Helsinki, Finland 9. Perth, Australia 10. Auckland, New Zealand 	<ol style="list-style-type: none"> 1. Abidjan, Cote d'Ivoire 2. Tripoli, Libya 3. Douala, Cameroon 4. Harare, Zimbabwe 5. Algiers, Algeria 6. Karachi, Pakistan 7. Lagos, Nigeria 8. Port Moresby, PNG 9. Dhaka, Bangladesh 10. Damascus, Syria

Top 10 in 2015	Bottom 10 in 2015	Top 10 in 2016	Bottom 10 in 2016
<ol style="list-style-type: none"> 1. Melbourne, Australia 2. Vienna, Austria 3. Vancouver, Canada 4. Toronto, Canada 5. Calgary, Canada 6. Adelaide, Australia 7. Sydney, Australia 8. Perth, Australia 9. Auckland, New Zealand 10. Helsinki, Finland 11. Zurich, Switzerland 	<ol style="list-style-type: none"> 1. Douala, Cameroon 2. Kiev, Ukraine 3. Harare, Zimbabwe 4. Algiers, Algeria 5. Karachi, Pakistan 6. Tripoli, Libya 7. Lagos, Nigeria 8. Port Moresby, PNG 9. Dhaka, Bangladesh 10. Damascus, Syria 	<ol style="list-style-type: none"> 1. Melbourne, Australia 2. Vienna, Austria 3. Vancouver, Canada 4. Toronto, Canada 5. Calgary, Canada 6. Adelaide, Australia 7. Sydney, Australia 8. Perth, Australia 9. Auckland, New Zealand 10. Helsinki, Finland 11. Zurich, Switzerland 	<ol style="list-style-type: none"> 1. Kiev, Ukraine 2. Douala, Cameroon 3. Harare, Zimbabwe 4. Karachi, Pakistan 5. Algiers, Algeria 6. Port Moresby, PNG 7. Dhaka, Bangladesh 8. Lagos, Nigeria 9. Tripoli, Libya 10. Damascus, Syria
Top 10 in 2017	Bottom 10 in 2017	Top 10 in 2018	Bottom 10 in 2018
<ol style="list-style-type: none"> 1. <u>Melbourne</u>, Australia 2. <u>Vienna</u>, Austria 3. <u>Vancouver</u>, Canada 4. <u>Toronto</u>, Canada 5. <u>Calgary</u>, Canada 6. <u>Adelaide</u>, Australia 7. <u>Perth</u>, Australia 8. <u>Auckland</u>, New Zealand 9. <u>Helsinki</u>, Finland 10. <u>Hamburg</u>, Germany 	<ol style="list-style-type: none"> 1. Kiev, Ukraine 2. Douala, Cameroon 3. Harare, Zimbabwe 4. Karachi, Pakistan 5. Algiers, Algeria 6. Port Moresby, PNG 7. Dhaka, Bangladesh 8. Tripoli, Libya 9. Lagos, Nigeria 10. Damascus, Syria 	<ol style="list-style-type: none"> 1. <u>Vienna</u>, Austria 2. <u>Melbourne</u>, Australia 3. <u>Osaka</u>, Japan 4. <u>Calgary</u>, Canada 5. <u>Sydney</u>, Australia 6. <u>Vancouver</u>, Canada 7. <u>Tokyo</u>, Japan 7. <u>Toronto</u>, Canada 9. <u>Copenhagen</u>, Denmark 10. <u>Adelaide</u>, Australia 	<ol style="list-style-type: none"> 1. Dakar, Senegal 2. Algiers, Algeria 3. Douala, Cameroon 4. Tripoli, Libya 5. Harare, Zimbabwe 6. Port Moresby, PNG 7. Karachi, Pakistan 8. Dhaka, Bangladesh 9. Lagos, Nigeria 10. Damascus, Syria

Source: Author's compilation from sundry sources.

Furthermore, the report of the EIU survey for the year 2018 shows that for the first time in eight years, the Australian city of Melbourne did not secure the top spot, as Vienna, the capital City of Austria,

which has been the second ranked most livable city since 2012 became the first. Other things of note in the ranking is that, Japan managed to rank two cities in the top 10, while there was not a single U.S. city that managed to be placed in the top 20. The first American city of Honolulu ranked 23rd place followed by Pittsburgh at 32. Since the inception of this EIU survey, no African city has ever come near to top ranking at all.

Vienna, the capital of Austria, usually scores highly in any survey of the world's most liveable cities. In 2015, it was rated by the Economist Intelligence Unit as the second most liveable city (and by another organisation as the city with the highest quality of living in the world). It has topped this second list for three years in a row until the 2018 global ranking when it came first and most livable city in the world. Vienna has excellent infrastructure, which has been designed to meet the changing needs of the city while ensuring sustainability. Vienna scores strongly in terms of its public transport and public housing. The city provides affordable public transport and has invested in an extensive bicycle network to keep traffic congestion in the streets low. Vienna has a large public housing system that provides high- quality housing for the majority of the Viennese population. This has kept housing affordable for everyone.

Other feature of Vienna that makes it liveable is the number of parks and other green spaces for people to enjoy. More than half the metropolitan area of Vienna is made up of these green spaces. This gives each resident of the city about 120 square metres of open space in which to socialise and exercise. This complies with standards recommended by the World Health Organization, that at least 9 square metres of open space should be available to every city dweller. Serious crime is rare and employment levels are high, creating a safe and stable environment for the city's residents

2.3. Least (Worst) Liveable Cities Profile Ranking.

Unlike the cities of Vietnam and Tokyo which ranked very high in safety and stability due to its low crime rate, high-quality health care and excellent infrastructure, Damascus the capital city of Syria lies

at the other extreme as the least or worst livable city. Having being plagued with a menacing civil war since 2011, Damascus has remain at the centre of violent civil war and as result of the war, it is left with very little infrastructure. Many hospitals, schools and shops have been bombed and many innocent people have been killed in the fighting. It is estimated that 11 million people have been killed or forced to leave Syria as refugees to escape the fighting. Such a place therefore cannot be regarded as habitable having lost its liveability. This simply explains why many of the most dangerous cities are located in war-torn countries, such as Syria, Afghanistan and Somalia where the level of personal safety is classified as intolerable. The profile and characteristics of the World Most Liveable and Least Liveable Cities for 10 years between 2009 and 2018 are highlighted in the Table 2.1.

In a nutshell, the 10 year EIU reports tabulated on Table 2.1 provides a rather interesting scenario. Cities in Canada, Australia and Western Europe rank highly, while Asia and African cities are ranked lowest in the world global ranking. For instance, the result shows that Australian cities in recent years have scored very favourably on the EIU Liveability Index. As a matter of fact, since 2012, not less than four Australian cities have been in the top 10, and ever since, the dominance of Australia and Canadian cities have been very evident.

But one would wonder why some of the great cities especially in Europe and America that we expect to be in this top ten ranking are not there. I mean cities like New York, London, Paris and Tokyo which are all prestigious hubs with a wealth of recreational activities. The probable reasons is predicated on the fact that these cities all suffer from higher levels of crime, congestion and public transport problems than would be deemed comfortable. See below how each of the top 10 most liveable cities in 2018 report scored using the five EIU ranking criteria.

Table 2.2: 2018 Ranking of World most liveable cities.**(A) The ten most liveable cities**

Country	City	Rank	Overall Rating		Culture &			
			(100=ideal)	Stability	Healthcare	Environment	Education	Infrastructure
Austria	Vienna	1	99.1	100.0	100.0	96.3	100.0	100.0
Australia	Melbourne	2	98.4	95.0	100.0	98.6	100.0	100.0
Japan	Osaka	3	97.7	100.0	100.0	93.5	100.0	96.4
Canada	Calgary	4	97.5	100.0	100.0	90.0	100.0	100.0
Australia	Sydney	5	97.4	95.0	100.0	94.4	100.0	100.0
Canada	Vancouver	6	97.3	95.0	100.0	100.0	100.0	92.9
Canada	Toronto	7	97.2	100.0	100.0	97.2	100.0	89.3
Japan	Tokyo	7	97.2	100.0	100.0	94.4	100.0	92.9
Denmark	Copenhagen	9	96.8	95.0	95.8	95.4	100.0	100.0
Australia	Adelaide	10	96.6	95.0	100.0	94.2	100.0	96.4

(B) The ten least liveable cities

Country	City	Rank	Overall Rating		Culture &			
			(100=ideal)	Stability	Healthcare	Environment	Education	Infrastructure
Senegal	Dakar	131	48.3	50.0	41.7	59.7	50.0	37.5
Algeria	Algiers	132	44.1	50.0	45.8	45.4	50.0	30.4
Cameroon	Douala	133	44.0	60.0	25.0	48.4	33.3	42.9
Libya	Tripoli	134	42.9	45.0	41.7	40.3	50.0	41.1
Zimbabwe	Harare Port	135	42.6	40.0	20.8	58.6	66.7	35.7
PNG	Moresby	136	41.0	30.0	37.5	47.0	50.0	46.4
Pakistan	Karachi	137	40.9	20.0	45.8	38.7	66.7	51.8
Nigeria	Lagos	138	38.5	20.0	37.5	53.5	33.3	46.4
Bangladesh	Dhaka	139	38.0	50.0	29.2	40.5	41.7	26.8
Syria	Damascus	140	30.7	20.0	29.2	40.5	33.3	32.1

Source: The global Liveability Report 2018 by the Economist Intelligence Unit (EIU)

Further analysis in terms of the measure of performance of the each of the 140 ranked cities using the overall scoring of the two groups shows that, while the top ten scores ranged from 96.6% to 99.1%, that is, from the tenth city (Adelaide in Australia) to the first (Vietnam in Austria), the least livable cities at the other extreme recorded scores ranging from 48.3% scored by Dakar in Senegal, to the last city (Damascus in Syria) which scored 30.7%. In terms of the global geography and spatial distribution, out of the ten worst cities in liveability, six (6) of them are located in Africa, including Lagos in Nigeria which ranked 137th, that is, the third worst or least livable city in the world.

2.4. How Nigeria Performed in World Liveability of Cities Ranking

First, it should be noted that only Lagos in Nigeria was ranked among the 140 cities used in the EIU annual global liveability ranking survey. In 2011 when Lagos joined the global ranked cities, it ranked third from the bottom for two consecutive years. The best performance so far was when it occupied the 137th position, that is the fourth to the last of the worst cities in the world from 2013 to 2015. By 2016, it dropped again to the 138th position and thereafter in 2017 and 2018 global ranking, it dropped further to the second to the last worst city in the 139th position.

Taking the specific factors used for the 2018 annual global survey report, out of the five criteria used, Lagos scored the least in stability/safety, (20.0%) along with Douala in Cameroon and Damascus in Syria. The next poorest score was in Education with 33.3% still along with same cities – Douala and Damascus. Lagos scored 37.5% in healthcare showing that our health indicators are very weak, just as it is in Port Moresby in Papua New Guinea (PNG), and only better off than Damascus, Dhaka in Bangladesh and Harare in Zimbabwe.

In terms of infrastructure, the city of Lagos recorded a score better than six other cities in the ranking with 46.4% where the least was 28.3%. in stability (20.0%) and Education (33.3%) when compared

with other cities among the 10 least liveable cities. Lastly, Lagos fared better than many of the ten(10) least liveable cities in terms of Culture & Environment using indices such as – Humidity/temperature rating (quantitative), Discomfort of climate to travellers, Level of corruption (Transparency International data), Social or religious restrictions, Level of censorship, Sporting availability, Cultural availability, Food & drink, Consumer goods and services. Lagos is ranked 3rd best among the 10 least liveable cities with 53.5%.

If all of these are what have in one way or the other contributed to the degree of uninhabitability in Nigeria urban environment, then, to what extent are we prepared or better put, is there any preparedness plan to transit to decent habitat environment and conditions any soon? Can we afford the cost required to oil this huge-data and smart technology-driven concept? Do we even have appropriate data policy and infrastructure to drive it. Since Smart technology can help cities sustain growth and equitable resources allocation and utilization, as well as improve efficiency for citizen's welfare, safety and government efficiency in urban areas in the years to come, do we then have a stable polity and the political will to see through the project when envisaged and embarked upon? What really makes a city smart and liveable? Where are the World most liveable or least liveable cities, and how did they get there? What are the drivers of habitable and liveable cities? What do we need to do to transit into smart and liveable cities in Nigeria.

Ladies and gentlemen, from the foregoing so far, it is very likely that your mind may have propped you to think out this obvious question - How Liveable and Habitable is my Neighborhood? If someone have lived in a neighborhood for over a period of five years and more, it is very likely that he/she would have understood the character of that place. It is perhaps only then such person would have been equipped enough to provide informed answer to the question – How habitable or uninhabitable is our neighborhood, either residential or work place? How can we make cities more liveable beginning with our neighborhood?

One final take from this analysis is the fact that no other cities in Nigeria comes within the ranking of 140 cities most liveable cities in the world, Port Harcourt where we are inclusive. This lecture is therefore geared toward exploring what the challenges are and offering suggestions as to how our cities and urban centres could become more habitable and liveable in few years from now. This is the connecting link to why we are looking at the issues of transiting Smart and Sustainable cities as possible way forward. In what ways are geospatial mapping technologies inevitable as one of the drivers of planning and implementing smart technology cities. These and many more are some of the issues this lecture will be ventilating upon today.

3.0. THE SMART AND SUSTAINABLE CITY/URBAN CONCEPT

3.1: The Smart City Concept

The offer of definitions of a ‘Smart City’ or ‘Smart Cities’ is so rich that caution must be taken in adopting any one, as no single definition exist to capture all the intent and purposes of a smart city especially within the perspectives of so many smart cities researchers and stakeholders. For the purpose of this lecture, I have appraised and presented just a few of them here. For instance, Rouse (2018) described a smart city as a municipality that uses Information and Communication Technologies (ICT) primarily for the purpose of achieving operational efficiency, information sharing with the public and to improve both the quality of government services and citizen’s welfare. In other words, the term essentially relates to the use of ICT to improve quality of life and city services. "Smart cities" also aim to be sustainable cities. They develop with respect to the economic, social and environmental needs of the present and the future.

Still on the definition of smart cities or urban, the UK Centre for Cities (2014) had identified various perspectives of presenting the concept and meaning of the smart city most especially from Broad, Data-driven to Citizens – driven definitions. For instance, the UK

Department for Business, Innovation and Skills (BIS, 2013) described Smart city as

a process rather than a static outcome, in which increased citizen engagement, hard infrastructure, social capital and digital technologies make cities more liveable, resilient and better able to respond to challenges.

While according to the Manchester Digital Development Agency(MDDA),

“a ‘smart city’ means ‘smart citizens’ – where citizens have all the information they need to make informed choices about their lifestyle, work and travel options” (MDDA,2018).

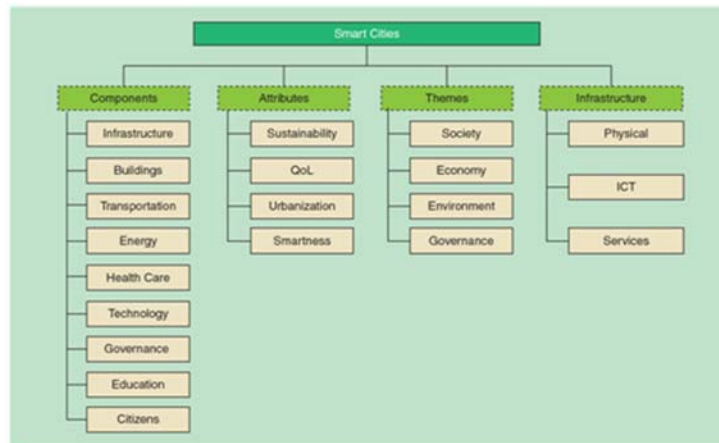


Figure 3.1: The feature of the smart city concept (Mohanty, 2017)

3.2: What Constitute the Functional Components of the Smart City?

What really constitute the components of the smart city comes in different shades. At times, it could depend on the level of technology that can be afforded and deployed for the conceived smart city. Other times, it could be as result of the size of the modeled smart city to be delivered. It should be noted also that, the studies of smart

cities have been around for sometimes now, therefore, the period a smart city was planned and implemented is another factor that could differentiate one smart city to another one. In Fig.3.2 are some of the submissions of smart city scholars on what would constitute the components that will normally drive the smart city.

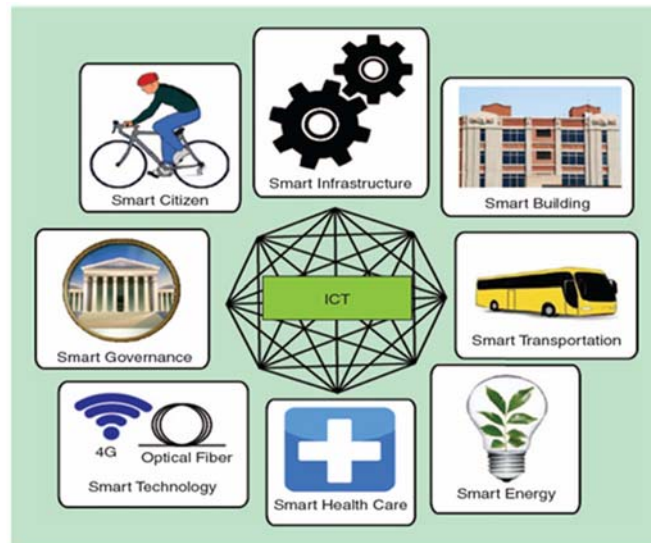


Figure 3.2: The broad components of the Smart City (Mohanty, 2017)

Emerging trends such as automation, machine learning and the Internet of Things (IoT) are driving the smart city adoption. Wherever these smart city technologies has been adopted or are being implemented, the overarching mission has been to optimize city functions and drive economic growth while improving quality of life for its citizens using smart technology and data analysis.



Figure 3.3: A broad overview of the components of the Smart City (Mohanty, 2017)

In all of these views on the concept of the smart city and its components, the appropriate Information and Communication Technology (ICT) remains a key factor. This is because, where ICT has been fully exploited to drive the smart city project, it has resulted into increase in the efficiency of mobility, retail and delivery services, minimize energy consumption, mitigate air pollution, as well as reduction in the response time to casualties and hazard sites. Ultimately too, the city can thus deliver better in terms of liveability, economic progress, quality of life, urban infrastructure, environmental management, sustainable development and accurate resources allocation. A more graphic illustration of these can be deduced from the illustrations in Figures 3.1 to 3.3.

3.3: The Spirit and Purpose of the Smart and Sustainable City/Urband

As the traditional cities continue to grow in leaps and bounds into mega urbanized regions, socio-economic and environmental problems associated with the unplanned growth have impacted on how livable these cities become. This is more so given the alarming rate of the present and the projected population drift into the cities that is raising global concern. The several efforts of urban scholars

in search for meaningful solutions to urban diverse problems lead to the concept of a smart city, which must eventually be seen as not just smart but sustainable. In all of these, a smart city is one that makes optimal use of all the interconnected information available today to better understand and control its operations and optimize the use of limited resources” Cosgrove et al, (2011), while also adopting “scalable solutions that take advantage of information and communications technology (ICT) to increase efficiencies, reduce costs, and enhance quality of life” Falconer & Mitchell (2012).

In its own contribution in search for major steps to be deployed in addressing the menacing challenges of cities growth, the International Federation of Red Cross (IFRC) published the following facts and statistics in its World Disaster Report (2010); that:

- *The global population in 2012 was over 7 billion.*
- *In 2010, the urban population outnumbered the rural population.*
- *Global urban population is 53% versus global rural population at 47%.*
- *The urban population projection for 2050 is 70%.*
- *The global population living in slums and informal settlements is 1.5 billion.*
- *3.1 million people are estimated to die annually from urban air pollution.*
- *1.3 million people are estimated to die annually from road traffic accidents.*

In the same vein, the UNFPA (2014)’s report showed that with the urbanisation of the world’s population still accelerating, more than 50 per cent of the global population was already urban with more than one billion people living in slums. Also, the megatrend of urbanisation will continue with estimates suggesting that by 2050 more than 67 per cent of the world’s population will be city dwellers (ECOSOC, 2011). It is instructive from the facts and figures above that, there is the dire need to address the huge urban population projection and the percentage of this population that will be exposed

to informal settlements and slums life, urban air pollution and possibly an increasing road traffic accidents.

Furthermore, cities with nearly one billion people living in it may be hit by floods, droughts, cyclones, earthquakes or other natural disasters. When this happens, power, water, gas, wastewater – all of which are often transported through a labyrinth of roads, tunnels, pipes and cables may encounter shocks and disruption. To cope with these threats and optimize the use of scarce resources, many city authorities want to exploit the opportunities offered by today's technology; they want their city to become 'smart'. Therefore, to answer the question - why then is the smart city? Woetzel (2018) said that, "as cities get smarter, they are becoming more livable and more responsive and today we are seeing only a preview of what technology could eventually do in the urban environment".

3.4: The Possibilities of the Smart City Concept

According to the British Standards Institute (BSI), Smart cities is a platform for achieving an the effective integration of physical, digital and human systems in the built environment to deliver sustainable, prosperous and inclusive future for its citizens"(BIS, 2014). The importance and centrality of the Smart City Technology in connecting other potent drivers of the smart and sustainable city and some of the possibilities attainable with it are illustrated in Figure 3.4.

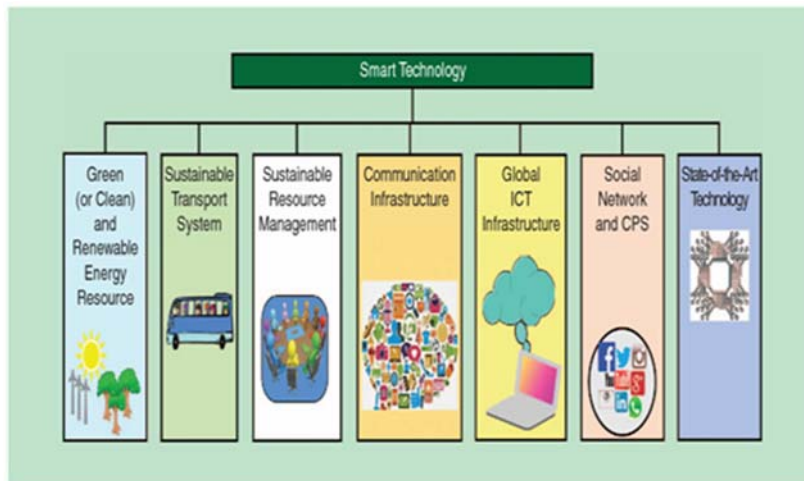


Figure 3.4: Some possibilities of the Smart Technologies

In transportation management for instance, City management can be incorporated into a smart city initiative to deliver the smart parking meter that uses an app to help drivers find available parking spaces without prolonged circling of crowded city blocks. The smart meter also enables digital payment, so there's no risk of coming with short of coins for the meter. Smart traffic management is used to monitor and analyze traffic flows to optimize streetlights to prevent roadways from becoming too congested based on time of day or rush-hour schedules, as well as ensure public transportation meets user demand. With intelligent use of smart sensors, smart streetlights dim when there are no cars or pedestrians on the roadways. The Smart grid technologies can be used to coordinate the operations, maintenance and planning to supply power on demand and monitor energy outages.

Smart housing in a smart city project can help to preserve 'Legacy' infrastructure and new buildings constructed with sensors to not only provide real-time space management and ensure public safety, but also to monitor the structural health of buildings. Attaching sensors to buildings and other structures can detect wear and tear and notify officials when repairs are needed. Smart Citizens can help in this

matter, notifying officials through a smart city app when repairs are needed in buildings and public infrastructure, such as potholes. Sensors can also be used to detect leaks in water mains and other pipe systems, helping to reduce costs and improve efficiency of public workers (Mohanty, 2017).

The built environment as with housing that is highlighted above, are often associated with enormous challenges of dealing with the waste generated by the increasing city population. It is therefore no doubt that urban waste management has remain one of the most difficult issues city planners have continued to struggle with in their bid to deliver clean and sanitized cities. The advent and adoption of Smart technology for improved sanitation has been achieved, either by using internet-connected trash cans and IoT-enabled fleet management systems for waste collection and removal, or using sensors to measure water parameters and guarantee the quality of drinking water at the front end of the system, with proper wastewater removal and drainage at the back end.

The smart and sustainable cities and urban centres being advocated for in this lecture today is considered a possible solution to addressing the squalor and slums and its attendant issues creating uninhabitable conditions in our fast growing and urbanizing areas in Nigeria. Therefore, the call to transit from uninhabitable habitats to habitable, smart and sustainable habitats is because, in a smart city, the digital technologies translate into better public services for inhabitants and better use of resources while reducing environmental impacts. This is why from the perspectives of the Citizen-focused definitions, the UK citizens considers a smart city “as clean, friendly and has good transport connections”. (Duckenfield, 2014).

Today, the smart city is seen as a city “connecting the physical infrastructure, the information-technology infrastructure, the social infrastructure, and the business infrastructure to leverage the collective intelligence of the city” [4], where there optimal energy conservation and efficiency in supply and utilization. This Smart city initiative has capacity to monitor and address urban environmental

concerns often propelled and made visible (say by) climate change and its multi-dimensional impacts, air pollution and its effects on human health, urban flash floods and hurricanes with their menacing impacts which comes with evidently discernible dangers to lives and properties. The use of Smart sensors has been critical components of an early warning monitoring system against these environmental problems.

3.5 SMART CITY EXAMPLES

3.5.1 Smart City Examples across the Globe

A. *Hamburg City (Germany)* - Hamburg is leading the way in Germany when it comes to the Smart City and has been quick to position itself with “Hamburg’s Strategy for the Digital City”, which aims to develop a standardised smart city strategy. Key areas include mobility, energy, business and work, accommodation and city life. What’s more, the city’s residents are also involved in the strategy (Kersten, 2016).

B. *Barcelona (Spain)* - The Barcelona city has put in place a smart transportation system and smart bus systems that are being complemented by smart bus stops that provide free Wi-Fi, USB charging stations and bus schedule updates for riders. A bike-sharing program and smart parking app that includes online payment options are also available. The city also uses sensors to monitor temperature, pollution and noise, as well as monitor humidity and rain levels. The city is certainly regarded as one of the best that offers the smart city and liveable experience in Europe.

C. *San Diego (USA)* – The North American city of San Diego like Barcelona in Spain, is another success story of a smart city. The city has installed 3,200 smart sensors in early 2017 to optimize traffic and parking and enhance public safety, environmental awareness and overall livability for its residents. Solar-to-electric charging stations are available to empower electric vehicle use, and connected cameras help monitor traffic and pinpoint crime.

D. Kansas City (USA) - The Kansas City is the largest city in the state of Missouri in the United State of America with a population of 488,943 in 2017. The smart city initiative of the City involves smart streetlights, interactive kiosks and more than 50 blocks of free public Wi-Fi along the city's two-mile streetcar route. Available parking spaces, traffic flow and pedestrian hotspots are all publicly available through the city's data visualization app.

E. Singapore - This an Island city-state off southern Malaysia, which is regarded as a global financial center with a tropical climate and multi-cultural population. Singapore is often considered the gold standard of smart cities, where sensors and IoT-enabled cameras are deployed to monitor the cleanliness of public spaces, crowd density and the movement of locally registered vehicles. Its smart technologies help companies and residents monitor energy use, waste production and water use in real time. In its quest to explore more opportunities of smart city, autonomous vehicles including full-size robotic buses, as well as an elderly monitoring system to ensure the health and well-being of its senior citizens are already being tested for its functionality.

F. Dubai (United Arab Emirates) – Dubai in the United Arab Emirates is by no means of the best experience of the smart city in the Gulf region. With a population of over 3million, spanning through a 4, 114 km², its known for its well planned luxury shopping and ultra modern architecture. Here, smart city technology is used for traffic routing, parking, infrastructure planning and transportation, telemedicine and smart healthcare, as well as smart buildings, smart utilities, smart education and smart tourism (Roushe, 2017).

3.5.2: Smart City Examples in Africa

There are a few attempts by African countries to key into the smart city concept by setting up what some authors regard as ambitious satellite 'smart cities'. Satellite cities, often billed as "smart cities" - connected, tech-driven urban areas - are being built by a number of African countries. Although, virtually all of them are on-going, this

move is perceived to be Africa's response and solution to the continent's rapidly urbanizing population. Below are few examples.

A. Hope City and King City (Ghana) – On Ghana's Independence Day in 2013, the government announced a \$10bn super high-tech satellite city named 'Hope City' outside Accra planned to put the country on the map for technology. Despite the high ambitions including hosting the Africa's tallest building, the project has failed to make headway since then, although the developers maintain it will still go ahead. The hub will include a hospital, university, housing and recreational areas. Similarly, the **King City**, located near Ghana's third largest city, Takoradi, and developed by Rendeavour, is a mixed-use development in western Ghana. The site is near the country's mining region and hopes to capitalize on the growth of the sector.

B. Waterfall City (South Africa) – This is the largest mixed-use development ever in South Africa, located between Pretoria and Johannesburg. It is expected to be completed by 2025, and could potentially create 86,000 jobs. The project aspires to cater for all needs: schools, shopping malls and large green spaces. Global professional services firm - PricewaterhouseCoopers is set to accommodate the area's first skyscraper.

C. Vision City and Kigali City (Rwanda) – Just outside of Rwanda's capital Kigali is Vision City, the country's largest housing project. It is part of the government's strategy to embrace "smart cities." The town square will have free wifi and the street lamps will be solar-powered. Similarly, **Kigali**, the Rwanda's capital city is undergoing a transformation. The 2020 Kigali Conceptual Masterplan plans to remodel Kigali into a high-rise, modern and tech-orientated city.

D. Tatu City and Konza Technological City (Kenya) – The **Tatu City** project aims to be a new urban center outside the capital Nairobi, and businesses are already located in the locality. In an attempt to lure companies, the city has a special economic status

providing lower businesses taxes. As part of the Kenyan government's Vision 2030 project, ***Konza Technological City*** located 60km outside Nairobi, aims to become a world-class technological and innovation hub. The cost of the so-called "Silicon Savanna" is expected to reach an eye-watering \$15.5bn. The government plans to complete the techno city sometime after 2030. The Konza Development Authority (KTDA) estimates Konza will bring in \$1bn every year and create 100,000 jobs. The site, spread across 5,000 acres, will not only be a center of technology and education, but will provide new homes and leisure activities with shopping malls and other amenities. The country wants this new "techno polis" to be a catalyst for the economy.

F. Eko Atlantic City (Nigeria) – Eko Atlantic is the ambitious multi-billion dollar project that aims to transform Lagos, the country's most populated city. Its creators want it to become the new financial hub for Nigeria - bringing in 150,000 commuters every day. Eko Atlantic is a privately funded project in partnership with the Lagos State Government. Once finished, it plans to be home to a quarter of a million people. The new city is connected off the Victoria Island, a district in Lagos. Eko Atlantic is being built along Lagos's Upmarket Bar Beach coastline. It will provide classy accommodation and high-tech infrastructure. It is being constructed on 10 square kilometers of reclaimed land from the Atlantic Ocean, and using tons of sand dredged from the Atlantic Ocean off the coast. This city when completed is billed as the largest real estate project in Africa, and possibly the Nigeria's answer to Dubai. However, construction has slowed as a result of Nigeria's economic stagnation.

The Vice Chancellor sir, distinguished ladies and gentlemen, to the best of my knowledge, it will be as difficult just like “a Camel passing through the eye of the needle ...” (Mat.19:24), before anyone would convince me that the fantastic features of smart and sustainable cities just highlighted above are already here with us in Nigeria. Then, I will be quick to point the attention of such person(s) to the menacing urban floods that have often knocked down several urban areas in Nigeria up till last year 2018. The seeming helpless

situation at Nkpolu junction, along the East –West road, which lasted for several months last year attest to this. Do I need to talk of the epileptic electricity power supply, the very terrible and pot-holes vested streets and roads within our communities, or is it the “water, water, water everywhere, but none to drink”, not forgetting that we now celebrate garbage and indiscriminate waste disposal in our cities roadsides.

From the foregoing, the need to transit from where we are in terms of the current state of our cities to the smart and sustainable city concept being described in this section cannot be over emphasized. It is therefore my humble submission, that the way to go about this in order to attain improved conditions for habitability of our cities and urban centers is by deploying the geospatial technologies and mapping approach. This is why the next section of this lecture is devoted to what geospatial technologies entails and what they can offer in the process of planning for habitable urban environment in our country.

WORLD SMART AND LIVEABLE CITIES



1. Vietnam, Austria



2. Melbourne, Australia



3. Tokyo Japan



4. Dubai, UAE

SMART CITIES INITIATIVES IN AFRICA



1. Vision City, Rwanda,



2. King City, Ghana



3. Eko Atlantic City, Nigeria

4.0. THE GEOSPATIAL TECHNOLOGY AND MAPPING AS DECISION SUPPORT TOOL FOR URBAN PLANNING

4.1 Geospatial Technology and Mapping Conceptualized.

Geospatial technology is a term used to describe the range of modern tools contributing to the geographic mapping and analysis of the Earth and human societies. These technologies have been evolving in some form since the first maps were drawn in prehistoric times. In the 19th century, the schools of cartography and mapmaking were joined by aerial photography as early cameras were sent aloft on balloons and pigeons, and then on airplanes during the 20th century. The science and art of photographic interpretation and map making was accelerated during the Second World War and later took on new dimensions with the advent of satellites and computers. While Satellites allowed images of the Earth's surface and human activities therein with certain limitations, Computers allowed storage and transfer of imagery together with the development of associated digital software, maps, and data sets on socioeconomic and environmental phenomena, collectively called Geographic Information Systems (GIS).

In a nutshell, there are now a variety of geospatial technologies potentially applicable for diverse purposes. By this, there is Geography, Earth science and indeed many other disciplines and professionals which increasingly rely on digital spatial data acquired with Surveying techniques, Global Positioning System (GPS), or from Remotely Sensed (RS) images. These data are then either processed with geostatistics or analyzed by Geographic Information Systems (GIS) and visualized on paper or the computer screen (Cartography). This therefore reveals the components or specializations that make up the geospatial technologies. While the fields and sectors deploying these technologies are still growing at a rapid pace, equipping decision makers with information on multi-dimensional topics such as urban planning, environmental resources management, engineering, biodiversity conservation, fire or disaster

management, agricultural monitoring, humanitarian relief planning, and so on.

A *map* is a symbolized representation of geographic reality, representing selected features or characteristics, resulting from the creative effort of its author's execution of choices, and is designed for use when spatial relationships are of primary relevance' (Kraak & Fabrikant, 2017). Earlier, ICA (1973), Board (1990) had conceptualized map as 'a representation or abstraction of geographical reality, as well as 'a tool for presenting geographical information in a way that is visual, digital, or tactile', normally rendered to scale and on a flat medium, of a selection of material or abstract features on, or in relation to, the surface of the earth or of a celestial body'. According to Woodward and Lewis (1998), the whole essence of map is to provide graphic representations of various phenomenon and to facilitate a spatial understanding of things, concepts, conditions, processes, or events in the human world', thus rendering human understanding of geographic reality. This is the context that map is being viewed and used in this lecture, we therefore see mapping as the act or process of making a map.

We have equally adopted the concept of Geospatial mapping to simply refer to the use of geospatial technologies for making maps. This involves spatial analysis techniques that typically employ software capable of rendering maps from processed spatial data, and applying analytical methods to both terrestrial and geographic datasets, including the use of geographic information systems. In this way, we differentiate the analogue and traditional mapping techniques that were in vogue prior to this modern software and computerized database geospatial mapping techniques. In the final analysis, the geospatial techniques which includes approaches to applying statistical analysis and other analytic techniques to data which has a geographical or spatial aspect, most notably in the analysis of entities using their topological, geometric, or geographic properties, invariably, the end product from the combination and use

of all of these technologies is the production of appropriate maps with which the analysed data are displayed.

4.2: The Geospatial Technologies: Components, Potentials and Possibilities

For geospatial mapping, Remote Sensing (RS), GIS and Digital Cartography are vital components of Geoinformatics or Geospatial technology. This is the science and technology dealing with the structure and character of spatial information, its capture, its classification and qualification, its storage, processing, portrayal and dissemination including applications for planning and decision support. We shall attempt to highlight the basic concepts, importance and possibilities of these technologies.

4.2.1 Remote Sensing (RS)

Remote Sensing is the technique of gathering spatial data of the environment without physical contact with the objects or features being sensed. It is the science and art of obtaining information about an object, area, or phenomenon through the analysis of data acquired by a device that is not in contact with the object area, or phenomenon under investigation. Remote sensing has also been described as the instrumentation, techniques and methods to observe the Earth's surface at a distance and to interpret the images or numerical values obtained in order to acquire meaningful information of particular objects on Earth. Functionally, *Remote sensing* is the process of collecting, storing, and extracting environmental information from images of the ground acquired by devices not in direct physical contact with the features being studied. In other words, imagery and data are collected from space or airborne camera and sensor platforms.

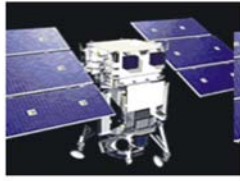
Today, some commercial satellite image providers now offer images showing details of one-meter or smaller, making these images appropriate for monitoring and mapping for several applications. For instance, there are now sophisticated commercial earth observation satellite sensors with Sensors resolutions of between 0.31m - 2m, providing high-resolution satellite image data that can be applied to

several thematic applications. Specific examples of these satellite include Worldview -4 (0.32m), Worldview -3 (0.31m), Worldview – 2 & 1 (0.46m), GeoEye – 1 (0.46m), Quickbird (0.65m), TripleSat (0.8m), Ikonos (0.82m) and Spot 6 & 7 (1.5m). In addition, by June 2014 DigitalGlobe received permission from the US Department of Commerce to collect and sell imagery at the best available resolutions. Six months after WorldView-3 became operational, DigitalGlobe was also permitted to sell imagery at up to 25 cm panchromatic and 1.0 m multispectral GSD. With these advancements, the potentials and possibilities which geospatial mapping and technologies offers will continue to be enhanced.

Importance of Remote Sensing (RS)

- Remote sensing can acquire data on the number of buildings, types, and sizes though can not reflect the number of people living in the buildings.
- Remote sensing deals with the spectral characteristics of the objects or phenomena, though there can be problem of misclassification during interpretation and analysis if the features or phenomena have the same or close spectral properties.
- A good knowledge of pattern recognition and ground truth may be necessary requirements for the integration of remote sensing for GIS applications and the sound knowledge of image processing and photogrammetry may be necessary before an individual can have a full grasp of GIS applications
- With RS, there is improved and wider data coverage, as space sensors can allow global data collection and also from the inaccessible area. Also, the Repetitive ability and spatial continuity in RS has helped to improve the collection of spatial data repeatedly without stop, providing near real-time monitoring of extensive areas of the Earth's surface at relatively low cost.

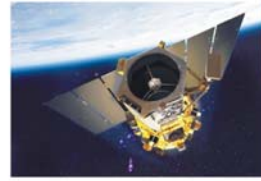
REMOTE SENSING SATELLITES



WorldView-1(0.46m)



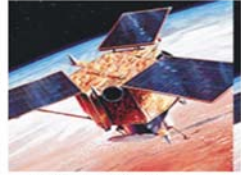
WorldView-4(0.31m)



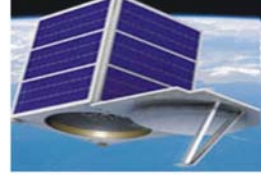
GeoEye-1Sat Sensor (0.46m)



QuickBird (0.61m)



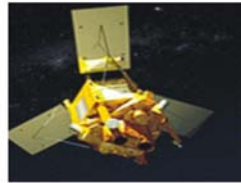
IKONOS (0.82m)



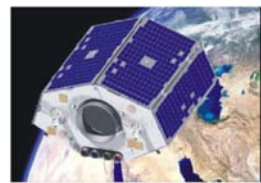
SkySat-2 (0.9m)



SPOT-7 (1.5m)



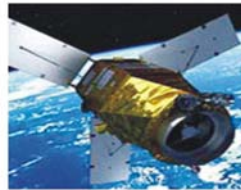
SPOT-6 (1.5m)



NigerSat-2 (2.5-5m)



KOMPSAT-3 (0.7m)



KOMPSAT-3A (0.55m)



NIGCOMSAT-1

4.2.2: Digital Cartography (DC) and Geographic Information System (GIS)

The Geographic Information System (GIS) is a system for capturing, storing, analyzing and managing data and associated attributes which are spatially referenced to the earth. It is equally a system of computer hardware and software, designed to allow users to collect, manage, analyse and retrieve large volume of spatially referenced data and associated attribute data collected from a variety of sources. Practically speaking, GIS as an information system is a set of processes executed on raw data to produce information which will be useful in decision making. This is because the common purpose in GIS application issues is decision making for managing use of land resources, transportation, retailing or any spatially distributed entities. Cartography is all about the arts, science and technology of map making and its uses for diverse purposes. The advent of Computer and its introduction into the map making process evolved the term digital cartography which essentially deploys computer and allied technologies to make maps through the process now termed geospatial mapping and thus largely integrating it with GIS.

Importance of Digital Cartography and GIS

- GIS uses geographically referenced data as well as non-spatial data (attribute data) and includes operations which support spatial analysis that can help to make the most effective decisions.
- GIS allows manipulating and displaying geographical knowledge in new and exciting way by putting maps {e.g. geological, lithological, contour, etc] and other kinds of spatial information into digital form.
- GIS makes connections between activities based on geographic proximity. That means looking at data geographically can often suggest new insights and explanation.
- GIS allows access to administrative records- property ownership, tax files, utility, cables and pipes- via their geographical positions.

- GIS with its capability to georeference and assign a specific location on the surface of the Earth, otherwise known as geospatial data, it can be used to detect and monitor geographic patterns including habitats of all sorts and sizes.
- Another important aspect of GIS is its ability to assemble the range of geospatial data into a layered set of maps which allow complex themes to be analyzed and then communicated to wider audiences. This ‘layering’ is enabled by the fact that all such data include information on its precise location on the surface of the Earth, hence the term ‘geospatial’.
- The end product of digital cartographic and GIS techniques is visualized maps. These maps enable us to answer space-related questions.
- Maps can be used to support spatial behavior as it enhances our ability or capacity to enable spatial thinking, spatial planning, spatial reasoning or decision thereby making cartography needed.
- Cartographers produce maps which are today regarded as the most successful and powerful instruments to enable spatial awareness.

4.2.3: Global Positioning Systems (GPS)

Another type of geospatial technology is Global Positioning Systems (GPS). It is a key technology for acquiring accurate control points on Earth’s surface. With it, location can be determined using the GPS receiver on Earth’s surface. It often requires a minimum of four satellites through a mathematical process called triangulation using a minimum of three transmitters to receive energy sent from the satellite traveling at the speed of light. The GPS is therefore a satellite-based systems and electronic devices for capturing spatial information such as location, height, direction and distance using a constellation of 21 satellites orbiting the earth.

Hand-held GPS are becoming popular as a means of capturing location data which are downloaded directly into the GIS program for building the required entity. GPS was actually developed as a

network of U.S. Department of Defense satellites which can give precise coordinate locations to civilian and military users with proper receiving equipment, although several other nations have developed other specks of GPS. The advent of radar systems and GNSS further improved access to more space-derived data/information. Radar systems can map the ground physical features and provide data/information independent of daylight and cloud cover

In addition to RS, DC, GIS, and GPS, there are other forms of geoinformation or geospatial technologies of great value to geospatial data sourcing and analysis currently. There is the Web and Internet Mapping Technologies which engage software programs like Google Earth and web features like Microsoft Virtual Earth, all of which are changing the way geospatial data are viewed and shared. The developments in user interface are also making such technologies available to a wider audience *abinitio* reserved for traditional GIS specialists.

Today, our smartphones are fitted with GPS technology and satellite navigation units. Some are fitted on our vehicles and we rely on these satellite imagery and digital mapping to get us where we want to go. Because this data is often freely available; every time a new link road is built, a new housing development or shopping centre is constructed, a road closes or diverts, the data file is simply updated. Every time you connect to the satellite network and ask them to plot you a route, your satellite navigation (SatNav) will update and you'll have up to the moment data to plan it. The manner in which these technologies work today enable us to track not only longitude and latitude to the accuracy of under a metre, but also the speed at which movements are made. Besides, these technologies have brought about Geo-caching, Geo-tagging, OpenStreetMap, and more, contributing to the dynamism in geospatial mapping. This is the power of geospatial technology and mapping.

Ladies and gentlemen, I have so far acquainted you with the potentials and possibilities of the smart and sustainable city at one end, and that of the importance and potentials of the geospatial technologies and mapping. At this juncture, we shall now provide the reasons and how geospatial technologies and mapping can serve as a vital driver or vehicle that can facilitate effectively the quest to transit from uninhabitable habitats to smart and sustainable urbans.

5.0: FROM UNINHABITABLE HABITATS TO SMART AND SUSTAINABLE URBANS

My Vice Chancellor sir, distinguished ladies and men who appears to me to have been very gentle here today, I have taken time to share/discuss with you the concept and feature, the spirit and purpose, as well as some of the possibilities that technological advancement has brought to bear on our world through a well envisioned and planned smart and sustainable city concept. We shall now briefly consider here the Current State of Our Cities uninhabitability thus justifying the necessity for Transiting, where we ought to be Transiting to, and how/why geospatial technologies and mapping are considered a key and indispensable driver in the process of transiting for uninhabitable habitas to smart and sustainable urbans.

5.1 The Current State of Our Cities Justifying the necessity for Transiting

In 2008, the UN-Habitat report indicated that Africa, with an urbanization rate of 3.31% from 2005 – 2010, still had only 39.15% of its population in cities. With the projected rate of urbanization in Nigeria between 2010 – 2020 put at 3.39%, coupled with the recent review by the national population commission which put Nigeria population at 167,000,000 people, even though its total land area mass remains at 923,700 square kilometres. Currently, Nigeria population is estimated to be in the range of 180 – 200 million, yet the land mass remain the same while social infrastructure development does not march the rapidly increasing population most of who are now in the cities. The usual consequence of this population explosion therefore is the demographic pressure on land,

housing and other facilities which increasingly become inadequate and hence leading to unplanned sprawl and chaotic development into the urban fringes. For these conditions not to persist, the time to put in place a holistic process and solution, capable of transiting a hitherto poor and uninhabitable living environment to a smart and sustainable habitable urban environment is now.

A survey of slum in our cities revealed that yet a lot of work to do in order to bring the status of our cities to the standard good enough to be rated as habitable and liveable. See table 5.1

Table 5.1 A Survey of Slums areas in Nigerian Cities

S/No	Nigerian Cities	Slum Areas
1	Lagos	Ajegunle, Makoko, Agege, Bariga, Badia, ilaje, Ijeshatedo/ Itire, Iwaya, Amukoko
2	Kano	Kurna Asebe, Sabon gari, Nassarawa,
3	Ibadan	Beere, Oje, Inalende, Mapo, Oke-Padi, Yemetu, Oniyaririn, Agbokojo, Akobo- Ojuirin, Bodija, Ojoo
4	Akure	Erekesan, Obanla, Isolo, Idiagba/Ijemikin
5	Kaduna	Angwar Kurmin Gwari, Television, Nasarawa, Angwar Shanu
6	Jos	Bayan Rogo, Gangare, Katakò, Angwan Rukuba
7	Enugu	Akwuke, Ugwuaji, Abakpa, Emene, Akegbeugwu
8	Port Harcourt	Njemanze, Igbo-etchè, Bundu Waterside, Mile 1, Eleme
9	Ado Ekiti	Oke -Isa, Irona, Oke-Ila
10	Abuja	Dutsen Alhaji, Karimu, Gwagwa, Kabusa, Kuchi Bena
11	Minna	Tudun Fulani, Kpakungu, Angwan Biri, Dutsen Kura
12	Makurdi	Wadata, Agwan Jukun, Idye, Logo
13	Zaria	Parts of Samaru, Hagin Dogo

Source: Bobadoye,S.A & Fakere, A.A (2012)

Despite the array of unplanned and uninhabitable slums in our cities, it's not all tales of woes, there are still some good sides which indicate that it is possible to achieve a decent and livable environment in Nigeria. Several surveys have been conducted to identify which cities are most beautiful, most safe for living in, most developed in Nigeria. It therefore means that a meaningful transition could start from these cities for take-off or as pilot smart cities planning initiatives. Here is the list of the result of some of these field surveys.

Ten Best States to Live in Nigeria (Classification based on Crime Rate)			Ten Most Beautiful Cities in Nigeria	
S/n	State	Crime Rate (%)	S/n	Cities
10	Benue	0.87	10	Warri
9	Kaduna	0.80	9	Calabar
8	Edo	0.80	8	Uyo
7	Kwara	0.78	7	Owerri
6	Kogi	0.63	6	Enugu
5	Jigawa	0.51	5	Port Harcourt
4	Zamfara	0.38	4	Kaduna
3	Abia	0.29	3	Akure
2	Katsina	0.10	2	Lago
1	Abuja		1	Abuja

Source: <https://www.nigeriafinders.com>, Accessed 2019

Ten Most Developed States in Nigeria			Ten Richest States in Nigeria in 2019 (Classification based on IGR(USD))		
S/n	State	Crime Rate (%)	S/n	State	Crime Rate (%)
1	Lagos	0.87	1	Lagos	33,667
2	Kano	0.80	2	Rivers	21,073
3	Anambra	0.80	3	Delta	16,749
4	Abia	0.78	4	Oyo	16,121
5	Rivers	0.63	5	Imo	14,212
6	Enugu	0.51	6	Kano	12,283
7	Akwa Ibom	0.38	7	Edo	11,888
8	Ogun	0.29	8	Akwa Ibom	11,179
9	Oyo	0.10	9	Ogun	10,470
10	Kaduna		10	Kaduna	10,334

Source: <https://www.nigeriafinders.com> (Accessed 2019).

In the real sense of it, here are some further justifications for putting in place the necessary preparedness plan for the transition I am advocating for in this lecture.

- It is very doubtful in my own opinion that you are having or enjoying a socially inclusive and engaging experience where you current reside or work.
- Nigeria government has since launched a housing programme that is called “Affordable Housing Scheme”. If today there is affordable, accessible and equitable housing in Nigeria virtually for every level in the society, shall we be talking about uninhabitable habitats today?
- Although, we seem to be having a fair share of an economically vibrant and inclusive cities and urban centres, which is responsible for the continuous influx of rural population to these urban centers. But have we been able to think through and plan for the provision of infrastructures that will march the demand of the uncontrolled urbanization?
- The sustainable urbans we need should be a collectively managed and democratically governed. As the menace of political ‘godfatherism’ and imposition of candidate hold’s sway, it continues to deny us responsible democratic governance. Perhaps, for this reason, we are unable or likely to fosters cohesive territorial development in our cities?
- Naturally, Nigerian are very resilient people, but why can’t this be translated into a regenerative and resilient urbans as in the “New Urban Agenda 2030: ‘the City We Need’”, where production of goods and services outweigh consumptions.
- The City We Need has shared identities and sense of place. But what is in the sense of a place when today Lagos is still known for traffic jam, Onitsha and Aba for smart business, where some places in our cities and urban centres are well known for their lack of safety? (I know you know what I’m talking about).
- Until a few years ago, the old Port Harcourt, designed decades ago, seemingly meets this feature in the City We Need being a well planned, walkable, and transit-friendly. If you have been in the same place in recent time, this virtue is totally lost. Or

do we need to talk about the unplanlessness of newly built up areas of the metropolis, the lack of a good network of roads, the indiscriminate parking and abandoned vehicle along the streets, and so on, all resulting to an unfriendly transit environment.

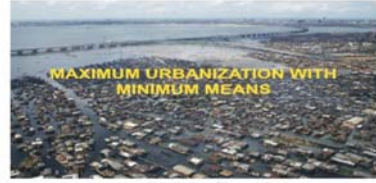
- The City We Need is safe, healthy and promotes well-being. For those of us that have lived in Port Harcourt over the years, we can attempt to visualize how safe Bishop Okoye road in Mile 3, Isaac Boro motor park area and some streets in Diobu were especially in the night few years back. For a new entrant into Lagos few years back, the fear of Mushin Olosha, Oshodi and Ojuelegba under bridge and motor park areas in the night was the beginning of wisdom. Do I need to mention another hot place in Lagos, even dreaded by some of the natives themselves till today, I mean Fadeyi Oloro, how safe has megapolitan development in these areas brought about the promotion of wellbeing and safety.
- The City We Need learns and innovates. Yes, only if we have been able to deploy our efforts to learning and bringing innovations of only positive things which could have turned Nigeria urban areas into hubs of cutting edge technological innovation, production and investment. If that were to be the case, Aba and Nnewi would have become the Japan of not only Nigeria, but West Africa, while Kano, Lagos and Onitsha would have become the Dubai of Africa. But is that the case today?

In the light of foregoing, it would mean that it is when we succeed in effectively addressing the issues highlighted above that the journey from our present state of uninhabitable urban environment and habitations into technologically and geospatially enabled smart and sustainable urbans in Nigeria would have commenced.

EVIDENCE OF UNHABITABLE SLUMS IN NIGERIAN CITIES



Flooded Residential Area in Lokoja



Makoko Slums in Lagos



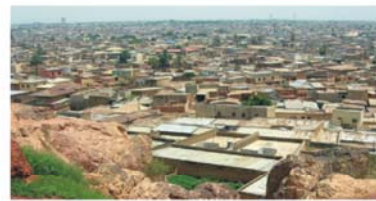
A Waterfront Area in Port Harcourt



An Unplanned Slum Area in Ibadan



Makoko Slum Area in Lagos



An Unplanned Slum Area in Kaduna



Asokoro Slum area in Abuja



Iwaya Slums Area in Lagos

5.2. Where we ought to be Transiting

Earlier, I tried to show you what could be considered as habitable and livable habitats, and alas the characteristics or what may be considered as the DNA of an uninhabitable locations and environment. It is a known fact that the possibilities and potentials of a magnet can only be best appreciated when there is a metal body within the magnetic field of the magnet. As soon as the magnetic flux is activated, the magnet is suddenly empowered to attract to itself any metal body around it.

What I simply mean to say is that today, there is such a strong magnetic flux around the smart and sustainable cities that has made it to be such a talked about issue now more than any time in the past by various scholars, researchers and other stake holders. This perhaps explain why this lecture is advocating for transition from the quagmire that we find of most of our cities and urban centers today to the smart and sustainable urban life and a more livable and habitable environment we need.

The spirit of this lecture therefore agrees and align with the campaign towards a more habitable and livable future being championed by the United nation through several of its programmes or projects. In further pursuant of this is the recognition of the repeatedly echoed manifesto of the *Urban Thinkers* that - "*the battle for a more sustainable future will be won or lost in cities*". There is also the World Urban Campaign, a project of the United Nations Human Settlements Programme, commissioned a project which eventually translated to the report presented at the United Nations Conference on Housing and Sustainable Development (Habitat III), in Quito, Ecuador. This project took place at about 26 Urban Thinkers Campuses around the world, engaging more than 7,596 men and women from 113 countries. Besides, 2,251 volunteer organizations equally participated representing fourteen (14) constituent groups that carried out the survey. An open and participatory dialogues approach which aimed at building consensus within the international community was used.

The resultant product of this two-year survey was meant to birth “a new paradigm for the 21st century” now christened Habitat III or Urban Agenda 2030. According to the Nicholas (2018), “*the outcome of this Habitat III will be the New Urban Agenda, an inter-governmentally negotiated document that will lead global action on sustainable urbanization for the next twenty years. To aid UN Member States in this process, The City We Need 2.0 synthesizes ideas and best practices among variegated stakeholder groups and will become a dynamic tool to influence global thinking on urbanization*”.

*Permit me to take you through the summary of this New Urban Agenda report tagged “**The City We Need 2.0**”, in which ten (10) principles on sustainable urban development were outline and enunciated. They are as follows:*

1. *The City We Need is socially inclusive and engaging*
2. *The City We Need is affordable, accessible and equitable*
3. *The City We Need is economically vibrant and inclusive*
4. *The City We Need is collectively managed and democratically governed*
5. *The City We Need fosters cohesive territorial development*
6. *The City We Need is regenerative and resilient*
7. *The City We Need has shared identities and sense of place*
8. *The City We Need is well planned, walkable, and transit-friendly*
9. *The City We Need is safe, healthy and promotes well-being*
10. *The City We Need learns and innovates*

The consensus on “The City We Need 2.0” is said to be unprecedented as it is the first time that so many different stakeholder groups have come together to produce a single document and speak with one voice. In Nicholas (2018)’s words, it therefore represents the coming of age of “sustainable urbanisation” in terms of all actors prepared to work together to make it happen.

In addition to this ten highlighted sustainable urban development features, the livable, habitable, smart and sustainable urban areas being canvassed for in this lecture can also be likened to the submission of what the city we need should entail by Mohanty *et al*, (2018). This illustrated in figure 5.1.

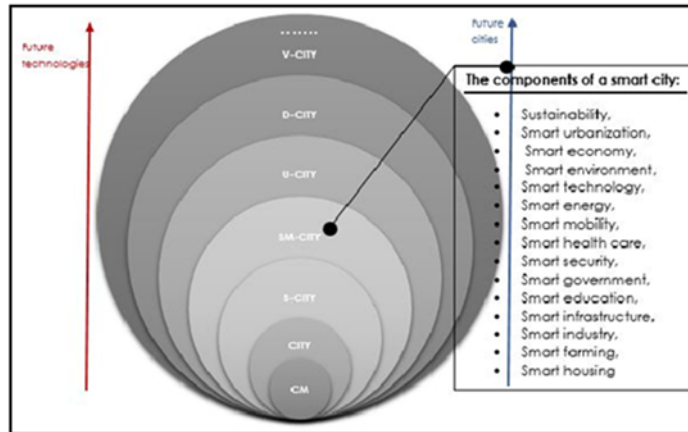


Fig. 5.1. What the Sustainable Smart Urbans being advocated for will entail.
(After Mohanty *et al*, 2018)

With this kind of the graphic representation of what a smart and sustainable urbans ought to be, it is therefore my pleasure to submit to you that we cannot afford to continue to drag ourselves in the unfortunate conditions we have long been experiencing in virtually all the cities and urban centers in this country. I am convinced beyond reasonable doubt that the time to transit from the uninhabitable charade and chaos which we call cities in Nigeria, into habitable habits likened to the ten features enumerated above is now. For all of these, the adoption of geospatial technologies and mapping to drive the process is considered to me as indispensable.

5.3. Geospatial Technologies and Mapping as Transiting Process Indispensable Driver

For the transition to smart and sustainable urban/city, here are some key ways in which the right use of geospatial technologies will be of great benefits.

- Making a city really smart starts with the creation of an accurate 3D map covering the entire city to show residential pattern and analysis of the attributes of each zone. This could help in the study, analysis and planning of appropriate housing scheme that can address the rebuilding and reconstruction of slum and uninhabitable habitats. Of course, such a 3D city map should be precise, detailed and up to date which could assist in proper decision-making.
- Proper use of geospatial technology for mapping has possible 3D maps production. This map contain the height dimension which is essential for many smart city applications such as flood risk monitoring, emergency response, viewpoint analysis and calculation of the solar energy potential of parcels and roofs, etc. These are some of the elements which the smart technologies uses to deliver a more habitable living environment through greater efficiency in the planning, monitoring and management of the smart urbans and cities.
- Maps are the best instrument for displaying, analysing and understanding the spatial relationships of a nation's resources. With maps, we are able to see beyond the horizon and present a graphic model of the nation, bringing to view both locational and attribute data on any feature that is located on the surface of the earth or any other celestial body.
- Maps are representations of the space we inhabit; hence mapping underpins all human activities. They are indispensable tools for project planning and implementation,

natural resources or urbanization management and monitoring, and several other applications.

- Maps are visualisation of geospatial datasets, which include core datasets, thematic datasets and application datasets.; they are the outcome of cartography for effective communication of spatial information.
- Cartographers' produced maps has become one of the most powerful instruments that can be used to support spatial behavior as it enhances our ability or capacity to enable spatial thinking, spatial awareness, spatial planning, spatial reasoning or decision. Besides, maps has continue to serve as the catalyst that enables us to fully address cognitive aspects of geographic space including planning the urban environment or space.
- Another importance of the geospatial mapping and technologies is that apart from various types of imagery (satellite, aerial and terrestrial), today, other data sources are available for creating 3D city maps, including airborne, mobile and terrestrial Lidar, and topographic and cadastral 2D maps. This is beside the fact that Remote sensing technology provides over 80% of geospatial data acquisition for a GIS analysis and then the map visualization with Cartography.
- Furthermore, there is access to newer, powerful and higher resolution satellite sensors, such as Worldview-4 (0.32m), Worldview – 2 & 1 (0.46m), GeoEye – 1 (0.46m), Quickbird (0.65m), TripleSat (0.8m), Ikonos (0.82m) and Spot 6 & 7 (1.5m). This means that a clearer image of the housing pattern and associated environmental conditions of different neighborhood within the city (for instance) can be appreciated and thus planned better.
- RS, DC and GIS combine to facilitate the provision of cost and time effective observation, integrating large areas and

large volume of spatially referenced data. In addition, the advent of radar systems and GNSS has further enhanced the access to more space-derived data/information. Today, it has become possible to deploy Radar systems to map the ground physical features and provide data/information independent of daylight and cloud cover.

- Today, the capability of the remote sensing and geospatial data required to be integrated to the smart city technology is not in doubt. This is because of some recent advancement in the science and technology behind the geospatial technologies. For instance, the following breakthroughs have been witnessed with recent advancement in remote sensing especially as major source of geospatial data. These are in the area of
 - ✓ *Improved data coverage:* Space sensors allow global data collection and also from the inaccessible area.
 - ✓ *Repetitive ability and Spatial continuity:* Remote sensing has improved the collection of spatial data repeatedly without stop. These data are collected over the earth surface in a spatially continuous manner.
 - ✓ *Homogenous data:* Due to data collection through one sensor, it allows spatially consistent data to be collected.
 - ✓ *Time saving and Low unit cost:* The time of acquisition, processing and distribution is significantly reduced, with the capability of providing near real- time monitoring of extensive areas of the Earth's surface at relatively low cost.
 - ✓ *Validation of ground measurement:* It is possible to use remote sensing for a spatial extension of ground measurement.

6.0 MY MODEST RESEARCH FRONTIERS AND CONTRIBUTIONS

For the past 27 years since I joined the University of Port Harcourt as an assistant lecturer, I've had an uncommon privilege of sharing my knowledge with various categories of students at both undergraduate and graduate levels across Faculties, Institutes and Centres in the university. Besides, I have equally played my part in mentoring some of my younger colleagues. In all of these, it is exciting to me each time I come across some of those students I taught several years back, most especially from Geology and Physics departments in the Faculty of Science, Economics and Geography and Environmental Management departments in the Faculty of Social Sciences. In my interactions with them, most of them are quick to either remind me or rehearse for me my "usual ubiquitous or inevitable brief charge" at the first lecture with each new set I teach that – *"It's my desire and prayers that at the end of this course, God would have enabled me to add lasting values to your lives through our interactions in this class"*.

Ladies and gentlemen, and my students seated in this auditorium, little did I know that I was prophesying each time I utter those words to them. The Word of God in Luke Chapter 1, verse 45 says –

"And blessed [spiritually fortunate and favoured by God] is she who believed and confidently trusted that, there would be fulfillment of the things that were spoken to her [by the angel sent] from the Lord."[AMP].

Today, I feel much fulfilled that indeed, I've been an angel in the hand of the Lord to add value that propelled many who I have lectured or mentored beyond their apparent frontiers of limitations. For me, this is real contributions to advancing frontiers of knowledge as well as capacity building.

By divine providence and guidance, I chose to build a career in a specialization in geography that centered on Geospatial Technologies for Map making and applications. In the light of this,

my teaching and research involvement goes beyond the transferring of theoretical knowledge to our students. I make bold to say that some of our graduates from my department have been able to build their survival and vocation around the practical skills they acquired from the - Cartography, Surveying, Global positioning system (GPS), Geographic information system (GIS), Remote sensing and Practical geography courses - that I participated in teaching them along with my other colleagues. This to me is another modest way I have contributed and I am still contributing, either by cementing or projecting one of the recently cut out vision of the university of Port Harcourt as an *entrepreneurial university*.

The Vice Chancellor sir, kindly permit me at this juncture to highlight other dimensions of my contributions to faculty as evident through my research and publications. I will attempt to present them under specific sub-themes.

6.1: Urban Land Use And Land Cover Analyses - Its associated functional displacement and implications on Liveability

Arokoyu & Obafemi (2002) looked at the nexus between Urban Land Use and its Infrastructure with the spatial temporal occurrence of Crimes in Nigeria Cities. We were able to establish a relationship between the spatial distribution of crimes and the characteristics of the urban environment, hence the need for an integrated and efficient spatial organization for a more effective administration and secured urban centers.

An efficient spatial organization of the urban environment has been viewed to possess the way out to eliminate social vices and crimes in our urban centres. This was against the background and the recognition of crime as a disturbing social menace of high magnitude in urban our centres especially within the inner city. Thus, we set out to investigate the nexus between Urban Structure and Distribution of Craft and Criminals in Nigerian cities using Port Harcourt as the case study.

We found out that there has been a concomitant rise in crime and criminality for which geography often offers an areal analysis involving the use of mapping and description of such crime variability pattern. The planner would often rely on such mapped information to display and analyse crime incidences and then develop appropriate strategies to curb them. What then is the message here? Evidence from various urban studies have shown that people are now careful when choosing which part of the city to live or do business, especially when they find out or know that such areas are prone to crime and criminality. In other words, a place could become uninhabitable due to crime and criminality.

6.2: Topical Urban Environmental Management Issues

The Vice chancellor sir, lady and gentlemen, we have in several modest ways made contributions in the area of planning the urban environment to make it a habitable and livable environment worth looking up to.

In our study (Obafemi, A. A. & Odubo, T. V.,2013) on the **Waterfront Redevelopment in Port Harcourt Metropolis, we assessed the perceived social and environmental implications for Urban Environmental Management.** We examined the issues involved in waterfronts slums demolition, the fears expressed by the residents affected, and the constraints that the implementation of the demolition policy would have to grapple with in the light of best practices for urban renewal programme. We noted the fact that there has been a continued dialogue between two concerned groups about urban renewal planning and sustainable urban environmental management, which are the dysfunctionalist and the functionalist schools of thought.

We weighed the arguments of both schools, in which the 'dysfunctionalist' see waterfronts as dysfunctional settlements therefore opting for clearance or redevelopment. On the other hand, the functionalist group believe that the area should be rehabilitated as they perform both social and economic functions. It submits that the redevelopment of these waterfronts by the government should be

such that can blend the “transferred waterside” lifestyle of these waterfronts residents to an urban setting and lifestyle amenable to global best practices and opportunities in a modern and sustainable city. Our findings proved otherwise, that is, the case of Port Harcourt water front redevelopment aligned with the dysfunctionalist idea and therefore raised many issues of lack of fairness and justice.

From our studies on the perception of noise pollution, we showed that the prevalence of noise pollution in an area does not necessarily correspond to peoples proper perception of its spatial dynamics, pattern, intensity as well as its impact on the environment and in particular on humans health. In this work, we argued that although the awareness level on noise pollution by the respondents appears relatively high, their knowledge of the intensity and dimension of impact effects is very low, while awareness level vary across various land uses zones. We thus recommend appropriate environmental education to alert respondents on the ill effects of intense exposure to noise pollution.

In another related study, we assessed noise pollution along four selected road arteries in Port Harcourt City, Nigeria. We deployed the Extech Digital sound level meter (Model 407750) to monitor noise levels at regular interval of one kilometer (1Km) with increasing distance away from the Cities traditional CBD, which also marked the origin of the four road arteries sampled. The study shows that noise level was very high in both Port Harcourt/Aba Express way and Ikwerre Road but relatively low in Trans Amadi Road. The relationship between the distance and noise level was very low implying that the influence of distance to determining spatial variation of noise level was not strong and that there are several other factors that determine noise level along road arteries in Port Harcourt City.

Another issue that contributes to why some parts of the city are becoming more and more unlivable and uninhabitable apart from the menacing challenges from solid wastes, is the nuisance associated with arbitrary siting of Abbatoirs just anywhere around the city of

Port Harcourt. We observed that this situation has brought nothing but an urban blight, which Andersen (2003) describes as urban decay or urban rot and which he saw as the sociological process by which a previously functioning city or part of a city falls into disrepair. It is our view that as long as unplanned and indiscriminate location, lack of proper waste management and disposal system, poor sanitary condition of abattoirs and their surroundings persist, the multifaceted environmental problems and pollution in the study area may not be abated. This made us to recommend that, proper planning and establishment of modern integrated abattoir facilities in each planning zones of the city, enforcement of compliance to relevant laws, regulate access to operational permit in other to control the indiscriminate springing up of abattoirs are inevitable if habitable environment in our cities is to be promoted.

The degree of comfort and environmental sanity which are part of the indicators of liveable environment and habitable habitats are often impeded with indiscriminate location of waste dumpsites especially around residential areas in our cities. Evidence from some of our studies especially in Port Harcourt, Yenagoa, and Benin City affirmed the possible effects of waste dumps location on the values of properties close to dumpsites and evaluated in terms of either the costs of land and houses or cost of rent of properties in these cities. Our findings have made us to conclude among other things that for a healthy human life and habitable environment, urban environmental managers and planners must insist on effective control in the siting of dumpsites. (Obafemi & Wizer, 2012; Obafemi & Diagi, 2012; Wizer & Obafemi, 2017)

6.3: Urban Environmental Management and Geospatial Mapping

Our Vice Chancellor sir, ladies and gentlemen, as a Professor of Geography, Geoinformation, and Environmental Management, I have been actively involved in the activities of my professional associations particularly – the Nigerian Cartographic Association (NCA) and Geoinformation Society of Nigeria (GEOSON). I have equally written books and published well researched articles

covering different aspects of Geospatial Mapping, Geoinformation, or Geospatial technologies with particular focus on Cartography, Surveying, Remote Sensing, Geographic Information System/Science, and engaged in coordinate and geospatial data tracking with Global Positioning System (GPS) device. These research publications were partly made possible from the experience gathered over time in the teaching of these areas of specializations across Faculties and Centres in this University and during my sabbatical experience. I have attended conferences and technical sessions to deliver papers on various thematic aspects of geospatial mapping and technologies. Permit me at this point to share some of my contributions in this area.

From my work on “Cartographic Inputs in Masterplans”, the publication sought to submit that, without cartographic inputs and products, the conceptualization and presentation of Master plans will largely remain inadequate and incomplete. It calls for the inclusion of the Cartographers in Master plan drafting team, and recommends that respective mapping units be adequately equipped and funded so as to have the capacity for the production of accurate, up-to-date and reliable maps, which are *sine-qua-non* to successful master planning.

The vital role and virtues of up-to-date cartographic maps for depicting the changes in the environment caused by the alarming increase in human activities, as well as quest for information about our dynamic physical environment, spatial location and patterns often depicted on a variety of maps, has been pointed out. While appraising the concepts and types of map revision, we see map revision as a task that cannot be ignored for too long and thus recommends constant revision of maps to keep the information conveyed in them as accurate, current and useful for various planning, and environmental management purposes. We also concluded that, whatever scale and form of planning that is desired, maps are indispensable for their success, right from the planning conception to the implementation, monitoring and its sustainable management.

The concept of urban noise mapping in Nigeria emerged and was embraced not too long ago. The information from such work often provide the society to know the pattern or epicenters of noise pollution within a geographic entity. My publication on this thematic and topical issue, served as a mirror to understanding mapping approach to urban environmental management, as well as be a complementary and resourceful manual to those responsible for environmental management, planning and implementing urban noise abatement and controls in our cities. We thus recommend noise mapping approach as a vital planning arsenal in the hands of urban planners, development engineers and others who may be assigned the responsibility of making the urban environment acoustically organized, serene, appreciated and livable.

Since 2005 when I commenced fieldwork for my PhD research that involved the monitoring of noise levels (NL), I have on several occasions engaged in research that entails monitoring of noise levels in small and large scales. In one of this research in 2010, I was interested in examining the noise pollution levels in Port Harcourt metropolis. To do this, I monitored NL across eight selected land use zones categorized into low, medium and high based on the density or intensity of activity in each land use. I found Noise pollution to vary over land use types with the commercial land use zone ranking the noisiest with 93.2 dB (A), while the intensity of land uses was found to correlate in most cases with the pattern and level of noise pollution. A sustainable and holistic approach to attenuate noise and its impact was recommended

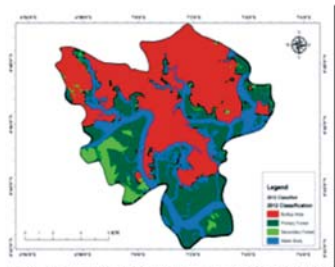
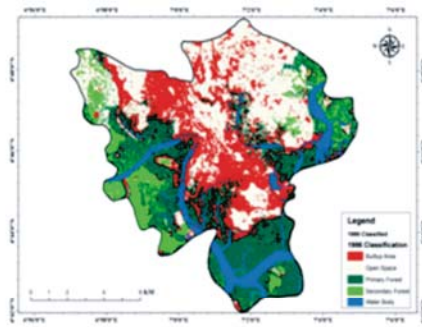
Again, I have been involved in the teaching and practice of surveying all along. This experience birthed my publications with particular focus on the fundamentals of surveying. The work provided the much-needed instructional guidance in the principles and procedures, which are fundamental to the art and science of field surveying. To this end, various techniques were discussed to show how the various forms and dimensions of field measurements are obtained. Error-prone operational practices and methods with relevant precautions to combat them were also discussed. The

important role of surveying techniques in environmental studies and fieldwork with particular reference to geography and geosciences case studies were highlighted. Suffice to say that this work became a simplified manual for studying, teaching and practicing surveying.

6.4: Mapping as Decision Support Tool - Cartographic science and geospatial mapping applications as decision support tool.

The concept of decision support system (DSS) as a geospatial technology and mapping tool often apply to how with the aid of clear information content of a map, an informed decision could be arrived at without necessarily being at the site or location of such phenomena. This technology have the capacity to provide effective tools for decision makers, just by having access to valuable and timely information about say for instance, natural resources, pollution incidence, impacted sites, landuse-landcover, urban change and the extent of environmental change being experienced in a particular place or environment, etc, as an important basis for sustainable planning and management as well as take accurate decision making.

GEOSPATIAL (DC,RS & GIS) TECHNOLOGIES MAPPING



Landuse Land cover map of Port Harcourt, 1986 and 2015

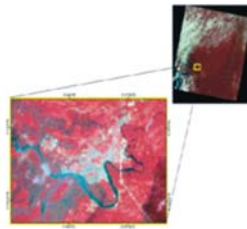


Fig. 2. Clipped 1975 (RGB-754) Landsat 2 MSS of the study area

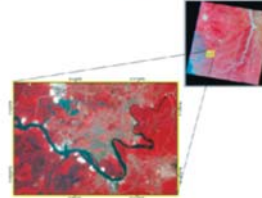


Fig. 3. Clipped 1987 (RGB-432) Landsat 4 TM of the study area

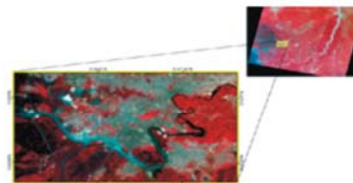


Fig. 4. Clipped 2015 (RGB-543) Landsat 8 OLI/TIRS of the study area

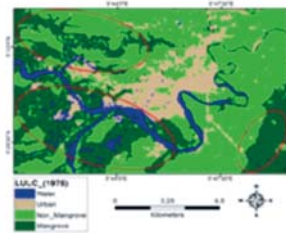
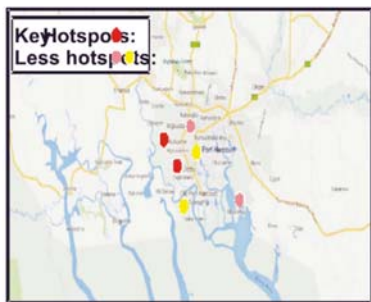


Fig. 5. Supervised classification of LU/LC 1975 Landsat 2 MSS

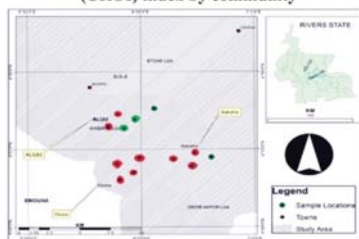
Further Geospatial Mapping Applications



Port Harcourt Crime Hotspots Mapping



Mean crime rate of incidence (CROI) index by community



Annotated noise map of the sample location.

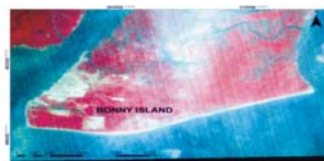


Figure 2 Shoreline changes between 1986 and 2001



Figure 3 Shoreline changes between 2001 and 2004

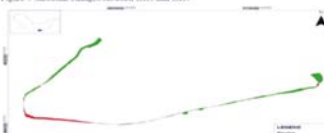


Figure 4 Shoreline changes between 2004 and 2008



Figure 5 Shoreline changes between 2008 and 2010

Analysis of Shoreline Changes in Bonny

In one of our study to demonstrate the efficiency of GIS application, we profiled the characteristics, assessed and analysis the road network system in Trans-Amadi Industrial Layout, in terms of its condition, pavement, road type, length, density as well as its connectivity. We argued for the adoption of GIS for effective monitoring and management of spatial data on important city roads such as this one with a high connectivity level. With this modern tool, the prevailing condition of a road can be auto-monitored with users or would be users knowing what to do or decide to use it or go for alternative route. This is helping greatly today in route planning in transport and logistics for a more effective and accurate decision making.

An integrative geospatial approach with remote sensing satellite imageries and GIS remains the best tools for monitoring liveability and habitability of the coastal communities, which are often at the mercy of seasonal inundations arising from sea level rise due to climate change induced global warming. In this study, Eludoyin, Oduore & Obafemi (2012) examined the shoreline changes over time in Bonny Island of Rivers State, Nigeria. With integrative geospatial technologies, we were able to map how the shoreline of the area is being eroded due to natural causes and human interference. We were equally able to predict the extent of places that will be inundated and made unsafe to live or uninhabitable at specific measures of sea level rises.

Still on the vulnerability of the coastal communities and how it impacts on the habitability of the areas, we looked at the shoreline status of Bonny Island and compared it with Andoni, another coastal community in the Niger Delta of Nigeria using geospatial technologies. Landsat TM of 1986, 2001, 2003, SPOT image of 2006 and Nigersat of 2004 were used for the study while all geo-processing operations and analyses were carried out in ArcGIS 9.2. The area affected and the rate of shoreline percentage loss or gain was calculated for each period in each study locations. We found out that, sea level rise which exacerbates the shoreline changes needed to be regulated along with indiscriminate dredging and sand mining.

In all, the adequacy of the decisions taken which should be premised on the shoreline changes being noticed has revealed how reliable and indispensable the application of integrated remote sensing and GIS technologies.

As urban centres continue to grow in leaps and bounds, one noticeable change is the rising ambient heat in our cities. Urban green is one of the excessive heat attenuation strategies recommended to enhance the comfort level and habitability in our cities. In one of our studies, we examined the use of urban forestry in controlling climate change effects on the people. We assessed land use and land cover status of Port Harcourt with a view to detect the percentage change of urban forest resources over time. Remote Sensing and Geographical Information System (GIS) techniques used for the study provided an efficient tool for mapping and analyzing urban forest resources inventories. With the ultimate goal to ameliorate the scourge of climate change in the society, a holistic approach which integrates urban forestry, GIS and elements of climate, a continual assessment of land use were recommended to enhance urban environmental quality and by implication improved livable urban environment.

Obafemi & Adeyemo (2003), Wizer & Obafemi (2017) in their study aimed at adding up to the solution seeking SWM in Port Harcourt observed that, those responsible for SWM do not even have a good knowledge of the spatial perspective in the distribution and locations of the disposal points, which we feel is vital in taking informed decision on SWM in the city. The study chronicles the solid waste management trends in Port Harcourt and then justifies how the use of maps especially the land use maps would enhance efficient solid waste management and planning for removal and disposal of solid waste in Port Harcourt. It concludes that within an integrated waste management system, mapping technology remains one of the key tools for addressing this seeming nagging menace in our cities. More so that several other studies has shown that improper SWM reduces the quality and liveability of our cities and urbans.

7.0: CONCLUSION AND RECOMMENDATIONS

7.1 CONCLUSION

I hear some friends say I look trimmed and smart, many thanks to the inaugural lecturers who alerted us that “We are what we eat” and another who cautioned us to “Eat Right, Live Right that our Liver will be Right (Prof. Ihekwaba/80th). I have equally found the need to have regular checkups on my teeth and general health, thanks to Prof. Chucks Onyeaso (76th). The condition in the gap between the rich and the poor in Nigeria who are often sentenced to uninhabitable habitats seems to be widening perhaps due to “Systemic Corruption and Abdulistic Capitalism” opined by Prof. W. Okowa), as well as “Environmental policy failures and the tragedy of underdevelopment...” by Prof. A. Adeyemo as referred in their 40th and 63rd inaugural lectures. I can now appreciate why there are “Different Tailors for the same people; the same Surgeon for Different People” and the reality that “Biological Diversity (is) Incredible (in) Generosity (but comes with) Incredible Responsibility”. This is in praise of Professors H. Fawehinmi (111th) and Ben Ndukwu (96th) Inaugural lecturers.

There is a saying that “since the birds have now learned how to fly without perching, the hunter has also learnt how to shoot without missing” What I simply mean to say is that the war against “Stealthy Thieves in Homes and Food Stores” is being won in my home. Many thanks to the counsel offered by the 68th inaugural lecturer who is incidentally our current 8th Vice Chancellor – Prof. N.E.S. Lale. Very recently, my colleague (Prof. Mmom /154th) alerted us that there’s need to still check inside the box again. Perhaps for thoughts and ideas that are not yet addressed, but could be a good lead to discovering why some of our plans and actions are not sustainably effective.

For me, these reflections are indication that, attending inaugural lectures of this institution comes with a lot of benefits and take-aways. It’s therefore my hope that today’s 158th inaugural lecture

series of this great University have created stirs and indelible impression to reflect and act upon.

The fact remains that a few cities in developing nations and in Africa have imbibed the smart and sustainable city idea. The government of several other nations, who in spite of the difficult terrain, topographic constraints and ecological challenges have been able to see the possibilities that smart cities concept offers. Most of who have therefore deployed appropriate information technologies have driven the concept even with the limited resources they had. The situation with Nigeria may not be as bad as some of these countries referred in terms of financial capacity to fund this technology-driven habitable human habitat. All we need is the strong political will that is led and championed by smart and selfless leaders, who are bold enough to put the right pegs in the right holes as well as put the interest of the nation above their personal gains and eccentricity.

For instance, the perennial flooding that has continued to ravage several of our cities and urban areas, thus making them seasonally uninhabitable can be addressed squarely. What we are experiencing I must say is partly a resultant failure to put in place and operate responsive preparedness plans that are geospatially enabled. I mean where appropriate modern technologies are engaged to produce maps that could provide real-time information to assist policy and decision makers to make informed decisions and arrive at useful solutions. Examples of which will include Digital elevation model, 3D floodplain and Vulnerability maps, mapped early warning profiles and signals, etc. The city of Holland and indeed the entire country, which is virtually under water and below the sea level in terms of its elevation is a good example to note. How they have been able to build urban centres smart and sustainable enough to effectively control its waters and void of flooding issues is novel. Why would such a city not be smart, sustainable and habitable?

According to a United Nation's report, in every week, 1.5 million people move to towns and cities, putting huge demands on local resources and environments. Yet with the right techniques and

technologies, urbanisation and sustainability can go hand-in-hand. With good design and materials, coupled with appropriate geospatial technology driven planning, rapid urbanization can be sustainable. It is therefore my candid opinion that the Eko Atlantic City, which is Nigerian's first shot at Sustainable Smart City has the potential to commence this transition, provided the concept and preparedness plan are right and geospatially enabled.

It is a truism that more than ever before, various dimensions and levels of technologies are being injected more directly into the lives of residents of our urban areas. Urban planners and other stakeholders as well as residents can now leverage on technology for a more robust planning, management, and monitoring of all components and factors that are essential to the delivery of smart and more liveable and habitable cities. Today, Smartphones have become one of the main keys to the city, putting instant information about transit, traffic, health services, safety alerts, and community news into millions of hands. So when all of these are made geospatially enabled, where necessary maps are customized into our smart android phones, we have simply been inaugurated into the smart citizen platform that has a role to play in this transition to habitable habitats.

Let me wrap up here with these two quotes, first from Bekele Geleta, Secretary General, International Federation of Red Cross Society (IFR) who said that

“Cities can also be the most dangerous place on earth for those who live in an urban environment where the authorities have little presence and where the will and the resources are lacking to ensure basic social services, food security, running water, sewerage and respect for building codes.”(Geleta,2010).

The second is from the former UN Secretary General, BAN Ki-moon, who said:

“I urge local authorities to accelerate all efforts to make cities safer to prevent the loss of lives and assets.” We need support and participation of local leaders: mayors, governors, county chiefs.” (UN, 2009).

My Vice Chancellor sir, and distinguished guest ladies and gentlemen, it is in our hands to achieve if indeed there is the will to change. But permit me to say that leadership and responsible governance has been lacking in our country to drive this transition being advocated here today. It is further worrisome to think that despite the gap between the jamboree pay and gratifications available to our political leaders vis-à-vis a common negotiated minimum wage of a N30,000.00 per month being demanded for by the Nigerian impoverished workers, which seems difficult for the government to accept, approve and commence implementation, the wage may still not afford the average Nigerian workers an affordable, decent and habitable habitation of their dream.

All the same, I wish to therefore at this juncture, align myself with the posers above from Bekele Geleta and that of BAN ki-moon and to humbly point our leaders to the need to urgently assume responsibility of providing Nigerians with affordable, decent and habitable habitation of their dream. This may not happen overnight or in one day, one month, and possibly not in one year, but if the will is strong enough, and the preparedness planning and process is geospatially enabled, and though we have tarried so long, the realization of this dream may not tarry longer than necessary, (putting faith in the word of God that say in Habakuk 2:3 which says;

“For the vision is yet for an appointed time, but at the end it shall speak, and not lie; though it tarry, wait for it, because it will surely come, it will not tarry”.

It should be noted that on the front burner as drivers of the transition to Sustainable Smart Urbans is the United Nations especially

through its several organs and programmes such as the UN-Habitat campaign towards a better urban future. It is part of the UN's mission to promote socially and environmentally sustainable cities and communities and provide adequate shelter for all. It works to ensure that cities become drivers of economic prosperity and social development for all. UN-Habitat for instance, has 40 years of global experience in cities and human settlements ranging from working on the highest levels of policy to specific technical issues on the ground. UN-Habitat has gained universally acknowledged expertise in all urban areas and is the UN's focal point on urban issues.

Beyond the dedication of first Monday in October as World Habitat Day, the UN General Assembly has since 2014 provided another platform known as World Cities Day which was founded by the People's Republic of China through a United Nations General Assembly resolution and marked on every 31st of October. The day culminates to the last day of October and celebrated as a key platform to raise the global consciousness of the importance of cities and human settlements in *Building Sustainable and Resilient Cities*. The World Cities Day has enabled cities and communities around the world to come together on this important platform to learn and share best practices on sustainable cities and their practices. Last year, 2018 theme "*Sustainability and Resilience*" which are an underlying commitment of the New Urban Agenda was celebrated in Liverpool City in the United Kingdom.

Let me quickly share a story with you as I conclude. The story has it that some three school children were playing together in their school, one day, one of them said, 'Heh, if you see the new car my daddy just bought you will be amazed. In fact, last weekend, my daddy drove us to the village in the new car, come and see, how many people came to stare and admire the car'. Another said, 'Hmm, we just moved from where we used to live before because my own daddy too just completed our new house, and we just moved into it last month, when will you come and visit me in our new house', he asked the other two friends. As they were contemplating on what to say and perhaps to agree on when to visit one of their friend in his

new house, the third friend had a deep breath and sighed. What is it?, the other chorused. 'It's a pity, I don't have somewhere I can direct you to as where we live talk less of asking you to come and visit me.

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say and perhaps to agree on when to visit one of their friend in his new house, the third friend had a deep breath and sighed. What is it?, the other chorused. 'It's a pity, I don't have somewhere I can direct you to as where we live talk less of asking you to come and visit me. We were managing in a shanty erected under high tension electricity cable, but the heavy rain that fell three days ago made the electric pole to fall and some cables are now touching our roof. When I returned home from school yesterday, my daddy told us that government has come to mark our house for demolition. Well, until they come, we are still living in the house. Do you now see why I cannot invite you to visit me'?

My beloved audience as I conclude, it may interest you to note that, there are some of us here seated and listening to this lecture today, or perhaps will be reading this lecture or hear about it later,

- Are you somehow ashamed to point to people or direct your friends to where you live, because it does not certainly match with your status.
- Perhaps, you do live in a place that when the cloud begin to change in preparation for rain, your heart will start panting because of the imminent consequence of the unresolved perennial flash floods in your neighborhood?
- Are you here, and going back home or returning into the street where you live gives you a nostalgia especially at those labelled wrong hours of the day when the 'area boys' (*omo oniles*) are in charge or on duty.
- Are you one of those who may have been forced to pattern your commuting to work and back to a not suitable and convenient time, just because of the nature of the traffic associated with where you reside.
- Perhaps, you live in a place or neighborhood that your last prayer in the night when going to bed is often for those guys not to see your house / apartment for fear of been robbed or attacked.

If you reside or work in such environments I have just described, I should tell you here and now that you are a good specimen of

those whose day of salvation to transit from uninhabitable to habitable and smart habitats shall be brought closer than when you ever imagined in Jesus mighty name Amen.

7.2 RECOMMENDATIONS

Ladies and gentlemen, I must confess that achieving a habitable living environment, Liveable communities, resilient and sustainable smart cities may not come cheap. What is however true is that we now know what we should look up to, in that there is a common ground as to what constitutes the essential ingredients for a liveable and habitable community in which the residents among other things:

- feel safe, socially connected and inclusive; a liveable city is also a healthy city, promoting health, wellbeing and equity.
- have access to affordable and diverse housing options linked via public transport, walking and cycling infrastructure to employment, education, local shops, public open space and parks, health and community services, leisure and culture.
- Where there is city greening initiatives and environmental sustainability;
- a place that promotes healthy and happy people and community wellbeing – a place where people want to live .A great place to live because it is more resilient, providing competitive social, economic and environmental advantages as well as support for sustainable society.

For all of these to be in place in addition to all that have been said earlier on the possibilities of smart city solution that is driven by ICT and geospatial mapping technologies, we make the following recommendations.

- ❖ Like a dynamic living organism, human settlement everywhere continue to grow over time and in the case of urbanism, as cities change and grow, the needs of the people living in cities also change. To maintain and improve the level of habitability or liveability of a city, ***the services and infrastructure often provided by governments and other stakeholders in the city governance need to be regularly reviewed to make them more functional and responsive.***

For this, the right experts within government, universities, private business and community organizations, including professional geographers and urban planners must be engaged to offer their professional expertise, rather than patronizing quacks.

- ❖ It has been established earlier that making a city really smart, sustainable and resilient starts with the creation of an accurate 3D map covering the entire city to show residential pattern and analysis of the attributes of each zone. These maps help city planners in the analysis and planning of appropriate housing schemes that can address the rebuilding and reconstruction of slums and uninhabitable habitats. ***We strongly recommend the use of this modern geospatial, up-to-date and précised 3D city maps, which are vital tools in proper decision-making at all levels of planning and execution of a 21st century compliant urban centres and cities.***

- ❖ ***Adequate and proper use of the right geospatial mapping and technologies involving DC, RS, GIS and GPS is also strongly advocated.*** Today, we now have access to newer, powerful and higher resolution satellite sensors, such as Worldview-4 (0.32m), Worldview – 2 & 1 (0.46m), GeoEye – 1 (0.46m), Quickbird (0.65m), TripleSat (0.8m), Ikonos (0.82m) and Spot 6 & 7 (1.5m). This means that a clearer image of the housing pattern and associated environmental conditions of different neighborhoods within the city (for instance) can be mapped and thus used to plan better. Moreover, Remote Sensing technology provides over 80% of geospatial data acquisition for a GIS analysis and then the map visualization with Cartography.

- ❖ Maps remain the best instrument for effective communication of spatial information, displaying, analysing and understanding the spatial relationships. With a graphic model, it brings to view both locational and attribute data

on any feature that is located on the surface, hence they are indispensable tools for project planning and implementation, resources allocation or the management and monitoring of urbanization, and several other applications. ***Our nation must invest and encourage the production of appropriate and up-to-date digital maps.*** For this, I recommend increased budgetary allocation to the Office of the Surveyor General of the Federation, the organ set up by the federal government to coordinate all matters relating to the production and approval of standard maps in Nigeria.

- ❖ As already enunciated in this lecture, the smart city solution is no doubt one of the ways forward in transiting from uninhabitable human habits. ***The idea of the Eko Atlantic City in Lagos State is novel. Being the first shot at Smart city technology in Nigeria, I suggest that everything that needs to be done or put in place to make the project succeed should be encouraged.*** This is because, everywhere these smart city technologies have been adopted or are being implemented, the overarching mission has been that as cities get smarter, they are become more livable and more responsive to optimize city functions and drive economic growth while improving quality of life for its citizens using smart technology and data analysis. Recall that it is only Lagos that is included in the World ranking of cities – No Port Harcourt, no Kano, no Jos, no Kaduna and no Enugu.
- ❖ It is my conviction that a more cost effective smart city technology where “City Greening” is adequately incorporated will be a good alternative and possibility to explore in our quest for smart and clean city. The idea is to protect the biodiversity and green areas of the city as way of mitigating the impact of climate change and green house gas emission. In some other cases, the house roofs are covered with green plants which help to modify the indoor temperature of the house. ***City greening of our built environment should be imbibed by property and estate***

developers. For Port Harcourt, the pride of a ‘Garden City’ is gone, but it can be redeemed with a ‘Smart Green City’ initiatives.

- ❖ Going forward, *the Nigeria government must as a matter of urgency align its relevant institutions with the drives and campaigns by the United Nations organs in the areas of promoting responsible management of our cities and urban centres.* There is need to fully identify and participate in the annual campaigns like the the New Urban Agenda (Agenda 2030), World Habitat Day marked every first Monday in October globally and the World Cities Day marked on every 31st of October. This is because the World Cities Day for instance, has enabled cities and communities around the world to come together on this important platform to learn and share best practices on sustainable cities and their practices.
- ❖ We have played enough of lip service to affordable housing delivery in Nigeria. The uncoordinated actions on human habitats and housing delivery through mortgage institutions and other schemes simply suggest that *our government (at all levels) lack the commitment to provide habitable habitats for her growing population in our rapidly urbanizing cities.* That is the more reason that the current “Affordable Housing Scheme” project of the Federal government has remained a mirage. It is partly as a result of this that the masses who are able to embark on putting up houses for themselves are forced to be at the mercies of the shylock developers. These developers in most cases, seems to be more concerned about the quick returns and profit on their investment in properties, rather than joining hand to contribute to the effort of delivering decent and habitable housing in a liveable environment at a reasonable cost.
- ❖ Finally, *the New Urban Agenda 2030 and the Sustainable Development Goal 11 are basically on making cities and*

human settlements inclusive, safe, resilient and sustainable. Government at all levels must mobilize their appropriate agencies and institutions to key into achieving SDG 11 in our country. The right atmosphere must be created by government for other stakeholders in the built environment to contribute their quota to ensure the vision and mission of SDG 11 and Agenda 2030 (tagged The City We Need 2.0) are realized. It therefore calls for more inclusive and sustainable forms of urbanisation, based in particular on a participatory, integrated and sustainable approach to urban planning. This is to ensure universal access to safe and inclusive green and public spaces, especially for women and children, older persons and persons with disabilities, and provide access to safe and affordable housing and transport systems.

I sincerely and most respectfully thank you for coming and for your rapt attention.

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CITATION



PROF. ANDREW ADESOLA OBAFEMI
(FNCA, FCAI, FECDMI, FIPMD, MANG, MNES, MISPN, REM(USA))
Professor of Geography, Geoinformation & Environmental Management,

Early Life and Education

Prof Andrew Adesola Obafemi hails from Aiyedayo – Amuro in Mopa-muro Local Government Area of Kogi State. He was born on February 2, 1964 to Pastor Solomon Olaoluwa Obafemi and Deaconess Ruth Omoleke Obafemi while his father was serving as the Assembly Pastor at The Apostolic Church, Ayewa, Aiyetoro-Gbede, then Kabba LGA, Kwara State now Ijumu LGA of Kogi State.

His educational voyage began at Kabba Local School Board Primary School, Egbe in 1971. On completion of his primary education in 1976, he proceeded to Mount Carmel College, Ilorin and latter to Abdul Aziz Atta Memorial College, Okene where he obtained his West Africa School Certificate (WASC) in 1983. He thereafter attended the Kwara State Polytechnic (SBS) for his A-Level from 1983 to 1985, and in the same year got admission to the University of Ilorin where he bagged a B.Sc (Hons.) Geography in 1988. After

his mandatory service to his fatherland through the National Youth Service Corps Scheme in the then Gongola (now Adamawa) State, he got admission into the University of Lagos where he obtained an M.Sc. with specialization in Cartography in 1991, and a year later registered for PhD in Cartography & GIS in the same department. For logistic reasons, he switched over to the University of Port Harcourt where he latter got another M.Sc and a PhD in Geography & Environmental Management in 2002 and 2006 respectively.

Career Development and Administrative Responsibilities.

He joined the services of the University of Port Harcourt in 1992 as an Assistant lecturer and rose through the ranks to become a Professor of Geography & Environmental Management in 2013. He helped to develop course contents for new courses that were introduced into the Geography programme by the NUC like Remote Sensing and Geographic Information System (GIS) which he equally taught for several years.

Prof. Obafemi has served creditably and is still serving in several positions of responsibility and committees within the University. He was the departmental exams officer from 1999 to 2008 when he was appointed the acting head of department from 2008 to 2010. Some of the other committees he served include, LOC, 2004 NUGA Games, Faculty Representative to College of Graduate Studies Board and Faculty of Education Academic Board, Vice Chancellor Adhoc-Committee on Staff Audit(2008), Basic Programme Board of Studies (2011- 2014). He was from 2009-2012 the Chairman, P T A, Gladys Cookey Int'l Day Care & Nursery School, Uniport. He's presently a member of senate and the senate representative on the University Council Development committee. He was the Assistant Director, Institute of Natural Resources and Sustainable Development (INRES) until recently when he was appointed Director, Centre for Disaster Risks Management and Development Studies, one of the Six National Emergency Management Agency (NEMA) centres of excellence in the training and capacity building for Disaster Risk Management in Nigeria.

Professor Obafemi loves his academic job like a calling, and has successfully supervised and graduated well over a 100 undergraduates, over 60 Master of Science and 8 PhD graduates. Apart from his regular attendance and presentations of papers at plenary and technical sessions in conferences within and outside Nigeria, he has published extensively in his chosen field of Geography and Geo-information Techniques in both national and internationally referred journals, books and conference proceedings. As a product of his years of teaching and research experience therefore, he has over 70 scientific publications to his credit.

Professional Activities, Certification and Recognitions

Prof. Obafemi belongs to several national and international professional associations such as Nigeria Cartographic Association (NCA), Association of Nigerian Geographers (ANG), Nigeria Environmental Society (NES), Geoinformation Society of Nigeria (GEOSON), National Registry of Environmental Professional (NREP, USA), Institute of Corporate Administrator (CIA) and Institute of Planning, Nigeria (IPN). He is a Registered Environmental Manager (REM-USA), a certified member of the Nigerian Institute of Safety Professional (ISPON), an IPN Certified Planner, a Fellow of the Institute of Corporate Administrator (FCIA); Policy Management Development (FIPMD); Institute of Policy Management Development (FIPMD); Environmental Crisis and Disaster Management Institute (FECRMI), and Fellow, Nigeria Cartographic Association (FNCA). He has been the National president of the Nigeria Cartographic Association (NCA) since October 2016, which also automatically makes him the Nigerian representative at the International Cartographic Association (NCA) Congress.

Prof. Obafemi is an experienced Geospatial and Environmental Consultant to several national and international corporations where he contributes his expertise in the area of Surveying and Geopositioning, Geospatial Mapping, Pollution Monitoring and Social Impact Assessment analysis. He is a Professorial assessor and

external examiner of Undergraduate and Graduate degree programmes of several Universities in Nigeria and South Africa. He has been a guest Editor of The Nigerian Journal of Cartography & GIS, Map and Associate editor of Journal of Geographic of Thought, and currently serves as a reviewer and member of the editorial board of several national and international journals. He has fairly travelled in and out of Nigeria, and enjoys field research and mapping as cartographic expression of geospatial data.

Family life, Social and Religious Activities

Prof. Obafemi is a devout Christian, who finds fulfilment in working and living in accordance with God's counsel and divine direction. He is a lay preacher, a family life counsellor, a gospel music minister a Tacsfonite and a life member the Full Gospel Business Men's Fellowship (FGBMFI). He has been an active member and leader in Our Saviour Chapel, the protestant Chaplaincy, the Monday Prayer Group as well as patron to several campus fellowships including TACSFON, NIFES, GSCF, JCCF, etc here in the university. He is happily married to Dr (Mrs). Deborah Temidayo Obafemi and they are blessed with four children namely Praise Olaoluwa, Peace Oluwadamilola, Paul Oluwatobi and Peter Ayodeji. Prof. Obafemi was a former Junior Amateur Boxer and Badminton player representing his state at various competitions. He has now settled for Badminton in his leisure time.

Distinguished Ladies and gentlemen, I present to you Prof. Obafemi, a seasoned scholar, a humble achiever, a certified planner, a Cartographer per excellence, an astute organizer and lover of nature and environment, a devoted Christian, a family life and career mentor, and indeed a man of many parts, who has by God's grace found fulfilment in making positive and timely impacts on the lives of his/her mentee and admirers, as our 158th inaugural lecturer.