



**SCHOOL OF ENVIRONMENTAL TECHNOLOGY,
FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA, NIGER STATE, NIGERIA**

EDITORS IN CHIEF

R. E. Olagunju

B. J. Olawuyi

E. B. Ogunbode

**SETIC
2020
INTERNATIONAL
CONFERENCE**

BOOK OF PROCEEDINGS

MAIN THEME:

Sustainable Housing And Land Management



3RD -5TH MAY, 2021



**SCHOOL OF ENVIRONMENTAL TECHNOLOGY COMPLEX,
FUT, MINNA, NIGER STATE, NIGERIA**

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Vice-Chancellor:
Federal University of Technology Minna, Nigeria

Host:

Prof: R.E. Olagunju mnia
Dean, School of Environmental Technology
Federal University of Technology Minna, Nigeria

**School of Environmental
Technology International
Conference
(SETIC 2020)**

3RD – 5TH MAY, 2021

**Federal University of Technology Minna, Niger
State, Nigeria**

CONFERENCE PROCEEDINGS

EDITORS IN CHIEF

R. E. Olagunju

B. J. Olawuyi

E. B. Ogunbode

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“Sustainable Housing and Land Management”

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PREFACE

The School of Environmental Technology International Conference (SETIC 2020) is organised by School of Environmental Technology, Federal University of Technology Minna, Nigeria. In collaboration with Massey University New Zealand, Department of Civil Engineering Faculty of Civil Engineering and Built Environment Universiti Tun Hussein Onn Malaysia, Malaysia Centre For Professional Development and Industrial Project Development School of Professional and Continuing Education (SPACE) UTM-KL Malaysia, Global Academia, Department of Architecture, Faculty of Engineering and Architecture, Istanbul Gelisim University Istanbul Turkey, Sustainable Environmental and Technology (SET) Research Group, Department of Architecture, Universiti Sains Islam.

The main theme for this year conference is “SUSTAINABLE HOUSING AND LAND MANAGEMENT”. This promotes and encourage innovative and novelty for policy issues for inclusive and sustainable housing; access to finance for housing and land development; sustainable building materials; building cost management; sustainable and resilient cities; geoinformatics for land management; rapid urbanization; sustainable land use and spatial planning and gender issues in access to land.

The responses from participants for this conference are overwhelming, well attended, and successful. The operation mode was virtual for all participants who choose the oral presentation mode and physical for all poster medium presenters. Our participants are from various Universities and other sector across the globe, from countries like United State of America (USA), Turkey, Malaysia, China, Saudi Arabia, Kenya, New Zealand and South Africa just to mention a few. Hence, this conference provides a good platform for professionals, academicians and researchers to widen their knowledge and approach on latest advances in research and innovation. Papers presented in this conference cover a wide spectrum of science, engineering and social sciences.

Finally, a note of thanks must go to SETIC 2020 Local Organizing Committee (LOC) for their remarkable dedication in making this conference a success. We hope the event will prove to be an inspiring experience to all committee members and participants.

ACKNOWLEDGEMENTS

The effort put together in achieving the success of SETIC 2020 is predicated on the feat of the first and second edition of School of Environmental Technology International Conference held in 2016 and 2018, respectively. The support and goodwill from Vice-Chancellor of Federal University of Technology, Dean School of Environmental Technology, Dr Dodo Y. A., Dr Moveh S. and many other highly motivated people are highly appreciated.

It is also my privilege and honour to welcome you all, on behalf of the Local Organizing Committee (LOC) to the 3rd edition of the Biennial School of Environmental International Conference (SETIC 2020). This Conference which was earlier schedule for 7th to 11 April, 2020 is holding now (3rd to 5th May, 2021) due to the challenges of COVID-19 Pandemic and the ASUU-FGN crisis which made our public Universities in Nigeria to be closed for about one year. We thank God for keeping us alive to witness the great SETIC2020 event, in an improved form exploiting the new-normal situation posed by the Pandemic for a hybrid (i.e. both physical and virtual) form of Conference participation.

The conference provides an international forum for researchers and professionals in the built environment and allied professions to address fundamental problems, challenges and prospects Sustainable Housing and Land Management. The conference is a platform where recognized best practices, theories and concepts are shared and discussed amongst academics, practitioners and researchers. This 2020 edition of SETIC has listed in the program a Round Table Talk on Housing Affordability beyond COVID-19 with selected Speakers from across the globe available to do justice on the topic of discussion.

Distinguished Conference participants, permit me to warmly welcome our Keynote and Guest Speakers:

- Prof. Ts. Dr. Mohd Hamdan Bin Ahmad, *Deputy Vice Chancellor (Development) Universiti Technology Malaysia (UTM)*;
- Assoc. Prof. Dr. James O.B. Rotimi, *Academic Dean Construction, School of Built Environment, College of Sciences, Massey University of New Zealand*;
- Assoc. Prof. Sr. Dr. Sarajul Fikri Mohammed, *General Manager, Centre for Professional Development and Industrial Project Development School of Professional and Continuing Education (SPACE), UTM-KL*.
- Prof. Ts. Dr. Zanail Abidin Akasah, *Visiting Professor on Sustainable Solar Integrated Design Building Design, International Micro Emission University (IMEU)/HIMIN Ltd. China & Senior Research Fellow, The Architects Resourcery, Jos, Nigeria*;
- Ar. Dr. Elina Mohd Husini, *Department of Architecture, Faculty of Engineering & Built Environment, Universiti Sains Islam*;
- Asst. Prof. Dr. Yakubu Aminu Dodo, *Department of Architecture, Faculty of Engineering and Architecture Istanbul Gelisim University, Istanbul Turkey*

and the five Speakers for our Round Table Talk on “Housing Affordability beyond COVID-19”

- Dr. Muhammad Mustapha Gambo, *Manager, Policy, Research and Partnerships, Shelter Afrique, Nairobi, Kenya*;

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- Prof. Dr. Soumia Mounir, *Department of Architecture Ecole Nationale d'Architecture d'Agadir [The National School of Architecture of Agadir], Morocco*
- Dr. Said Alkali Kori, *General Manager, Projects and Portfolio management, Family Homes Fund, Federal Ministry of Finance, Abuja;*
- Ts. Dr. Sasitharan Nagapan, *Department of Civil Engineering, Faculty of Engineering and Built Environment, Universiti Tun Hussein Onn Malaysia, Malaysia;*
- Dr. Mercy Nguavese Shenge, *AIA Assoc. Historic District Commissioner, City of Rockville, MD, USA.*

for accepting to share from their knowledge, wealth of experience and be available to interact with participants on varied issues on “**Sustaining Housing and Land Management**”.

As reflected on the Conference program, the Conference activities will be Virtual for power point presenters to run in four parallel sessions on the Zoon platform while the participants for Poster presentations (mostly Postgraduate students) are expected to have their Posters displayed in the Environmental Complex Building of the Federal University of Technology, Minna. With a total of One Hundred and One (101) articles captured in the Conference Proceedings covering the seven subthemes of the Conference, I have no doubt that we are all in for an impactful experience at SETIC2020 as we brainstorm, exchange ideas, share knowledge and participate in evolving more approach to sustainable housing and land management drives.

I implore us all to enjoy every moment of the deliberations and ensure we maximize the great opportunity offered by the Conference to network for better research and career development as we also make new friends.

I also on behalf of myself and the LOC express our appreciation to the Dean, School of Environmental Technology and the entire Staff of the School for giving us the opportunity to steer the ship for SETIC2020. To the Reviewers and various Committees that served with us, I say thank you for helping us through despite the pressure of work.

Thanks, and God bless you all.

Olawuyi, B.J. (PhD)
Chairman, LOC
SETIC2020

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DECLARATION

PEER REVIEW AND SCIENTIFIC PUBLISHING POLICY STATEMENT

3rd May 2021

TO WHOM IT MAY CONCERN

I wish to state that all the papers published in SETIC2020 Conference Proceedings have passed through the peer review process which involved an initial review of abstracts, blind review of full papers by minimum of two referees, forwarding of reviewers' comments to authors, submission of revised papers by authors and subsequent evaluation of submitted papers by the Scientific Committee to determine content quality.

It is the policy of the School of Environmental Technology International Conference (SETIC) that for papers to be accepted for inclusion in the conference proceedings it must have undergone the blind review process and passed the academic integrity test. All papers are only published based on the recommendation of the Reviewers and the Scientific Committee of SETIC

Babatunde James OLAWUYI
Chairman SETIC2020
Federal University of Technology, Minna, Nigeria

Papers in the SETIC2020 Conference Proceedings are published on www.futminna.edu.ng,
AND ALSO SELECTED PAPERS WILL BE PUBLISHED IN REPUTABLE JOURNALS



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Prof. Abdullahi Bala
Vice-Chancellor,
Federal University of Technology Minna, Nigeria

HOST

Prof. Olagunju Remi Ebenezer
Dean
School of Environmental Technology,
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Prof. Kemiki O.	Building Cost Management
Prof. (Mrs) Zubairu S. N.	Gender Issues in Access to Land
Prof. Nuhu M. B.	Access to Finance for Housing and Land Development
Prof. Ajayi M.T.A	Policy Issues for Inclusive and Sustainable Housing
Prof. Sanusi Y.A	Rapid Urbanization, Sustainable Land Use and Spatial Planning
Prof. Jimoh R.A.	Sustainable Building Material

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ACKNOWLEDGEMENT TO KEYNOTE SPEAKERS AND GUEST SPEAKERS

SETIC 2020 organisers wishes to thank our keynote speakers, and Guest speakers for accepting to create time to share from their rich wealth of knowledge and interact with delegates and participants on varied issues being examined at this year's conference. A brief profile of each keynote speaker is provided here, this would allow for future interaction and networking with them.



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ROUND TABLE PANEL SPEAKERS



Round Table Talk
On Housing Affordability Beyond Covid-19

Main Theme

SUSTAINABLE HOUSING AND LAND MANAGEMENT

Dr. Muhammad Mustapha Gambo
Manager: Policy, Research and Partnerships,
Shelter Afrique, Nairobi, Kenya.

Prof. Dr. Soumia Mounir
Department of Architecture Ecole Nationale
d'Architecture d'Agadir [The National School of
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Dr. Said Alkali Kori
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Nexus between Social Infrastructure and Residents Wellbeing: A Review

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Abstract

Social infrastructure refers to various neighborhood facilities and services which improve cohesion and participation among residents to create a livable environment. Infrastructure is crucial to the development of a vibrant city. However, it is a requisite tool for human and social capital development, as it provides response to the basic needs of individuals and the community at large. Although social infrastructure is provided at various levels, the provision at neighborhood and urban centre's affect the wellbeing of residents and improve community sustainability. Despite several inputs by different authors on this subject, little have been said about the link between social infrastructure and wellbeing of residents at the urban centre's. Hence, this paper attempt to explore literature on the nexus between social infrastructure and resident's wellbeing. The study was achieved through systematic and random review of recent and relevant literatures on social infrastructure, quality of life and wellbeing. Also theories and concept of individualism, collectivism and cognitive psychology were highlighted. The review has observed that the role of social infrastructures play on residents wellbeing cannot be over thrashed. Therefore, it is necessary for development policies in the urban place to be in tone with best global practices, geared towards improving the living standards of residents by providing an enabling environment for individual capacity building and collective social development in order to improve resident's wellbeing.

Keywords: Infrastructures, Livability, Sustainability, Wellbeing and Development

INTRODUCTION

Social infrastructure services can be referred to as various services such as (education, medical, postal services, personal security, transport, communication etc.) which are provided mostly by the public sector to ensure that the living standards of residents are improved (Vaznonien and Kiausiene, 2018). Recent statistics have indicated that globally, cities are currently home to the majority of the world's population, an estimated one billion people are living in slums according to UN secretary- General on SDG progress report (2019) and he stressed that swift action is necessary to reverse the current situation.

Urban center's in Africa has become one of the fastest-growing regions of the world and rapid expansion is mostly hinged on the output of rural urban migration due to aspirations for life satisfactions, well-being and quality living (Satterthwaite, 2017). However, in sub Saharan Africa, the rate of urbanization growth and infrastructure inequalities has attracted global attention (Abubakar, 2010).

Rees *et al.* (2010) in their discussion argued that wellbeing gives relatively broad illustration of the living standard of the population and comprises both concepts, measuring the subjective satisfaction of the people which involves happiness, relations within families, with allies and colleagues. More so, it has to do with access to basic amenities within the residents and a situation where this is lacking it results to a situation of ill-being, a situation where people are experiencing low wellbeing or a state of deprivation (Rojas, 2014). Furthermore, Abuja is now the fourth prime urban region in Nigeria after Lagos, Kano and Ibadan. The city's rapid rate of urban development is more shocking in its satellite towns, which are rising at close to 20% per annum. There is no doubt that the available infrastructures there have been overstretched as a result of this expansion (Abubakar and Doan (2010).

The ultimate objective of the sustainable development goals (SDGs) is to end poverty in all its forms everywhere so as to improve wellbeing and standard of living (SDGs, 2016). The idea of sustainable development is the kind of development that caters for the needs of the present generation without compromising the ability of the future generation to meet their own needs and aspirations (WCED, 1983). Lately, many researchers have conducted studies on urban problems that has to do with human wellbeing and sustainability and this is in line with the

United Nations (UN) sustainable development goals which include poverty reduction, zero hunger, good health, wellbeing, quality education, access to clean water, sanitation and others (UNDP, 2011). This study is a review of literatures on the nexus between social infrastructures and resident's well-being in the urban place.

Conceptual Framework

The conceptualization of wellbeing revolves round two schools of thought namely; the objective perspective which originates from the Scandinavian welfare research tradition and the subjective perspective which was derived from, and prevails in, the American quality of life research tradition (Susanne and Schwanen, 2013). The subjective idea believes that an individual's opinions and experiences are the basis for assessments of how well he or she lives. Alternatively, Gasper (2014) opined that the act of feeling and thinking, becoming and living and dying, and more, constitute a being. Therefore, he stressed that well-being thus has diverse aspects rather than set up a precisely delimited, narrow single notion of well-being, and then try to police its correct usage. He studied Wellbeing as an umbrella notion which comprise of the following ideas; Hedonism; well-being seen as pleasure, Desire theories; well-being seen as preference or desire fulfilment and Objective list theories of substantive conceptions.

In the objective view, well-being is established from the evaluation of the objective circumstances in which people live, given standards based on values, goals or objectives. Lately, the most influential objective indicator of social well-being is the United Nations Development Programme's (UNDP) Human Development Index (HDI). The HDI is a composite index that, since 1990, measures well-being by aggregating four objective indicators (life expectancy at birth; mean years of schooling; expected years of schooling; and gross national income per capita) across 3 dimensions—health; education; and living standards (UNDP 2011).

Social infrastructure services have increased over the recent decades, but due to the economic crises and demographic challenges, there has been a shift in understanding of how Social infrastructure services should serve people. Also, several scholars have explored the concept of wellbeing but the aim of this article is not to discuss the evolution of wellbeing. However, it is targeted towards the importance of infrastructure services to urban dwellers. Community wellbeing has to do with a community infrastructure that is accessible and available to all and supports the gathering of residents, healthy ecosystems that provide the region with valuable resources which support the sense of place (Vazonien and Kiausiene, 2018).

Rojas, (2014) argued that well-being is conceptualized from the view point of the individualist culture which is seen as a living experience of being happy with oneself. People do experience well-being and they are in a privileged position to report what their situation is; it is for this reason that subjective well-being provides useful information about happy or satisfied people feel about their immediate environment. Hence, following a subjective well-being approach to poverty, Social infrastructure services could not only aim to abate poverty but they could also have targeted to raise people's well-being. Necessities of communities as well as prospects to satisfy them are one of the most important factors affecting the demand and supply of Social infrastructure services. Needs of communities being the social determinants of higher wellbeing could motivate, stimulate or limit Social infrastructure development (Atkociuniene et al, 2015).

Livability

Veenhoven (2014) defined livability as the degree to which a living environment fits the adaptive collection of a species practical to human society, it denotes the fit of institutional arrangements with human needs and capacities (Kaal 2011). According to Livability hinges

upon three key symbiotic domains of social life: the economy, social well-being and the environment. (Hart, 1998) The livability theory has the following assumptions

- Like all animals, humans have innate needs, such as for food, safety, and companionship.
- Gratification of needs manifests in hedonic experience.
- Hedonic experience determines how much we like the life we live (happiness). Hence, happiness depends on need gratification.
- Need gratification depends on both external living conditions and inner abilities to use these. Hence, bad living conditions will reduce happiness, in particular when its demands exceed human capabilities.
- Societies are systems for meeting human needs, but not all societies do that job equally well. Consequently, people are not equally happy in all societies.
- Improvement of the fit between social institutions and human needs will result in greater happiness.

Sustainability

The concept of sustainability is a relatively new idea, the movement as a whole originates from social justice, conservationism, internationalism and other past movements with rich histories (WCED, 1983). The end of the twentieth centuries, many of these ideas had come together in the call for ‘sustainable development.’

According to UN (2003) The United Nations trapped former Norwegian prime minister Gro Harlem Brundtland to run the new *World Commission on Environment and Development*. In 1983 after decades of struggle to raise living standards through industrialization, many countries were still dealing with life-threatening poverty. According to Seghezze (2009) The reports from the world conference on environment and development in 1987 led to further review of the concept of sustainable development which propose a sustainability triangle formed by ‘Place, Permanence and Persons

Development

Sen, Amartya (1989), in his discussion on development and capabilities consider first an approach to development, in which the objective is to attain and withstand high rates of economic growth. The irresistible priority is economic growth. Here, the unit of analysis is obvious: the economy. The currency of evaluation is clearly monetary income. Trade-offs, such as between environment protection and employment creation, are in many cases resolved by market prices and exchange rates. He further stated that another approach to development in which the objective is to enlarge what people are able to do and be, what might be called, people’s real freedoms.

It is people centered. In this view, a healthy economy is one which enables people to enjoy a long healthy life, a good education, a meaningful job, family life, democratic debate, and so on. Nevertheless, the success of all this has to be judged ultimately in terms of what it does to the lives of human beings. The enhancement of living conditions must clearly be an essential if not the essential object of the entire economic exercise and that enhancement is an integral part of the concept of development (Bauer, 1971)

The UNDP (1990) first report on human development have pursued the idea of bringing the human development perspective to the front burner on a range of issues. Also, lately different entities are producing their own National and Regional Human Development Reports in addition to the global report and some countries have state or provincial reports. These reports are intended to assess the state of a population from the perspective of people’s lives and their analyses draw on data regarding people’s health, education, political freedoms, security, environment and other aspects of their lives (Alkire, 2002). Through assessing the state of a

population from a human development perspective, these reports have the political purpose to raise awareness and generate public debate regarding public issues and concerns which would not have been considered in the political agenda for implementation.

Social infrastructures and resident's well-being

The wellbeing of urban dwellers revolves within several systems of social infrastructural facilities that are available and accessible to them. The environment and health are main areas (apart from financial situation, job, leisure, and housing) that constitutes the concept of subjective well-being referring to how people experience the quality of their lives based on their emotional reactions and cognitive judgments (Joanna, 2018)

Transport provides the basic conditions for active functioning of national economy and society; it is an important tool of achieving social, economic, foreign-policy goals. Transport has become the principal tool for achieving the national goals (Popova, 2017). Simultaneously, transport system can be a bottleneck of any economy, since the problems of transportation system facilitate the infrastructural restrictions and create the threat of deceleration of social development of the country. Most often that Social infrastructure which forms a system of social support and one can say that the communities aiming to satisfy the social demands create conditions for constant, continuing social evolution and reduces the feeling of helplessness of people when they come across problems which are abundant in the life of both a separate person and various communities (family, team, nation etc.) as well.

“If we are to have any chance of creating vibrant new communities that offer residents quality of life and that open up new opportunities – communities that are well balanced, integrated, sustainable and well connected – then we have to think about building for the wider needs of the whole community, not just focus on building homes.” (Emily et al, 2005) as cited in (Dette and Gartner, 1987)

According to Dette and Gartner (1987) the lack of social infrastructure to support new residents when they arrive slows the process of building a community and can create long-term problems for the wellbeing and opportunities of new arrivals. New communities need provision of space for support services first even before the development of buildings this article stressed the need of the idea of ‘walking distance communities’ where each neighborhood have each of the following; chemist, church, public community Centre and sports facilities.

Measuring Wellbeing

There is a wide acceptance of the fact that measurement of well-being can be considered using two broad approaches: objective and subjective measures. Hence, the both approaches are necessary. Objective measures make assumptions about what is required for any individual and then sets out indicators to estimate how far the requirements have been satisfied. Also, according to Selwyn and Riley (2015) the objective indicators usually measure three main areas namely; Economic, Quality of life and Environment. More so, objective measures on their own cannot measure a nation's progress completely and that subjective measures are also needed.

The subjective well-being approach understands well-being as the experience people have in their living conditions. Well-being is, in consequence, something that happens in the realm of the person and not in the realm of objects. Objects and factors may be of relevance in generating well-being, but they are not well-being (Rojas,2014). Hence, Subjective measures usually sample people's opinion to assess their own well-being. There are three broad approaches (the evaluative, experience and eudemonic) to measure subjective well-being. According to King et al., (2014) in his study acknowledged that subjective measurement tools focuses on individual reports of life experiences that complement social, economic and health indicators considering the extent to which ones perceived needs are met and the importance of that perceived need which has resulted to a major methodological flaws. It has been observed that

no single indicator can measure well-being across all the disciplines. Participatory methods and mixed methods approaches have provided valuable insights into how local people define well-being, and as Camfield et al. (2009)

note, *“The contribution of qualitative approaches to a focus on people’s resources and agency is that they can encompass areas of people’s lives that are influential and important, but rarely measured”*

Various methods have been used to scale, normalize, weight and aggregate wellbeing and sustainable development indices and much disagreement has sprouted regarding how to normalize the scores for the different criteria included to make them comparable (in terms of units and importance), and how to aggregate the standardized scores into an index (Bohringer and Jochem 2006).

Access to social infrastructures and resident’s wellbeing

The role of social Infrastructure services and physical planning in the development and establishment of sustainable cities cannot be over emphasized. This is because every plan must have spaces reserved for the location of infrastructures which will make the community livable and conducive. Residence wellbeing have several links with spatial variables especially in our immediate environment, the socio-economic and physical development of any geographical entity is a function of the investment in quality infrastructures (Sapkota, 2018). The World Bank in 2007 noted that the Organization for Economic Co-operation and Development (OECD) estimates that total global expenditures on infrastructure in energy, transportation, and water from 2000 to 2030 will need to be about \$57 trillion (in constant 2000 US\$) in order to attain targeted economic growth rates. About half of this spending will be in emerging economies, which have the greatest needs for additional infrastructures. Some of the arguments on wellbeing and infrastructure both locally and globally are as follows; (Eja et al., (2011), Bai, et al., (2012), Popova, (2017) Sapkota, 2018; Roy et al., 2018; Rigon, 2018) among others.

Eja et al (2011) conducted a study in port Harcourt on access to urban water supply and it was observed that water supply is a serious problem which result to people travelling long distance often on foot to get water for domestic use. This situation has often led children roam the street in search of water and deprive them of the opportunity to go to school and it has affected the well-being of the residents. Also, according to the Stockholm environmental institution, one-third of the world’s population already live in areas that suffer moderate to severe water shortages. The World Health Organization (WHO), noted that majority of people in new urban centers of developing countries do not have access to portable water, which is considered in developed countries to be a basic necessity (WHO, 1997). However, this research work does not state clearly the proportion of respondents that were captured within each zone of study this can affect the fair representation of the entire study area.

Bai, et al., (2012) Conducted a study on health and well-being in the changing urban environment and they observed that Urban poor communities are extremely exposed to health risks due to the deficiency of proper infrastructure, poor access to health care, information and knowledge networks. Such inequalities are not exclusive to, but more prominent in, developing cities, suggesting a universal need for better urban management and governance with the use of system approach to achieve equitable health and wellbeing outcomes. Furthermore, studies of Popova, (2017) examined the factors of population wellbeing and the relations with transport infrastructure development of Latvia around the Baltic States and he argued that transport infrastructure contributes immensely to people’s well-being. However, the study was limited to transportation infrastructure alone and indicators of wellbeing investigated in this research are level of poverty of population and level disposable income of households per capita.

Other indicators of well-being such as health, environmental quality and education were left out. Therefore, there is need to explore further in research to increase the area scope. Another study conducted by Sapkota, (2018) on the access to infrastructure and human wellbeing evidence from rural Nepal documents the level of access to infrastructures and assess its perceived impacts on human well-being in less remote communities and observed that the perceived impacts of access to infrastructure on human wellbeing is higher in more remote areas.

The study's outcome can be useful in similar areas in Nepal and, to a certain extent, in other parts of the world. More so, this study is applicable for choosing the best rural infrastructure projects in hilly and mountainous rural areas. However, the findings can provide only a reasonable reference to similar areas and establish a causal relationship between the level of access to different types of infrastructures on different aspects of human well-being, we suggest further research using larger samples. Also, in the method of selecting the samples only remote communities were picked it was not done randomly. The study concentrated on rural areas alone, what is the likely scenario of the urban place? More so, the survey was aligned to the living standard of Nepal as a result of the method of data collection and analysis that was adopted. Hence results from the studies will not be applicable elsewhere.

Rigon (2018) carried out an investigation on the analysis of wellbeing in urban Nigeria, by selecting some elite stakeholders in the urban sphere and sampling their opinions and the analysis revealed that there is need for underpinning urban policies with regards to human well-being. This study identified several approaches to understanding the concept of well-being such as; objective, hedonic, evaluative account, preference satisfaction, capability and functioning and he assumed that most of the approaches have some characteristics in common. Though he based his arguments on what different stakeholders have perceived well-being to be. The method and sampling procedure employed for this study does not have a fair representation of all the intended beneficiaries of the research findings.

Manggat et al (2018) carried out a research on the impact of infrastructure on rural communities in Malaysia they gathered that rapid growth in the rural economies is determined by the accessibility and the delivery of essential infrastructures and the impact of the infrastructure development is also related to the quality of social services especially in the aspect of education, health and the quality of life of rural communities in general. However, they observed that the provision of sufficient and efficient basic infrastructure is the basis of a good quality of life among rural communities. Nevertheless, this review focused on the rural areas alone without considering the urban and peri-urban areas that experience the same challenges as a result of urbanization.

Melanie et al (2017) carried out a study using spatial measures to test a conceptual model of social infrastructure that supports health and wellbeing tested a limited number of pathways in a new conceptual framework of social infrastructure and found preliminary support for associations between social infrastructure and SWB. The research opined that accessibility to a range of social infrastructure services promoted the SWB of residents. The conceptual framework was tested using spatial neighborhood attributes and regularly collected population health survey data to demonstrate the importance of both access, and mix of social infrastructure services as upstream health determinants and their influence on downstream health outcomes.

The study further noted that people had spatial access to SI services within 800 m and others with access nearly doubled at 1600m. Hence, having access to single services at 1600m was not most beneficial to health and results suggested that the mix of social infrastructure services available within 800m was most beneficial to residence well-being. Nevertheless, this research considered only the health outcomes without looking at other factors that constitute wellbeing.

Also, applicability of social infrastructure services and facilities to different demographic groups to assess their relative influence on health and wellbeing was not explicit enough. The issue of service quality, service capacity and delivery was not considered appropriately.

Ikenna (2016) discussed the access to social infrastructure in contrast to availability in rural areas of Imo State. The study used Questionnaire survey method and oral interviews to gather data on identified indices of accessibility to social infrastructure, income or affordability. Also, three variables of social infrastructure were used in this study; health care facilities, schools and leisure centers. The result shows a strong positive relationship between income and access to social infrastructure in the pilot area. However, this research was carried out in rural areas of Imo state, the basis for selection of those pilot areas were not explicit enough and the sampling procedure for the sample frame was not clearly stated. It did not explain how the house hold heads will be sampled whether randomly or systematically and the proportion of respondents per area was not determined in the study. Furthermore, the second objective which is to ascertain the conditions of social infrastructure in the study area was not properly captured in sources of data. There was no check list to examine the state functionality or physical conditions.

Improving the quality of life has been a subject of discussion by various researchers in the past but the aspect of defining what the quality of life entails and measuring progress has not been properly captured in literature (Costanza et al, 2006) in his study an approach integrating opportunities, human needs and subjective well-being. He concentrated on the definition of the indicators of quality of life from different disciplines with respect to measurement of human needs with objective and subjective well-being approaches. Therefore, integrating these two concepts in the research was able to overcome the issue of bias and it gives a clearer picture of QOL in both multiple spatial and temporal scales. Hence quality of life was defined as the extent to which human needs are met in relation to individual or group perceptions of subjective well-being. Also this study provides a foundational insight needed to make an integrative QOL tool more robust and applicable across temporal, cultural and spatial scales for resolving the issue of scale and weighting of variables.

Despite the contribution of all these studies much has not been said about the urban infrastructure provisions and resident's satisfaction locally especially in Nigeria with its fast growing urban Centre's. Abuja is among the sub-Saharan African cities experiencing series of urban infrastructural deficit as a result of its rapid urban population growth without urban governance structures in place that can meet their challenges and manage the changes (Satterthwaite, 2016). It has been named among the fragile cities in West Africa because municipal authorities and their institutions are unable or unwilling to provide basic services to urban residence (Muggah, 2016). Hence this study identified the following gaps in existing literatures; insufficient local data on the subjective and objective measurement of residents wellbeing, especially at the neighborhood level and Urban place with respect to access to infrastructure provisions, satisfaction with living environment and overall quality of life which will provide useful data to policy makers for inclusive planning procedure, project implementation by Non-governmental organizations and other international development partners.

CONCLUSION AND THE WAY FORWARD

The relevance of infrastructure provisions to resident's satisfaction cannot be overemphasized in the quest to achieve sustainable development goals. Also, it is necessary for development policies in the urban place to be in tone with best global practices in the world in order to improve it ranking among contemporary global cities. Therefore, it is against this background that this study decides to carry out an analysis on urban infrastructure and residents wellbeing

in the urban space with the view of opening new areas of research, fill existing gaps identified in literature so as to provide the basis for proper implementation of policies and plans that will create a conducive environment for living and working for urban residence.

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Impact of the Land Use Act on Sustainable Housing Development in Nigeria from 1978-2018

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Abstract:

The Land Use Act ('the Act') was enacted to address the problems associated with acquisition of land for development purposes such as housing development. However, since the inception of the Act about 42 years ago, the objective of sustainable housing development in Nigeria has not been realized as majority of Nigerians cannot afford decent housing. The research problem lies in the inability of the Act to facilitate housing development and delivery in Nigeria which can be traced to requirement of consent of Governor, the power of revocation of land for public purpose, and entrenchment of the Act in the constitution. The objective of this paper is therefore to examine the legal effects of these provisions on housing development. This paper employs the doctrinal method of research by reliance on legislation, case laws, textbooks and journal articles to examine the impact of the Act on housing development in Nigeria. The finding of this paper reveals that the requirement of Governor's consent and exercise of power of revocation are serious impediments to access to land for housing. More so, the entrenchment of the Act in the Constitution made it difficult, if not impossible, to amend the Act. It is thus recommended that the Act should be amended to make the processes of revocation of land by government and obtaining consent of the Governor less cumbersome. Finally, the constitution should be amended to expunge the Act from the Constitution to make it easy for Act to be amended to fastrack the development in the housing industry.

Keywords: Land, Housing, development, Constitution,

INTRODUCTION

The significance of land to any society cannot be over-emphasized due to the fact that every development has to be carried out on land. Access to land is an indispensable factor to be reckoned with in a capital intensive investment such as provision of mass housing to Nigerians by government.⁵⁶ For housing purposes, land is an indispensable factor in any plan to provide houses to the citizens or to provide financial assistance to those who want to build and own their own houses. In Nigeria, government is under a social contract to ensure that Nigerians have equal access to property and property rights, and to direct its policy towards ensuring that suitable and adequate shelter is provided for all Nigerians.⁵⁷

However, there has been shortage of low-cost housing units in Nigeria which has pushed many Nigerians including the working class to the slum areas. Nigeria is currently faced with a housing deficit of about 17 million units, and thus requires an additional one million housing units per annum for the next eight years to reduce the deficit.⁵⁸ Umezulike (2016) submitted

⁵⁶ Dimuna, K.O. (2016) Enhancing Land Acquisition for Individual Housing Development in Nigeria: A Case Study of

Benin Metropolis Edo State, Nigeria. International Journal of Research and Innovation in Applied Science (IJRIAS),

Vol.1, Issue VII, p.1.

⁵⁷ Section 16(2)(d) of the Constitution of the Federal Republic of Nigeria (1999) as amended.

⁵⁸ Umezulike, I.A. (2016) The Land Use Act-A Catholic Legislation? In: Utuama, A.A. (ed.) Critical Issues in Nigerian

that the Land Use Act⁵⁹ (hereinafter referred to as ‘the Act’) has sufficiently addressed the issues of planning, development and control of land in Nigeria as a springboard to mass housing delivery in Nigeria.⁶⁰ This submission of the learned author seems to suggest that the Act has achieved the objectives for which it was enacted, and that the problem of inadequate housing in Nigeria lies outside the Act. However, this research is driven by the position that the problem of inadequate housing in Nigeria lies within the Act.

The basic philosophy of the Act is to make land available to all Nigerians and to preserve the right to land.⁶¹ The Act sets out a legal framework for a national land policy, and it represented a shift from the colonially inspired *laissez faire* policy of ‘dualism’ in the Southern states, and in the Northern States, a modification of inherited policy of ‘paternalism’; to one anchored on the “trusteeship” policy.⁶² The trusteeship policy was intended to achieve certain objectives such as to secure for Nigerians the right to land for building, residential and commercial purposes. The policy also re-affirms that nobody in Nigeria apart from the state or federal government owns land, and power of management and control is vested in the Governor who is a trustee.⁶³

The objective of Government towards providing housing for all as contained in the National Housing policy, which seeks to provide affordable housing for Nigerians, has not been achieved, even as the National Housing policy has become an illusion.⁶⁴ The research problem is based on the inability of the Act to address the problem of housing deficit in Nigeria arising from high cost of land, and lack of security of title to land. Thus, despite the existence of the Act for more than four decades, it has fallen short of realizing one of its fundamental objectives of making lands available to Nigerians for housing purposes. The geographical scope of the paper extends to the whole country because the Act has nation-wide application, and the problems associated with the Act which impact negatively on housing development in Nigeria are not restricted or peculiar to a particular zone or state. Hence, the need to examine the impact of the Act since its inception in 1978 to 2018, which marks four decades of the enactment of the Act. This paper employs doctrinal research methodology which is a purely theoretical research, and is concerned with analysis of the legislation and case laws and how they are applied.⁶⁵ The aim of this paper is to examine some aspects of the Act that inhibit and pose challenge to sustainable housing development in Nigeria, and the objective of the paper

Property Law. Malthouse Press Ltd, Lagos, p.98.

⁵⁹ Cap. L5, Laws of the Federation of Nigeria, 2004.

⁶⁰ Umezulike, I.A. Op. Cit. p.98.

⁶¹ Utuama, A.A. (2002) Nigerian Law of Real Property. Malthouse Press Ltd, Lagos, Second Edition, p.263.

⁶² James. R.W. (1982) Nigerian Land Use Act: Policy and Principles. University of Ife Press, Ltd, Ile-Ife, p.1

⁶³ Madaki, A.M. (2006) “The Land Use Act Policies: An Overview”. Journal of Private and Comparative Law, Ahmadu

Bello University, Zaria, p. 86.

⁶⁴ IHEME, J.O. Et al. (2015) The Effect of Government Policy on Housing Delivery in Nigeria: A Case Study of PortHarcourt Low Income Housing Programme. International Letters of Social and Humanistic Sciences, SciPress

Ltd, Switzerland, p.88.

⁶⁵ Ali, S.I Et al. (2017) Legal Research of Doctrinal and Non-Doctrinal. International Journal of Trend in Research and

Development, Vol.4(1), p.493.

therefore is to establish that the Act is partly responsible for the problems of housing development in Nigeria, and proffer solutions to these problems, and suggest how the Act can be used as a viable tool to revolutionalise the housing industry in Nigeria.

HISTORICAL BACKGROUND TO THE ACT

Before the arrival of the Europeans in Nigeria, every community in Nigeria had its own customary law through which land was acquired and managed. However, with the advent of the Europeans, series of allegations were made against customary law. The customary law was regarded as archaic and too primitive, and it did not guarantee security of title to land, and land was not alienable.⁶⁶ The difficulties associated with land acquisition for development project and individual ownership of land coupled with speculation in urban land were highlighted in the Third National Development Plan 1970-1980.⁶⁷ In urban areas, acquisition of land both for government projects and other building purposes became virtually impossible. Additionally, there was the problem of insecurity of title under customary law. The inability of the public and private sectors to provide sufficient shelter for the people, and even the inflationary trends in the economy were blamed largely on the system of tenure.⁶⁸

The Anti-Inflation Task Force highlighted the need to avoid the injustice of private appropriation of socially created wealth, and to remove the bottle-neck that land constituted to development and, in particular, to the expansion of the housing programmes.⁶⁹ The Report recommended the promulgation of a legislation that would vest all lands in the state government. In 1977, the military government set up the Land Use Decree Panel which Report was never made public.⁷⁰ However, the Reports of the Land Use Decree Panel and the Anti-Inflation Task Force culminated into the promulgation of the Land Use Decree which was essentially based on the Land Tenure Law of 1962.⁷¹

SUSTAINABLE HOUSING DEVELOPMENT

The concept of sustainable housing is synonymous with sustainable growth. Sustainable housing development can be defined as the development and implementation of policies, programmes or initiatives designed to deliver safe, viable and affordable houses for individuals.⁷² This concept adopts the tenets of sustainable social, economic and environmental factors in delivering national housing plans and policies for the masses with minimum impact on the environment. The importance of housing to man cannot be overemphasized. Good housing serves as a place where a person gets shelter, comfort, security and dignity among others.⁷³

⁶⁶ Aboki, Y. (2005) "The Land Use Act and Foreign Investment in Nigeria". Contemporary Issues in Nigerian Law.

Chukkol, K.S. et al. (eds.) Faculty of Law, A.B.U. Zaria, pp.5-6.

⁶⁷ Ibid.

⁶⁸ Olong, A.M.D. (2011) Land Law in Nigeria. Malthouse Press Ltd, Lagos, Second Edition, p.142.

⁶⁹ James, R.W. (1982) Nigerian Land Use Act: Policy and Principles. University of Ife Press Ltd, Ile-Ife, p.26.

⁷⁰ Ibid.

⁷¹ Ibid. p.27; see also Olong, A.M.D. Op. Cit. p.143.

⁷² Ojoko, E.O. (2016) Sustainable Housing Development in Nigeria: Prospects and Challenges. Journal of Multidisciplinary Engineering Science and Technology (JMESI). Vol.3, Issue 5, Available at <https://www.researchgate.net/publication/304538510>. Accessed on 8/09/2019 at 12:14am

⁷³ Aluko, O. (2012) "The Effects of Land Use Act on Sustainable Housing Provision in Nigeria: The Lagos State

The history of formal intervention into housing sector in Nigeria dates back to the colonial administration with the establishment of the Lagos Executive Development Board which was focused on the provision of expatriate quarters.⁷⁴ However, a robust housing policy was launched by the then military government in 1991 with the slogan ‘Housing for all by the year 2000 A.D’. The goal of the policy was for all Nigerians to have access to decent housing at affordable cost before the year 2000.⁷⁵ This policy was rigorously pursued but it was besieged by administrative bottlenecks which made it difficult for the objective of the policy to be realized.⁷⁶ In 2002, the Housing and Urban Development Policy was formulated to correct inconsistencies of the Act as well as to allow land to be used in a free market economy.⁷⁷ The inability of previous policies to adequately resolve the backlog of housing problems in Nigeria reveals the need for more pragmatic solutions, and this forms the basis for a review of the 1991 National Housing Policy.⁷⁸ Given the importance of housing in the national economy, the federal government of Nigeria set up a 15- man committee on urban development and housing in 2001 with a responsibility to articulate a new housing policy.⁷⁹ The report of the committee as accepted by the federal government was published in government white paper on the report of the presidential committee on urban development and housing in the year 2002.⁸⁰ The report contains a new housing policy, which was subsequently published in the year 2006.⁸¹ Due to the failure of the previous policy, a committee was set up to review previous National Housing Policy, and a new National Housing Policy was adopted in 2012 with the following objectives: develop and sustain political will of governments for the provision of housing, develop an efficient land administrative system to enable land ownership available, accessible, secure and easily transferable at affordable price, and provide adequate and affordable housing finance to all Nigerians by developing efficient primary and secondary mortgage markets.⁸² Additionally, the goal of sustainable housing development as contained in the Goal 11 of the United Nations (UN) 2030 Agenda for Sustainable Development is ‘increased access to sufficient, safe, and low-cost housing’ for the world’s poorest people living in the slum areas.

Experience”. *Journal of Sustainable Development*, Vol.5, No.1, p.117

⁷⁴ Bello, A. (2019) Review of the Housing Policies and Programmes in Nigeria. *International Journal of Contemporary Research AND Review*, Vol.10, Issue 2, p.10.

⁷⁵ *Ibid.*,p.11.

⁷⁶ Abraham, S.S. (2019) Assessment of National Housing Policy and Homelessness in Nigeria: Policy Options for Buhari’s Administration. *Journal of Humanities and Social Science*, Vol.24, Issue 5, p.35.

⁷⁷ *Ibid.*

⁷⁸ Waziri, A.G. and Roosli, R. (2013) Housing Policies and Programmes in Nigeria: A review of the Concept and Implementation. *Business Management Dynamics*, Vol.3, No.2, p.64.

⁷⁹ *Ibid.*

⁸⁰ *Ibid.*

⁸¹ *Ibid.*

⁸² *Ibid.*

However, Nigeria is presently the most populous African country with the largest economy. The deplorable situation of housing in Nigeria has been captured thus:⁸³

...decent and adequate shelter is one of the basic needs of the individual, family and community. The house and the environment on which it stands also have profound influence on human health, efficiency, social behaviour and satisfaction. Therefore, the importance of providing adequate number of dwellings which contain essential utilities and services for community life and satisfies reasonable standards of comfort and hygiene cannot be overemphasized as shelter is basically acknowledged to have a profound impact on the lifestyle, health, growth, happiness and productivity of an individual. Therefore, lack of it is one of the worst forms of poverty. An overview of the housing sector in Nigeria clearly reveals that access to adequate and affordable housing remains elusive to many Nigerians both in the urban and rural areas.

The above statement summarizes the importance of housing to the individual and the community, and how decent accommodation or shelter affects the social and economic life of the individual and society. Nigeria is one of the poorest countries of the world with majority of the population living below poverty line. The implication is that only few Nigerians can afford to buy land to build their houses. In Lagos, Ibadan, Kano, and Abuja, the need for housing is rising by about 20 percent a year as current total output in the formal housing sector is estimated at no more than 100,000 units.⁸⁴ While no adequate data available, it is clear that the formal sector is only producing a fraction of the total number of urban units needed each year.⁸⁵ The UN estimates that by 2050, 75 percent of the population will be living in cities.⁸⁶ This translates into an annual housing requirement over the coming decades of at least 700,000 units just to keep up with growing population.⁸⁷

IMPACT OF THE ACT ON SUSTAINABLE HOUSING DEVELOPMENT

There are some provisions of the Act which have created problems that militate against housing development in Nigeria thereby accounting for the slow pace of growth and development in the housing sector. It may be argued that the Act has addressed all issues relating to planning, development and control of land in Nigeria, and therefore government has no major obstacle in the acquisition of land for mass-housing delivery to the citizens. However, the World Bank report shows that changes to the land and legal framework can help to speed development of the housing and mortgage sectors.⁸⁸ Thus, the objective here is to highlight those aspects of the Act that constitute a clog in the wheel of sustainable housing development in Nigeria.

⁸³ Chinwuba, N.N. (2016) Concept and Conception of Property in Law: The Link with Shelter in Nigeria. In: Utuama,

A.A. (ed). Critical Issues in Nigerian Property Law. Malthouse Press Ltd, Lagos, p.25.

⁸⁴ (2016) Nigeria: Developing Housing Finance. World Bank. Available online at:

<http://documents.worldbank.org/curated/en/102491481528326920/pdf/110897-WP-P131973-PUBLIC-HousingFinanceNigeriaweb.pdf>. Accessed on 1/4/2020 at 10:15am.

⁸⁵ Ibid.

⁸⁶ Ibid.

⁸⁷ Ibid.

⁸⁸ Ibid.

Consent Requirement under the Act

The provision that the consent of the Governor must be obtained before any transfer of right over land can be effected is perhaps the most potent provision of the Act which enhances security of title.⁸⁹ The implementation of the consent provision has placed severe bottlenecks in the path of those willing to acquire or transfer land for residential, industrial or commercial purposes thereby impeding housing development in the country. Section 22 (1) of the Act provides that it shall not be lawful for the holder of a statutory right of occupancy granted by the Governor to alienate his right of occupancy, or any part thereof by assignment, mortgage, transfer of possession, sub-lease or otherwise howsoever, without the consent of the Governor first had and obtained.

Thus, the Act forbids alienation of rights of occupancy in any manner without the requisite consent, while section 26 of the same Act says that any alienation without the consent shall be null and void. The same restraint applies to the holder of customary right of occupancy and statutory right of occupancy.⁹⁰ Thus, in *Brossett Manufacturing Nig. Ltd v. M/S Ola Ilemobola Ltd*,⁹¹ the Supreme Court held that any alienation without the Governor's consent is null and void. In *Savannah Bank of Nigeria v. Ajilo*,⁹² the Supreme Court decided that all transactions under which an interest in land is transferred requires consent for its validity otherwise it is void. As rightly observed by prof. Sagay, as a result of this decision of the Supreme Court, Savannah Bank was unable to realize the primary purpose of mortgage in this case i.e. sale of the property as a consequence of default on the part of the mortgagor. He further noted that this case sent alarm bells ringing in many banks because of the possible abuse and exploitation to which the principle could be put by unscrupulous debtors; indeed there was a danger that banks' lending activities would be stalled with the attendant effect on economic activities.⁹³

Luckily the Supreme Court seems to have realized its error because in subsequent cases of *Awojugbagbe Light Ind. Ltd v. Chinukwe*⁹⁴, and *Attorney General of the Federation v. Sode*⁹⁵, it held that in land transactions, the holder of the right of occupancy is the person to obtain the governor's consent as well as to register the deed in the Land Registry.⁹⁶ The position of the law now that failure to obtain consent does not render the transaction a nullity is more inclined to doing substantial justice rather than adhering to mere technicality. The implementation of the consent provision of the Act has placed severe bottlenecks in the path of those willing to acquire or transfer land for industrial or residential purpose. The problem has been summarized thus:⁹⁷

⁸⁹ Taiwo. E.O. (2005) "Interpretation and Constitution of the Phrase 'Consent First hand and Obtained' under Section 22 of the Land Use Act, 1978". *University of Ibadan Journal of Private and Business Law*, Vol.4, p.79

⁹⁰ FARMERS SUPPLY COM KDS V. MOHAMMED (2009) LPELR, pp.26-27, paras.D-B)

⁹¹ (2007) LPELR-809

⁹² (1989) 1 NWLR p.305.

⁹³ Sagay, I.E. (2000) *Nigerian Law of Contract*. Spectrum Books Limited, Ibadan, pp.376-377

⁹⁴ (1993) 1 NWLR (270) p.485 at 512

⁹⁵ (1990) 1 NWLR (p.128) p.500

⁹⁶ Sagay, I.E. Op. Cit, p.377

⁹⁷ Ogiji, L.O. (2015) *The Land Use Act and the Challenges of Restraints in Transfer of Land Rights*. Ahmadu Bello

University Law Journal, Vol.29-35, p.2.

The operations of the consent provisions of the Act have made land transaction more difficult and less economic. In fact, it can be said that the delay in seeking compliance with the consent provisions of the Act has tended to reduce considerably the number of land transaction; consequently, capital formation has not been satisfactory, so also is the general development process in the country.

Furthermore, the practice of demanding exorbitant consent fees by some states has been a source of great dissatisfaction.⁹⁸ There is no legal basis for charging consent fees. This constitutes serious impediment to access to land, and poses great challenge/difficulty in land/property transactions in Nigeria, thus making alienation of land as difficult as it was before the enactment of the Act.⁹⁹ Apart from the exorbitant nature of the fees charged for consent, it has also been stated that the government uses the opportunity to collect withholding tax, capital gains tax and stamp duties which increase the cost of accessing land, thereby making it difficult to alienate it.¹⁰⁰ There is thus a serious constraint on someone who is desirous to sell or buy a piece of land for housing purpose as a result of the high cost of land. The effect of the consent requirement was summarized as follows: “it is bound to have a suffocating effect on the commercial life of the land and house owning class of the society who use their properties to raise loans and advances from banks...these areas of the Land Use Act need urgent review to remove their problem nature.”¹⁰¹ Thus, the requirement that consent of the Governor must be obtained has a negative impact on the housing development in Nigeria. Any provision of the law that restricts alienation of land will definitely affect sustainable housing development.

Entrenchment of the Act in the Constitution

The Act was very unpopular at its inception and there were threats by some politicians during the 1978 political campaigns to abrogate it.¹⁰² This informed the decision to incorporate the Act into the constitution to prevent untimely abrogation of the legislation. However, the relationship between the Act and the constitution has generated controversies. This made Olanipekun (2016) to submit that the entrenchment of the Act in the constitution is a constitutional absurdity.¹⁰³ The provision of section 315(5) of the Constitution provides that the provision of the Act can only be amended in accordance with section 9(2) of the constitution. The result is that the procedure for amendment of the Act is the same as the procedure for amendment of the constitution, however stringent it is.

Section 315(6) of the Constitution also provides that the Act shall be regarded as one of the items in the Exclusive Legislative List. However, unfortunately, most lands in the country are

⁹⁸ Ibid, p.3.

⁹⁹ Ibid.

¹⁰⁰ Ibid.

¹⁰¹ Banire, M. (2016) Administration of Consent Provision under the Land Use Act: a Curse of Blessing for Development- Case Study of Lagos State. In: Utuama, A.A. (ed.). Critical Issues in Nigerian Property Law. Malthouse Press Ltd, Lagos, p.115

¹⁰² Olong, A.M.D. (2011) Land Law in Nigeria. Malthouse Press Ltd, Second Edition, p.144

¹⁰³ Olanipekun, W. (2016) Constitutionality of an Unconstitutional Act: The Unconstitutional Entrenchment of the Land Use Act in the Nigerian Constitution. In: Utuama, A.A. (ed.) Critical Issues on Nigerian Property Law. Malthouse Press Ltd, pp.164-165.

under the control of the state government. Therefore what is the rationale for considering the Act as one of the items in the Exclusive Legislative List? The entrenchment of the Act in the constitution appears to have elevated the Act beyond the level of ordinary legislations thereby making it impossible to amend.¹⁰⁴ It will appear that every attempt to revolutionise the housing industry in Nigeria must start from the genesis of the problem i.e. the incorporation of the Act in the constitution.

The present constitutional arrangement is not in the best socio-economic interest of property rights of Nigerians, as the entrenchment of the Act in the Constitution has frozen the principles of the Right of Occupancy and property rights.¹⁰⁵ More so, to amend the provisions of the Act, section 9(2) of the Constitution must be complied with. Thus the amendment must be supported by votes of not less than two-thirds majority of members of the House of Assembly, and approved by resolution of the Houses of Assembly of not less than two-thirds of all the states. This procedure is cumbersome because of the time and resources required, and the rigorous procedures involved.

Abuse of Power of Revocation

When the Act was promulgated in 1978, workers and Nigerians who wanted to own their houses heaved a sigh of relief. At last, they would own their own houses without having to purchase land at exorbitant prices from land speculators. The Act gave the Governor the power to revoke a right of occupancy for overriding public purpose.¹⁰⁶ Thus, section 28(1) of the Act provides “it shall be lawful for the Governor to revoke a right of occupancy for overriding public interest.” However, revocation can only be valid in the face of overriding public interest including but not limited to the purpose of exclusive government use, development for public good, and on the grounds of preservation of public safety.¹⁰⁷ This power was meant to ensure that the objectives of the Act of providing housing to Nigerians are achieved by making it possible for government to acquire land for building of housing estate/ projects.

However, it does not appear that the objective has been achieved. According to prof. Yakubu, the power of revocation is the part of the Act which frightens many land users.¹⁰⁸ The only class who could get grant of right of occupancy is those who are privileged and the elites¹⁰⁹. Other Nigerians who require land for residential and other developmental purposes are left to suffer. The process of obtaining grant and the expenses involved have discouraged many Nigerians who wanted land for development.

¹⁰⁴ Ibid.

¹⁰⁵ Utuama, A.A. (2016) “Underbelly of the Land Use Act: Activating the Wealth of the People. In: Utuama, A.A. (ed.)

Critical Issues in Nigerian Property Law. Malthouse Press Ltd, Lagos, pp.197-198.

¹⁰⁶ Section 28 of the Act

¹⁰⁷ Kindston, K.G. (2016) The Nigerian Land Use Act: A Curse or A Blessing to the Anglican Church and the Ikwerre

Ethnic People of Rivers State. American Journal of Law and Criminology, Volume 6, Number 1, Sacha & Diamond,

England, United Kingdom, p.153.

¹⁰⁸ Yakubu, M.G. (1986) Notes on the Land Use Act. A.B.U Press Ltd, p.37.

¹⁰⁹ Madaki, A.M. (2006) The Land Use Act 28 years after its Enactment: A Critical Assessment, Contemporary Issues

in Nigerian Law. Department of Private Law, ABU, Zaria, p.405

The Act has empowered only the governor to revoke right of occupancy for public interest. Unfortunately, the power is sometimes used to revoke strategically located lands for Nigerians and thereafter given to friends and others close to the corridors of power as rewards for patronage. In *Orianze v. A.G. Rivers State*,¹¹⁰ the Supreme Court stated that the revocation of right of occupancy is not just a mere executive or administrative act that can be done in secret or any surreptitious manner and later conveyed in official gazette; the holder of the right of occupancy is entitled to be heard before his interest can be validly revoked.¹¹¹ Therefore, it is very important for the government to comply with procedures for revocation of a right of occupancy.

Insecurity of Title in Customary Right of Occupancy

Before the enactment of the Act, the customary land tenure in the country did not guarantee security of title. Thus, buying of land from land owning families most especially in Southern states became a game of chance, as in most cases, the purchaser ended up buying lawsuit.¹¹² This was the precarious situations, and it was expected that with the enactment of the Act, these problems would be addressed. Although there is no provision in the Act specifically preserving the customary land tenure system as an institution, there are different provisions of the Act which unequivocally point at such preservation so that today, there is no doubt that the institution exists.¹¹³ While section 1 swept away all the unlimited rights and interest Nigerians had in their lands and substituted therefor limited rights in the form of a right of occupancy, the transitional provisions recognize and protect existing rights on land in that limited form.¹¹⁴ Unfortunately, due to the lack of documentation of the customary right of occupancy, the problem of insecurity of title still persists in relation to land covered by customary right of occupancy. Thus, it is easy for unsuspecting members of the public who want to buy land not documented to have comprehensive information on such lands. The Act introduced a right of occupancy as the main basic interest in land in Nigeria and the introduction of a certificate of occupancy is supposed to guarantee greater confidence and assurance to conveyancers in secured credit transactions in Nigeria.¹¹⁵

CONCLUSION

The housing industry in Nigeria has faced certain challenges arising from the poor implementation of the provisions of the Act. The Act was enacted to allow access to affordable land to Nigerians, and prevent land speculation. Unfortunately, four decades after its enactment, the impact of the Act has not been felt as a catalyst for sustainable housing development in Nigeria. Many problems militating against the growth and development in the housing industry can be traced to the Act.

¹¹⁰ (2017) 6 NWLR (Pt.1561) p.224.

¹¹¹ Ibid.p.296

¹¹² Verity, President of the West African Court of Appeal in *Ogunbambi v. Abowaba* (1951) 13 WACA 222 at p.223

¹¹³ Smith, I.O. (2013) *Practical Approach to Law of Real Property in Nigeria*. Ecowatch Publications, Revised Edition,
p. 116.

¹¹⁴ Ibid.

¹¹⁵ Umozulike, I.A. (2006) "The Land Use Act-A Catholic Legislation?" In: Utuama, A.A. (ed) *Critical Issues in Nigerian*

It is the finding of this paper that the Act being the legal framework for the control and management of land in Nigeria is a critical component in any plan and implementation framework for sustainable Housing development. However, some aspects of the Act have become clogs in the wheel of socio-economic development. A major challenge is the requirement that consent of governor must be obtained before alienation of interest can be valid. The regime of consent requirement has been characterized by exorbitant consent fees, and delays in processing the consent. Secondly, the inclusion of the Act in the constitution has made the Act rigid and irresponsive to changing socio-economic realities. There is no justification for incorporation of the Act in the constitution, and the inclusion of the Act in the Exclusive Legislative is absurd. Finally, the situation where land is vested in the Governor, and only the Governor can revoke right of occupancy for overriding public interest is against constitutional arrangement of the federal system of government operated in Nigeria. Thus, other tiers of government such as the Federal Government have no equal power to revoke land like the state Governor to meet demand of infrastructural development for housing. It is thus recommended that the procedure for obtaining consent should be simplified to make it easy and affordable for holders of certificate of Occupancy to secure loan for housing purposes. More so, the Act should be expunged from the constitution so that it can be easily amended to address the urgent challenges in the housing sector. Finally, the constitution and the Act should be amended in a way that it will not be difficult for the federal government to acquire land across the country for mass housing delivery and related projects.

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SQL-Driven Spatial Database Transactions in Support of Compulsory Land Acquisition for Road Expansion Projects

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Abstract:

Activities in an electronically-driven land administration organization might warrant the deployment of spatial database queries that culminate in cartographic visualization of the likely outcome of intended land management decisions among which include the compulsory acquisition of land for overriding public interest. This study is an experimentation of spatial database query in the retrieval of information about land and buildings that may likely be affected by the exercise of government's eminent domain powers for the widening of a motorable road in the municipality of Idah in Kogi State, Nigeria. Spatial data for the prototype project area covering three neighbourhoods in Idah municipality were obtained from Google Earth[®] and OpenStreetMap[®] and were further processed and analyzed using QGIS[®] and Spatialite[®] respectively. Prototype database tables for property owners' identity, parcels, buildings, and roads were created; while structured query language (SQL) operations were instantiated to project the spatial and non-spatial attributes of properties that may be affected under varying scenarios of a proposed road widening scheme. Experimentation of the 10 metre-, 15 metre-, and 20 metre SQL buffer operations returned visually reliable results of the total number and attributes of land and buildings that may be vulnerable to expropriation for the prototype road widening project in the municipality. The value of this study is anchored on the deployment of SQL operations in the planning phase of compulsory land acquisition and compensation.

Keywords: Spatial database, SQL, Land administration, Compulsory land acquisition, Road project.

INTRODUCTION

The expansion of an existing road width to accommodate increase in vehicular and pedestrian traffic in any municipality will entail the deployment of eminent domain powers to avail the local government with land for the implementation of the road expansion project and the provision of associated facilities like drainage and service channels. Sections 28 and 29 of the Nigerian Land Use Act enacted in 1978 provide the legislative foundation for the expropriation of private interests in land for overriding public interest and the assessment and payment of compensation (Federal Ministry of Justice, 2004). While there is a need to identify the number of parcels and landed properties that spatially intersect with the proposed road width, the deployment of the existing manual/analogue processes may prolong property enumeration, budgeting, and fund appropriation to cater for the payment of compensation.

Following the recent federal executive decision to grant financial autonomy to local governments in Nigeria (Ikenna, 2019), it is pertinent that spatial database and information technology tools should be deployed by the local governments to serve as precursors to the enumeration and inspection of parcels and unexhausted improvements likely to be affected by a land expropriation plan. In Kosovo, Meha et al. (2011) demonstrated the practical use of Spatial Data Infrastructure (SDI) and Geographic Information System (GIS) to land expropriation and resettlement for the purpose of public mining operations. Contrary to this feat in Europe, Municipalities in Nigeria including Idah, the study area is yet to develop an SDI let alone adopt digital land administration tools. Furthermore, while Chiemelu & Eze (2014) and Akeh (2018) in related studies, contributed to our knowledge of how GIS software packages can be used to handle cadastral data, little is known from first principle, the language of communication and syntax deployed at the back-end by these software packages for the creation, retrieval, and visualization of spatial data especially during land acquisition for road projects.

With recourse to Idah local government of Kogi State in Nigeria, this study aims to experiment the use of spatial database query in the retrieval of information about land and buildings that may likely be affected by a municipality's exercise of eminent domain powers for the widening of an existing motorable road. Hence, the use of spatial database transactions which is the foundation of GIS platforms is proposed to provide timely and cost effective approach towards the planning and implementation of compulsory land acquisition for the expansion of an existing road network.

REVIEW OF LITERATURE

Compulsory acquisition otherwise called eminent domain, compulsory purchase, land expropriation or resumption pertains to the exercise of legislative powers by the government and its agencies to take possession of private land for overriding public interest and payment of compensation to affected parties (Azuela and Herrera-Martín, 2009; Šumrada et al., 2013). Overriding public interest implies land use for the benefit of the society as against individual benefit (Belej and Walacik, 2008; Šumrada et al., 2013). An instance is the construction, reconstruction, and widening of existing road network, which would warrant active involvement of the public works agency and land administration organization (Arvanitis et al., 2008; Šumrada et al., 2013). While the public works agency is concerned with land availability for project implementation, the land administration organization is saddled with identifying the affected parcels and title holders for onward field inspections and cadastre (spatial database) updates culminating into the assessment and payment of compensation.

From the perspective of ownership, roads in Nigeria can be categorized into the Federal government-owned trunk 'A' roads; state government-owned trunk 'F' roads, state government-owned trunk 'B' roads, the Local government-owned trunk 'C' roads (Olubomehin, 2016). The functional classification of these road comprise the arterials, minor collectors, major collectors, and local roads (Raguraman and Sinha, 2006). For the purpose of this study, emphasis is on the trunk 'C' roads among which are local rural roads with prospects of being upgraded to minor collector roads. These transport infrastructure and associated land uses can avail the spatial database expert with insights into their modelling as spatial objects and fields using the OpenGIS® geometry object model designed to show the hierarchy of spatial data types comprising classes and subclasses in Figure 1 below.

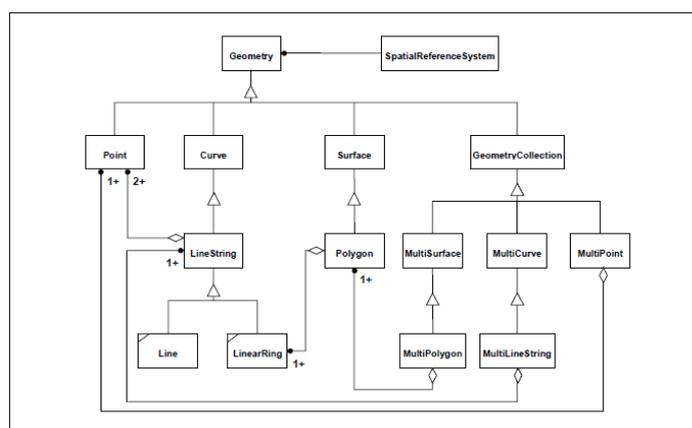


Figure 1: Hierarchy of geometry class.

It can be inferred from Figure 1 above that a parcel of land is represented as a polygon in geographic/land information system (GIS/LIS); while collector- and minor arterial roads are represented as linestring. Instantiating GIS buffer functions on a selected linestring would produce a polygon. In addition, a collection of several land parcels into shapefile amounts to

the super class - 'Geometry Collection' in spatial databases. These features (linestrings, polygons, and geometry collections) are tied to the International Terrestrial Reference Frame (ITRF) or spatial reference identity (SRID) chosen by the user (OGC, 1999), which in the case of this article is the WGS84 spatial reference (SRID) with possibility of 'on the fly' map projection to the Minna datum tagged EPSG:26392 as appropriate to the study area.

Spatial database transactions entail the use of Structured Query Language (SQL) aimed at instructing the computer to use Data Definition Language (DDL) to create database structures on the one hand, and/or enabling the use of Data Manipulation Language (DML) to retrieve, alter, and update data tables contained in a geodatabase (Connolly and Bergg, 2005; Menke, et al., 2015; Yeung and Hall, 2007). Providing the foundation and standards for this operation is the OpenGIS® Simple Features Specification for Structured Query Language (SQL) and made applicable to land acquisition for road expansion projects.

There are notable developments in the deployment of automated spatial database creation and query for the Nigerian land administration and cadastral practice, which are anchored on the approaches of cadastral research design proposed by Çagdas & Stubkjær (2011). For instance, Orisakwe and Bakari (2013) developed a parcel-based cadastral information system leading to the production of an automated-composite map of the study area. Using ArcMap as the dominant software, Akeh (2018), Chiemelu & Onwumere (2013), and Chiemelu & Eze (2014), demonstrated the conversion of analogue spatial data into digital and Geo-enabled formats to pave the way for ArcMap-embedded queries, which tend to conceal the fundamental SQL operations at the back-end of the software. Similarly, Abbas et al. (2014) successfully developed a geodatabase of land and buildings in a residential neighbourhood, leading to automated data retrieval without recourse to the fundamental SQL operations; while Kemiki et al. (2015) developed a cadastral information system based on the entity relationship model capable of automated retrieval of multi-criteria data of landed properties still without recourse to the fundamental SQL operations at the back-end of the software.

An observable gap in these studies is the emphasis on software automation without recourse to the fundamental query languages deployed at the back-end of the software to display tables and map outputs. This study addresses the gap by availing interested practitioners with the fundamental machine language associated with the back-end operations of GIS software when implementing land acquisition for road expansion projects. Hence, a spatial analyst can revert to spatial data creation and manipulation from the first principle in the event of limited functionalities in these software packages.

METHODOLOGY

Research philosophy and paradigm

This experimental study was carried out within the framework of Epistemological Pragmatism - a research philosophy that accords credence to the deployment of combined approaches to problem-solving on the condition that the evolved solution(s) can be successfully applied in practice (Saunders et al., 2009). The theoretical underpinning of this study is the use of SQL to support the activity of an electronic land administration organization towards managing compulsory land acquisition for proposed road expansion.

The research techniques

This study entails a combination of design- and experimental strategies. The design strategy was used to develop a model of spatial artefacts comprising land, buildings and road networks, while the experimental strategy was used to instantiate database query scenarios of buffer functions aimed at projecting associated records and cartographic visualizations in connection with compulsory land acquisition for a proposed road widening scheme.

Computer hardware requirements

Features of the Laptop computer deployed for this study include Intel® 2.30GHz Corei7-360QM CPU or Equivalent of 3.6GHz AMD® Ryzen 1800X CPU, 8.00GB of installed random access memory (RAM), and 17 inches visual display unit. Other features include a DVD Writer, Web Cam, USB 2.0 ports, Wireless and Bluetooth antenna, a Secure Digital (SD) card slot and a USB Wifi Dongle as external device.

Software requirement

Software for this study include pre-installed Windows Operating system and Office application suites, and interoperable open-source spatial packages comprising QGIS® 2.8.1 and Spatialite®. Application areas of these spatial software packages are detailed in Table 1.

Data sources and data formats

Vector data layers of the areas of interest comprising neighbourhoods of Igalogba, Ukwaja, and parts of Sabon-Gari in Idah Local Government area of Kogi State were obtained from Google Earth® and OpenStreetMap® (Figure 2). Spatial data pre-processing was carried out in QGIS® 2.8.1 to ensure spatial data consistency prior to their upload in the Spatialite® environment where SQL-oriented database transactions were performed.

Data preparation process

Data processing was carried out in two progressive phases comprising QGIS® and Spatialite® operations. In between both phases is the bridging operation of data importation into the Spatialite® database - Compulsory_Acquisition_Scheme.sqlite created for the purpose of the study. The entire process commenced with QGIS® 2.8.1 operation of file creation, definition of spatial reference system as WGS84 with coordinate 'on the fly' to the Minna/Nigeria Mid belt ITRF - EPSG:26392.

Table 1: Software packages

S/N	Software	Application areas
1	QGIS Desktop 2.8.1 	<ol style="list-style-type: none"> 1. Create vector of the study area; 2. Create shapefiles and edit attribute tables; 3. Connect deliverables with the Spatialite® database; 4. Add saved SQL results as layer in the QGIS project; & 5. Cartographic visualization of saved SQL results.
2	Spatialite_gui 2.0.0-devel 	<ol style="list-style-type: none"> 1. Create database of spatial and non-spatial objects; 2. SQL Editing and Execution for Tables and Views; and 3. Connect to QGIS for spatial data editing, and cartographic visualization.

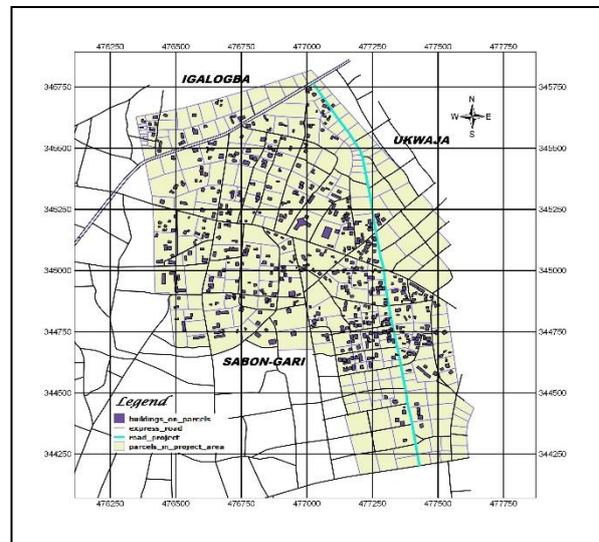


Figure 2: Map of the study area in Idah, Kogi State

Furthermore, the .osm layers for road network (Lines), municipal buildings (polygons) were extracted from the online OpenStreetMap® portal as shapefiles, while the attribute table tagged "BIODATA.dbf" for natural persons was created to populate the pseudo-names and pseudo-national identity numbers (NIN) of all parcel owners in the study area. Other fundamental tables created in QGIS® 2.8.1 and exported to Spatialite® include NNPDATA.dbf for non-natural persons, parcels_in_project_area.shp, buildings_on_parcel.shp, project area.shp, and road_network.shp (Table 2).

The retrieval of records for cartographic visualization was instantiated using the tuple relational calculus statements in Figure 3(a); while the DDL, which can be possibly deployed to create new database table is captured in Figure 3(b). The condition of buffer operation arising from a proposed road expansion is written as $ST_Buffer(ST_Transform(r.Geometry, 26392), X)$; where X is the instance of the buffer function in metres, r is the selected road with defined identity, and 26392 represents the local (Minna/Nigeria Mid Belt) datum to which the SRID transformation from Geographic Coordinate (WGS84) was performed.

```
SELECT ..An array of tuples....
FROM 'Table 1' AS X, 'Table 2' AS Y, .....
WHERE 'Condition 1' OPERATOR 'Condition 2'
      OPERATOR 'Condition n'
```

```
CREATE TABLE '.....Name of Table....' AS
SELECT ..An array of tuples....
FROM 'Table 1' AS X, 'Table 2' AS Y, .....
WHERE 'Condition 1' OPERATOR 'Condition 2'
      OPERATOR 'Condition n'
```

```
WITH CTE AS
(SELECT ..An array of tuples....
FROM 'Table 1' AS X, 'Table 2' AS Y, .....
WHERE 'Condition 1' OPERATOR 'Condition 2'
      OPERATOR 'Condition n'
)
SELECT DISTINCT *FROM CTE
```

```
CREATE TABLE '.....Name of Table....' AS
WITH CTE AS
(SELECT ..An array of tuples....
FROM 'Table 1' AS X, 'Table 2' AS Y, .....
WHERE 'Condition 1' OPERATOR 'Condition 2'
      OPERATOR 'Condition n'
)
SELECT DISTINCT *FROM CTE
```

Figure 3(a): Instances of SQL-DML

Figure 3(b): Instance of SQL-DDL

Figures 4 and 5 are screen dumps of the graphic user interfaces (GUIs) of the spatial database engines containing the aforementioned shapefiles and database files that were exported from QGIS 2.8.1[®] to Spatialite[®] 2.0. Further created in Spatialite[®] 2.0 using a combination of DML and DDL include tables of buffers-; affected parcels-; and affected buildings within 10 metre-, 15 metre-, and 20 metre scenarios of road widening. The interconnectivity between QGIS 2.8.1[®] and Spatialite[®] 2.0 enabled the sharing of database tables for map visualizations.

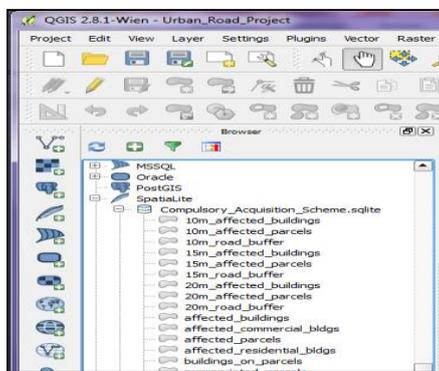


Figure 4: Spatialite browser panel in QGIS

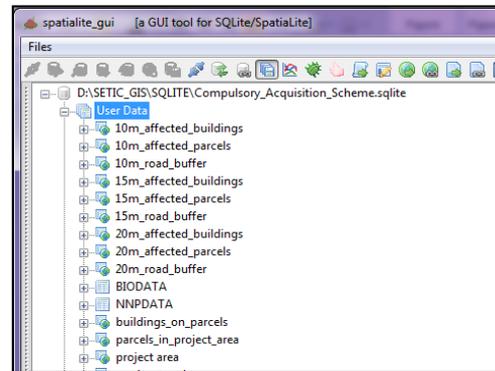


Figure 5: Actual Spatialite browser panel

In Table 2, the first-seven rows pertain to the fundamental data for this article while the rest are SQL derived tables using DML expressions.

Techniques of data analysis and presentation

Results from spatial scenario analysis of compulsory land acquisition arising from SQL (data definition and data manipulation) statements executed in Spatialite[®] were presented in the form of table of results (tuple selection), and cartographic visualization of vectorized maps reflecting the conditions and constraints of the SQL statements. The implications of the spatial scenario analysis of compulsory land acquisition were discussed.

Table 2: Database Schema

Table	Attributes and data type	Status
BIODATA	OBJECTID: Integer, Name: String, Gender: String, Birth_Date: Date, NIN: String,	Original table
NNPDATA	OBJECTID: Integer, Name: String, RC_ID: String, Coop_type: String, Estab_Date: Date	Original table
parcels_in_project_area	PK_UID: Integer, parcel_id: Integer, land_use: String, title_type: String, max_term: String, grant_date: Date, holder_id: String, perimeter: Real, shape_area: Real, Geometry: Geometry	Original table
buildings_on_parcels	PK_UID: Integer, building_id: Integer, perimeter: Real, Area: Real, Geometry: Geometry	Original table
project area	PK_UID: Integer, Proj_area: String, Perimeter: Real, Area: real, Geometry: Geometry	Original table
road_network	PK_UID: Integer, road_id: Integer, osm_id: Integer, highway: String, Length: Real, Geometry: Geometry	Original table
road_project	PK_UID: Integer, road_id: String, osm_id: String, highway: String, Length: Real, Geometry: Geometry	SQL-derived table
10m_road_buffer	PK_UID: Integer, road_id: String, osm_id: String, highway: String, Length: Real, Geometry: Geometry	SQL-derived table
10m_affected_parcels	parcel_id: Integer, land_use: String, title_type: String, allocation_date: Date, holder_id: String, perimeter: Real, parcel_area: Real, Geometry: Geometry	SQL-derived table
10m_affected_buildings	building_id: String, parcel_id: String, building_type: String, perimeter: Real, parcel_area: Real, Geometry: Geometry	SQL-derived table
15m_road_buffer	PK_UID: Integer, road_id: String, osm_id: String, highway: String, Length: Real, Geometry: Geometry	SQL-derived table
15m_affected_parcels	parcel_id: Integer, land_use: String, title_type: String, allocation_date: Date, holder_id: String, perimeter: Real, parcel_area: Real, Geometry: Geometry	SQL-derived table
15m_affected_buildings	building_id: String, parcel_id: String, building_type: String, perimeter: Real, parcel_area: Real, Geometry: Geometry	SQL-derived table
20m_road_buffer	PK_UID: Integer, road_id: String, osm_id: String, highway: String, Length: Real, Geometry: Geometry	SQL-derived table
20m_affected_parcels	parcel_id: Integer, land_use: String, title_type: String, allocation_date: Date, holder_id: String, perimeter: Real, parcel_area: Real, Geometry: Geometry	SQL-derived table
20m_affected_buildings	building_id: String, parcel_id: String, building_type: String, perimeter: Real, parcel_area: Real, Geometry: Geometry	SQL-derived table

DATA ANALYSIS AND DISCUSSION

The database transactions

The 10 metres scenario of a proposed road widening scheme

If the width of the selected road project with osm_id = 561800328 is to be widened by 10 metres, SQL operations in Table 3 indicated that 23 buildings along the proposed road network shall be affected. The map visualization indicates a sparse distribution of these affected buildings comprising 11 commercial- and 12 residential buildings.

Table 3: 10-metre buffer operation 1

SQL
<pre>CREATE TABLE '10m_affected_buildings' AS WITH CTE AS (SELECT b.building_id AS 'building_id', p.parcel_id AS 'parcel_id', p.land_use AS 'building_type', b.Perimeter AS 'perimeter', b.Area AS 'area', b.geometry AS 'Geometry' FROM (SELECT ST_Buffer(ST_Transform(r.Geometry, 26392),10) AS geom3 FROM road_network AS r WHERE r.osm_id = 561800328) AS e, buildings_on_parcels AS b, parcels_in_project_area AS p WHERE p.title_type = 'customary right of occupancy' AND ST_INTERSECTS(e.geom3, ST_Transform(b.geometry, 26392)) AND ST_WITHIN(b.geometry, p.Geometry)) SELECT DISTINCT *FROM CTE</pre>

Table output								Cartographic visualization
	ROWID	building_id	parcel_id	building_type	perimeter	area	Geometry	
1	1	642107784	1115342400	Residential	52.834500	153.706300	BLOB sz=141 GEOMETRY	
2	2	642107799	1115342399	Residential	38.879100	80.191300	BLOB sz=141 GEOMETRY	
3	3	642107803	1115342399	Residential	33.661000	57.773600	BLOB sz=141 GEOMETRY	
4	4	642108353	1115342405	Residential	42.586900	79.607600	BLOB sz=173 GEOMETRY	
5	5	642112824	1115342386	Residential	58.288000	206.341400	BLOB sz=141 GEOMETRY	
6	6	642112840	1115342386	Residential	18.771900	22.220300	BLOB sz=141 GEOMETRY	
7	7	642112844	1115342386	Residential	47.795300	144.484700	BLOB sz=141 GEOMETRY	
8	8	642116821	1115342336	Residential	54.627700	187.514700	BLOB sz=141 GEOMETRY	
9	9	642116822	1115342337	Residential	122.770100	394.373100	BLOB sz=221 GEOMETRY	
10	10	642116823	1115342337	Residential	54.086300	185.266900	BLOB sz=141 GEOMETRY	
11	11	642116829	1115342336	Residential	24.757300	38.028000	BLOB sz=141 GEOMETRY	
12	12	642116830	1115342336	Residential	18.727700	22.202000	BLOB sz=141 GEOMETRY	
current block: 1 / 23 [23 rows] [fetched in 00:00:00.019]								
Total Number of records = 23								

The second database query returned 61 results in table and map visualization of parcels and their title holders likely to be affected by the eminent domain powers of the municipality (Table 4). From the third database query, it was found that only 11 out of 61 parcel owners have unexhausted improvements upon their lands (Table 5).

15 metres scenario of a proposed road widening scheme

Applying the same principle in Tables 3, 4, and 5 to the scenario for the widening of the width of selected road project with osm_id = 561800328 by 15 metres, results from the SQL operation in Table 6 indicates that 38 buildings along the proposed road network shall be affected.

Table 4: 10-metre buffer operation 2								
SQL								
SELECT n.Name AS 'Name', n.NIN AS 'NIN', n.Birth_Date AS 'Date_of_Birth', p.parcel_id AS 'parcel_id', p.land_use AS 'Land_use', p.parcel_area AS 'parcel_area', p.Geometry AS 'Geometry' FROM '10m_affected_parcel' AS p, BIODATA AS n WHERE n.NIN = p.holder_id GROUP BY p.parcel_id ORDER BY n.Name								
Table output				Cartographic visualization				
	Name	NIN	Date_of_Birth	parcel_id	Land_use	parcel_area	Geometry	
1	OSEBEYO ESTHER	51967283	1977-07-13	1115342289	Residential	2482.449000	BLOB sz=253 GEOMETRY	
2	ISREAL EGBITA HANNAH	38981510	1979-09-16	1115342290	Residential	1365.865800	BLOB sz=189 GEOMETRY	
3	LERAMO ADENIYI SUCCESS	33884590	1978-06-25	1115342291	Residential	1013.699400	BLOB sz=173 GEOMETRY	
4	AFORGWU JOHN OBOH	43733019	1977-01-22	1115342292	Residential	769.430600	BLOB sz=205 GEOMETRY	
5	IMAM TOYIB	84527466	1978-10-18	1115342293	Residential	653.567100	BLOB sz=189 GEOMETRY	
6	ENIWAIBE KEHINDE PAUL	38351265	1976-04-17	1115342294	Residential	797.196400	BLOB sz=173 GEOMETRY	
7	SIMEON DARLINGTON ARINZE	68678809	1974-11-03	1115342295	Residential	921.329500	BLOB sz=157 GEOMETRY	
8	ABUKA OJOICHE SHADRACH	89832249	1978-11-22	1115342296	Commercial	1427.285300	BLOB sz=141 GEOMETRY	
9	PETER DANIEL	50561215	1978-07-16	1115342297	Residential	2260.959200	BLOB sz=141 GEOMETRY	
10	OGWUCHE PETER	52374415	1982-11-19	1115342298	Residential	3106.830100	BLOB sz=205 GEOMETRY	
11	ENVIOMA OLIVER CHIDERA	43633246	1985-05-22	1115342299	Commercial	2714.972100	BLOB sz=157 GEOMETRY	
12	PAUL INALEGWU EGAPI	83679756	1986-06-30	1115342301	Commercial	2962.198800	BLOB sz=189 GEOMETRY	
13	ABDUL SHERIFAT ILEMENYO	41124691	1988-05-26	1115342302	Residential	1192.012300	BLOB sz=157 GEOMETRY	
14	HASSAN MUNIRAH A.	99274821	1983-10-05	1115342303	Residential	1363.342700	BLOB sz=157 GEOMETRY	
15	NDUBUEZE HAPPINESS	52027008	1988-11-16	1115342304	Commercial	1975.171600	BLOB sz=157 GEOMETRY	
16	ADAJI OJODALE JONAH	18335607	1987-08-03	1115342305	Residential	2429.949200	BLOB sz=173 GEOMETRY	
current block: 1 / 61 [61 rows] [fetched in 00:00:00.021]								
Total Number of records = 61								

The map visualization indicates a sparse distribution of these affected buildings comprising 20 commercial- and 18 residential buildings. The second database query returned 62 results in

S/N	DESCRIPTION	SQL OPERATION	TABLE OUTPUT OF SPATIAL DATABASE QUERY	MAP VISUALIZATION
1	Spatial database query to create a table for the affected buildings in the parcels that may likely be acquired in part or whole for overriding public purpose of municipal road widening by 15 metres.	CREATE TABLE '15m_affected_buildings' AS WITH CTE AS (SELECT b.building_id AS 'building_id', p.parcel_id AS 'parcel_id', p.land_use AS 'building_type', b.Perimeter AS 'perimeter', b.Area AS 'area', b.geometry AS 'Geometry' FROM (SELECT ST_Buffer(ST_Transform(r.Geometry, 26392), 15) AS geom3 FROM road_network AS r WHERE rosm_id = 561800328) AS e, buildings_on_parcels AS b, parcels_in_project_area AS p WHERE p.title_type = 'customary right of occupancy' AND ST_INTERSECT(e.geom3, ST_Transform(b.Geometry, 26392)) AND ST_WITHIN(b.Geometry, p.Geometry)) SELECT DISTINCT *FROM CTE		
2	Spatial database query to retrieve the particulars of all land title holders likely to be affected by the eminent domain powers of the municipality for overriding public purpose of municipal road widening by 15 metres.	SELECT n.Name AS 'Name', n.NIN AS 'NIN', n.Birth_Date AS 'Date_of_Birth', p.parcel_id AS 'parcel_id', p.land_use AS 'Land_use', p.parcel_area AS 'parcel_area', p.Geometry AS 'Geometry' FROM '15m_affected_parcels' AS p, BIODATA AS n WHERE n.NIN = p.holder_id GROUP BY p.parcel_id ORDER BY n.Name		
3	Spatial database query to retrieve the particulars of all land title holders and the attributes of unexhausted improvements on their lands likely to be affected by the eminent domain powers of the municipality for overriding public purpose of municipal road widening by 15 metres.	SELECT n.Name AS 'Name', n.NIN AS 'NIN', n.Birth_Date AS 'Date_of_Birth', p.parcel_id AS 'parcel_id', p.land_use AS 'Land_use', p.parcel_area AS 'parcel_area', COUNT(b.Geometry) AS 'No_of_bldgs', SUM(b.Area) AS 'Total_GFA_Bldgs', p.Geometry AS 'Parcel_Geometry' FROM '10m_affected_buildings' AS b, '10m_affected_parcels' AS p, BIODATA AS n WHERE ST_WITHIN(b.Geometry, p.Geometry) AND n.NIN = p.holder_id GROUP BY p.parcel_id HAVING COUNT(b.Geometry) > 0 ORDER BY p.parcel_id		

Table 5: 10-metre buffer operation 3

SQL																																																																																																																					
SELECT n.Name AS 'Name', n.NIN AS 'NIN', n.Birth_Date AS 'Date_of_Birth', p.parcel_id AS 'parcel_id', p.land_use AS 'Land_use', p.parcel_area AS 'parcel_area', COUNT(b.Geometry) AS 'No_of_bldgs', SUM(b.Area) AS 'Total_GFA_Bldgs', p.Geometry AS 'Parcel_Geometry' FROM '10m_affected_buildings' AS b, '10m_affected_parcels' AS p, BIODATA AS n WHERE ST_WITHIN(b.Geometry, p.Geometry) AND n.NIN = p.holder_id GROUP BY p.parcel_id HAVING COUNT(b.Geometry) > 0 ORDER BY p.parcel_id																																																																																																																					
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<table border="1"> <thead> <tr> <th>Name</th> <th>NIN</th> <th>Date_of_Birth</th> <th>parcel_id</th> <th>Land_use</th> <th>parcel_area</th> <th>No_of_bldgs</th> <th>Total_GFA_Bldgs</th> <th>Parcel_Geometry</th> </tr> </thead> <tbody> <tr> <td>1 ENVIOMA OLIVER CHIDERRA</td> <td>43633246</td> <td>1985-05-22</td> <td>1115342399</td> <td>Commercial</td> <td>2714.972100</td> <td>3</td> <td>360.138000</td> <td>BLOB s2z=157 GEOME</td> </tr> <tr> <td>2 NDUVEZEZ HAPPINESS</td> <td>52027008</td> <td>1988-11-16</td> <td>1115342304</td> <td>Commercial</td> <td>1975.171600</td> <td>1</td> <td>93.861600</td> <td>BLOB s2z=157 GEOME</td> </tr> <tr> <td>3 OKGADREJOY STGFHEW</td> <td>77282394</td> <td>1986-03-03</td> <td>1115342317</td> <td>Commercial</td> <td>8499.613600</td> <td>2</td> <td>349.746900</td> <td>BLOB s2z=189 GEOME</td> </tr> <tr> <td>4 PAUL JOY UNEKWU</td> <td>52683444</td> <td>1958-07-25</td> <td>1115342318</td> <td>Commercial</td> <td>9214.278300</td> <td>3</td> <td>638.241000</td> <td>BLOB s2z=253 GEOME</td> </tr> <tr> <td>5 UZOKA PRECIOSU</td> <td>28234385</td> <td>1978-10-19</td> <td>1115342324</td> <td>Commercial</td> <td>6990.087100</td> <td>2</td> <td>347.050800</td> <td>BLOB s2z=141 GEOME</td> </tr> <tr> <td>6 KALU NKECHI O.</td> <td>96501898</td> <td>1981-05-13</td> <td>1115342336</td> <td>Residential</td> <td>3094.807300</td> <td>3</td> <td>247.744700</td> <td>BLOB s2z=221 GEOME</td> </tr> <tr> <td>7 SANI MICHAEL O.</td> <td>46380230</td> <td>1977-03-30</td> <td>1115342337</td> <td>Residential</td> <td>4153.374400</td> <td>2</td> <td>579.640000</td> <td>BLOB s2z=189 GEOME</td> </tr> <tr> <td>8 OPALUWA RUTH UMH</td> <td>61808539</td> <td>1984-01-15</td> <td>1115342386</td> <td>Residential</td> <td>1947.237900</td> <td>3</td> <td>373.046400</td> <td>BLOB s2z=221 GEOME</td> </tr> <tr> <td>9 AMEDU GIDEON OJONUKPE</td> <td>66604664</td> <td>1967-01-18</td> <td>1115342399</td> <td>Residential</td> <td>3301.499100</td> <td>2</td> <td>137.964900</td> <td>BLOB s2z=189 GEOME</td> </tr> <tr> <td>10 MUSA RAMAT</td> <td>50303310</td> <td>1967-02-12</td> <td>1115342400</td> <td>Residential</td> <td>2129.223600</td> <td>1</td> <td>153.706300</td> <td>BLOB s2z=141 GEOME</td> </tr> <tr> <td>11 SAMUEL MOROLAKE M.</td> <td>68815111</td> <td>1976-02-15</td> <td>1115342405</td> <td>Residential</td> <td>3295.321700</td> <td>1</td> <td>79.607600</td> <td>BLOB s2z=221 GEOME</td> </tr> </tbody> </table>										Name	NIN	Date_of_Birth	parcel_id	Land_use	parcel_area	No_of_bldgs	Total_GFA_Bldgs	Parcel_Geometry	1 ENVIOMA OLIVER CHIDERRA	43633246	1985-05-22	1115342399	Commercial	2714.972100	3	360.138000	BLOB s2z=157 GEOME	2 NDUVEZEZ HAPPINESS	52027008	1988-11-16	1115342304	Commercial	1975.171600	1	93.861600	BLOB s2z=157 GEOME	3 OKGADREJOY STGFHEW	77282394	1986-03-03	1115342317	Commercial	8499.613600	2	349.746900	BLOB s2z=189 GEOME	4 PAUL JOY UNEKWU	52683444	1958-07-25	1115342318	Commercial	9214.278300	3	638.241000	BLOB s2z=253 GEOME	5 UZOKA PRECIOSU	28234385	1978-10-19	1115342324	Commercial	6990.087100	2	347.050800	BLOB s2z=141 GEOME	6 KALU NKECHI O.	96501898	1981-05-13	1115342336	Residential	3094.807300	3	247.744700	BLOB s2z=221 GEOME	7 SANI MICHAEL O.	46380230	1977-03-30	1115342337	Residential	4153.374400	2	579.640000	BLOB s2z=189 GEOME	8 OPALUWA RUTH UMH	61808539	1984-01-15	1115342386	Residential	1947.237900	3	373.046400	BLOB s2z=221 GEOME	9 AMEDU GIDEON OJONUKPE	66604664	1967-01-18	1115342399	Residential	3301.499100	2	137.964900	BLOB s2z=189 GEOME	10 MUSA RAMAT	50303310	1967-02-12	1115342400	Residential	2129.223600	1	153.706300	BLOB s2z=141 GEOME	11 SAMUEL MOROLAKE M.	68815111	1976-02-15	1115342405	Residential	3295.321700	1	79.607600	BLOB s2z=221 GEOME
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Total Number of records = 11																																																																																																																					

table and map visualization of parcels and their title holders likely to be affected by the eminent domain powers of the municipality. With respect to the third database query in Table 6, it was found that 18 out of 62 parcel owners have unexhausted improvements upon their lands.

The 20 metres scenario of a proposed road widening scheme

If the width of the selected road project with osm_id = 561800328 is to be widened by 20 metres, SQL operations in Table 7 indicated that 45 buildings along the proposed road network shall be affected. The map visualization indicates a sparse distribution of these affected buildings comprising 22 commercial- and 23 residential buildings. The second database query returned 63 results in table and map visualization of parcels and their title holders likely to be

affected by the eminent domain powers of the municipality. In the third database query, it was found that only 21 out of 63 parcel owners have unexhausted improvements upon their lands; amounting to a total of 45 buildings (Table 7).

Table 7: Spatial database query results and visualization arising from proposed widening of an existing road by 20 metres

S/N	DESCRIPTION	SQL OPERATION	TABLE OUTPUT OF SPATIAL DATABASE QUERY	MAP VISUALIZATION
1	Spatial database query to create a table for the affected buildings in the parcels that may likely be acquired in part or whole for overriding public purpose of municipal road widening by 20 metres.	<pre>CREATE TABLE '20m_affected_buildings' AS WITH CTE AS (SELECT b.building_id AS 'building_id', p.parcel_id AS 'parcel_id', p.land_use AS 'building_type', b.Perimeter AS 'perimeter', b.Area AS 'area', b.geometry AS 'Geometry' FROM (SELECT ST_Buffer(ST_Transform(r.Geometry, 26392), 20) AS geom3 FROM road_network AS r WHERE r.osm_id = 561800328) AS e, build- ings_on_parcels AS b, parcels_in_project_area AS p WHERE p.title_type = 'customary right of occupancy' AND ST_INTERSECT(s(geom3, ST_Transform (b.geometry, 26392)) AND ST_WITHIN(b.geometry, p.Geometry)) SELECT DISTINCT * FROM CTE</pre>	<p>Total Number of records = 45</p>	
2	Spatial database query to retrieve the particulars of all land title holders likely to be affected by the eminent domain powers of the municipality for overriding public purpose of municipal road widening by 20 metres.	<pre>SELECT n.Name AS 'Name', n.NIN AS 'NIN', n.Birth_Date AS 'Date_of_Birth', p.parcel_id AS 'parcel_id', p.land_use AS 'Land_use', p.parcel_area AS 'parcel_area', p.Geometry AS 'Geometry' FROM '20m_affected_parcels' AS p, BIODATA AS n WHERE n.NIN = p.holder_id ORDER BY p.parcel_id</pre>	<p>Total Number of records = 63</p>	
3	Spatial database query to retrieve the particulars of all land title holders and the attributes of unexhausted improvements on their lands likely to be affected by the eminent domain powers of the municipality for overriding public purpose of municipal road widening by 20 metres.	<pre>SELECT n.Name AS 'Name', n.NIN AS 'NIN', n.Birth_Date AS 'Date_of_Birth', p.parcel_id AS 'parcel_id', p.land_use AS 'Land_use', p.parcel_area AS 'parcel_area', COUNT (b.Geometry) AS 'No. of bldgs', SUM(b.Area) AS 'Total GFA_Bldgs', p.Geometry AS 'Parcel_Geometry' FROM '20m_affected_buildings' AS b, '20m_affected_parcels' AS p, BIODATA AS n WHERE ST_WITHIN(b.Geometry, p.Geometry) AND n.NIN = p.holder_id GROUP BY p.parcel_id HAVING COUNT(b.Geometry) > 0 ORDER BY p.parcel_id</pre>	<p>Total Number of records = 21</p>	

Implications for the planning of compulsory land acquisition and compensation

The type and width of the proposed road project in the municipality would determine the GIS buffer option to be adopted. In this case, the local rural road is proposed to be widened to a minor collector passing through residential and commercial land parcels. From the SQL-driven spatial database transactions, the 10 metres road width expansion scenario attracts the least acquisition cost with 61 affected parcels and 23 buildings. However, if the 15 metres or 20 metres option is to be adopted, the marginal increase in affected parcels is unity but with a higher cost of assessing and paying compensation for more unexhausted improvements (38- and 45 buildings) held by a total of 18- and 21 persons respectively. These results align with a similar study conducted by Meha et al. (2011) in Kosovo where GIS operation was found to provide spatial- and attribute information for the cost of land expropriation in connection with a mining project.

CONCLUSION

This study experiments the possibility of using SQL-driven transactions to identify parcels and unexhausted improvements on land that might be affected by eminent domain powers of the municipality for the purpose of road expansion projects. With respect to the 10 metre-, 15 metre-, and 20 metre scenarios for the widening of an existing road, a combination of DML and DDL have been proven to successfully retrieve spatial and non-spatial attributes of affected properties, and then create database tables of query results for onward map visualization. The limitation of this study is that field inspections would be required to update and validate the

spatial data repository of the municipal lands office especially in the areas where new buildings are developed prior to the effective date of expropriation. Nevertheless, the success of these operations has underscored the importance of comprehending the back-end operations of GIS software along with its application to spatial database transactions associated with compulsory land acquisition for road expansion projects.

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Africa's Population Growth: Adopting the Smart City Model in Nigeria as a Blueprint for its Future Cities

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Abstract:

Africa is currently experiencing impressive population growth and Nigeria at the helm of it all, the continent is envisioned to hit a population of 2.4 billion between 2016 and 2025. This population growth will highly favour urban areas over rural areas but also pose a threat if these cities are not ready to harness the population potentials. Lagos with its alarming population growth has taken a proactive step to begin the construction of a smart city called the Eko Atlantic city. But Lagos is not the only city which has an alarming population on the other end of Nigerian Map is Kano state with a highly growing population and also a high commercial presence. This paper aims to bring to foresight the need for Nigeria to be responsive towards its population growth and in that regard make proactive design considerations in planning her cities. Through a critical review of literature gathered from secondary data of similar situations from countries around the world that have overcome similar challenges and analysed through content analysis. Findings reveal that a major setback of smart cities evolving in Africa is as a result of economic, environmental, cultural and financial factors. It is however recommended that while implementing government policies, urban development agencies should take into consideration the rapid growing population in the planning of its cities to meet the sustainable, resilient and responsive cities as advocated by the UN sustainable development goals.

Keywords: Population, Urbanization, Smart Cities, Sustainability, Nigeria.

BACKGROUND TO STUDY

The world faces a challenge of population upsurge with Nigeria experiencing an increase which will gradually become a threat if not checked in time. The nature of population increase in Nigeria has been termed as rapid rate of urbanization characterized by economic growth without infrastructural development. This kind of development is characterized by a major neglect of the rural areas and little improvement on infrastructure to support the growing population in urban areas, the cons will be that it chauffeurs in pressure on limited resources while escalating social inequality. The UN-Habitat (2006) asserts that in the next two decades 95% of growth in the developing world will be in the cities. Venables (2016) asserts that the African continent needs to build at least twice the urban capital stock that it has built over the whole of its previous history, a state of emergency on infrastructural development. Similarly, Lagos state has been ranked the fastest-growing city overall in the 2017-2030 timeline according to (Euro monitor international, 2018). Meanwhile, the year 2030 marks the target deadline for the sustainable development goals by the United Nations Development Programme. These SDGs are set out goals to promote prosperity in the world while protecting the environment, these 17 integrated goals are a call by the United Nations for forward development and amongst these 17, 1 goal directly affect the development of future cities.

Goal 11: sustainable cities and communities.

The research intends on increasing habitant's productivity by establishing healthier communities, reducing carbon footprint and ensuring a healthier community through sustainable design and healthy community living, in that regard; the adoption of smart city concept in the blueprint design of megacities can increase the operational efficiency and improve the quality of life of habitants of that city.

The state of urbanization in Africa

Major African cities are experiencing rapid development, they are now over populated when compared to rural areas, Africa has been dubbed to reach majority urbanized state by the year

2030 (WUP 2005). Fay and Opal (2000) made a case that the rate of urbanization is not as a reflection of the economic growth, they said it has nothing to do with the economic growth of the country rather in the African context that it is an inverse relationship to the level of urbanization in a country. Most developing countries share a particular sentiment towards urbanization and decide to develop the rural communities. However research has proved this wrong and that developing the rural area will not reduce urbanization if anything it will act as an enabler to the exodus of rural to urban migration to continue as seen in Fig 2.1.

Africa's rapid urbanizing population

While the rest of the world host the most urban population for now, it is projected that Asia and Africa will host most of their population in urban areas from 2030 going forward, and will continue to dominate. Most investors are looking at the young urbanizing population of Africa as the future of the world due to the various opportunities that comes as an advantage of population. Asia with 54.5 percent of its population living in cities, and Africa with 53.5 percent of its population urban. Asia alone will account for more than half the world's urban population (2.66 billion out of a global urban population of 4.94 billion); and the urban population of Africa (748 million) will by 2030 be larger than the total population of Europe at that time (685 million).

Competition between urbanizing cities

It is often important that the definition of cities does limit it to be viewed on the bases of population, cities are more than just concentration of people and resources, and it is a hub for trade, culture, information and industries. In developed countries cities drive the economy by generating over 80 percent of the national economic output. Developing cities economies are globally reliant on advanced producer service for their income. In today's economies major cities play pivotal roles in global networking not just by producer service for goods or a host for institutions but also generating related economic and civil society activity in other cities. In the new millennium, cities around the world are already beginning to have several key impacts on developing regions as well, these cities have been able to link resources, population and revenue together, cities like Lagos are already establishing cultural trends in their countries, regions and countries, also included are cities like Istanbul and Mumbai.

Table 2.1 Showing the Rural and urban population by region in 2005 and as projected by 2030

Population (Millions)	Europe	North America	Africa	Asia	Latin America and the Caribbean	Oceania
Rural Population 2005 - (Millions)	0-700	0-400	0-800	0-3900	0-500	0-100
Urban Population 2005 - (Millions)	0-500	0-250	0-350	0-1600	0-450	0-100
Rural Population 2030 - (Millions)	0-650	0-500	0-1500	0-4800	0-650	0-100
Urban Population 2030 - (Millions)	0-500	0-350	0-700	0-2600	0-550	0-100

Source: United Nations, World Urbanization Prospects: The 2003 Revision.

Table 2.2 urban growth in the world's largest cities, 1950-2020

Population (Thousands)	New York	Tokyo	Lagos	Sao Paulo	London	Delhi
Rural Population - 1900 (Thousands)	12,500	11,000	1,000	2,500	8,000	2,000
Urban Population - 2005 (Thousands)	18,000	35,000	12,500	18,000	7,500	15,500
Rural Population - 2015 (Thousands)	19,500	36,000	17,000	20,000	7,500	21,500
Urban Population - 2020 (Thousands)	20,000	37,000	21,000	21,000	7,500	24,000

Source: United Nations, World Urbanization Prospects: The 2003 Revision

Smart city paradigm

The world has presented a significant number of future city models in order to improve the management of population and resources addressing urban processes and inhabitants requirements, for the most part of the 20th century the smartness of a city was a media science fiction, but as a result of telematics and ICT development it has become a reality, ICT development on one hand has helped in automation, monitoring, analysis and planning the city. Sabr (2016) asserts that smart city is rooted in intelligent infrastructures ICTs-Human connections. He pointed 3 axes which the city growth must pay attention to:

- i. Sustainability: by improving the city/environment relationship and using green economy.
- ii. Smartness: context aware economy and governance.
- iii. Inclusiveness: by fostering a high-employment, economy delivering social and territorial cohesion.

Smart cities' concept can be seen as the surest way to have sustainable, liveable, secure and connected city designs, through the use of ICT.

Nam and Pardo (2011) opined that a city is smart when it has achieved economic sustainability growth fuelled by its investment in human and social capital, modern transport system, communication infrastructure and a participatory government that manages its natural resources well.

Caragliu *et.al* (2013) suggests, smart growth encompasses not just transportation but a mindset towards creating a holistic and sustainable community with great quality of life.

Geller (2003) asserts that it is a self-decisive and independent city, with great performance in its economy, government, people, environment and living.

Consequently, desk study has highlighted the under listed variables as a result of their implication in the adoption of smart city ideas in the design of future cities in Africa. However some weigh more than others and have better implication of fostering this course rather than hindering it in the most effective way.

- i. Sustainability
- ii. Internet of things (IoT) incorporation
- iii. Global Inclusiveness
- iv. Public and Private Partnerships
- v. Political will
- vi. Citizen Participation

Harnessing Nigeria's population in creating smart cities

Identifying the indicators that make a smart city a smart city lie in different concepts, that is why in dealing in urban development related topics like smart cities Roche *et., al* (2012) asserts that smart cities are like an urban area with a layer of technology, overlaid on the urban structure and fabric of the city. This establishes a major relationship between ICT features and infrastructure; which creates an environment for citizens of that city to share, interact, bringing on the net different stakeholders to transfer real time information between each other and the city. Thereby optimizing the city's potentials to development. Since smart cities will depend on population, in 2017 during the Nigerian smart city summit, Demola (2017) opined that it was time for Nigeria to harness it population as a reality rather than a threat adopting a polycentric approach to sustainable urban development. The use of "Swarm Intelligence", which is a decentralized system that makes use of the organization of a collective population sort of how ants work together in their environment to achieve a common goal, this intelligence system relies on feedback from various electronic devices like handheld devices to give feedback of the environment and the same concept is what is used in Google maps to give

feedback on real time traffic situations and the more population it gets feedback from the more accurate the result. Thereby using technology to successfully harness population in giving accurate information.

The global smart city index Fig 2.2 above shows a low rating of the only two Nigerian cities that made it to the ratings and out of a total of 102 cities that were rated. It revealed that Abuja was ranked 97th and Lagos state ranked 102nd both with a “D” rating. These cities are renown as one of the fastest growing cities in the world and a the biggest city in Nigeria respectively according to the United Nations; and with the 2030 SDGs deadline approaching, Nigeria should be looking to harness its already existing population as a catalyst to adapt some of its most populated cities into smart urban spaces.

Smart city index

Table 2.3 showing amongst a host of other cities the rankings of Nigerian cities according to the smart city index

1-10 Ranked Countries

Overall ranking	City	Overall rating
1	Singapore	AAA
2	Zurich	AAA
3	Oslo	AA
4	Geneva	AA
5	Copenhagen	AA
6	Auckland	A
7	Taipei city	A
8	Helsinki	A
9	Bilbao	A
10	Dusseldorf	A

93-102 Ranked Countries

Overall ranking	City	Overall rating
93	Cape Town	C
94	Manila	C
95	Athens	C
96	Rio de Janeiro	C
97	Abuja	D
98	Bogota	D
99	Cairo	D
100	Nairobi	D
101	Rabat	D
102	Lagos	D

Source: United Nations, World Urbanization Prospects

METHODOLOGY

Qualitative research method was used in carrying out this study, using content analysis once the sources (articles) were selected for inclusion in the study. Relevant literature sources in context with the title of the paper as regards urbanization and smart city development was recorded in a spreadsheet. The spreadsheet was designed containing columns that were established considering the indicators deduced from desk study. Consequently, the study considered a total of 80 articles which were initially identified. The articles include 70 that were electronically accessed amongst thesis writings as well as journal articles. Thereafter the study exclusively made use of 63 articles which were selected and evaluated using the keywords and title to select only the papers who dealt with the aforementioned variables to determine which would be relevant to the study. After reading the abstracts and considering which of them provided information on sustainable urban smart cities, 50 articles were selected for the final analysis.

Across these literatures it was observed that there exist significant levels of inconsistencies, while some authors may come to a definitive conclusion others seem to conclude with setting up of criteria, suggestions or even indicators. Therefore data were coded in more general terms to suggest were they would best fit, however this designations were further explained in the research discussions.

Despite the efforts to assemble systematic relevant data in the context of this study, it was met by certain limitations. For the first part this research is entirely limited to journal articles; secondly, the content analysis is drawn from the conclusions of the works of other authors, with little or no space to argue the quality of their findings, biases and conclusions. However

it is a work that presents a broad reading of literature, findings, trends, consistencies reported by other researchers.

Table 3.1: showing variables for the study

SN	VARIABLES
i	Sustainability
ii	IoT Incorporation
iii	Global Inclusiveness
iv	Public And Private Partnerships
v	Political Will
vi	Citizenry Participation

Source: United Nations, World Urbanization Prospects

Table 3.2: Showing Articles reviewed for comparative study

Sn	Author(s), Topic	Year	Themes
1	Margerum, R.D (2002).; <i>Evaluating collaborative planning: Implications from an empirical analysis of growth management</i>	2002	Citizens and civil society should Participate in the formulation and enforcement of urban policies.
2	Kim, H.-J. ; <i>Smart era, expansion and transformation of urban planning</i>	2007	Smart city era would change urban planning as it is known just as the introduction of ICT revolutionised e-services.
3	Washburn, D.; Sindhu, U.; Balaouras, S.; Dines, R.A.; Hayes, N.; Nelson, L.E. <i>Helping CIOs understand "smart city" initiatives</i>	2009	The use of the Chief information officers (CIO) expertise to further interoperability of smart city systems and stakeholders.
4	Ramin Keivani; <i>A review of the main challenges to urban sustainability, International Journal of Urban Sustainable Development</i>	2010	A Necessity to understand sustainability and break the 'silo mentality' of the disciplines that are involved in urban development.
5	George C L.; Mariacristina R; <i>Definition methodology for the smart cities model</i>	2012	Smart city models should be simple and comprehensive to citizens.
6	Lazaroiu, George Cristian & Roscia, M.; <i>Definition methodology for the smart cities model. Energy.</i>	2012	In the modelling of a real city's smart city plan expert contribution from various chosen fields should be involved in the research to enable a very workable city model.
7	Cho, Young. <i>Designing Smart Cities: Security Issues.</i>	2012	Use of CCTV detection and speech recognition in smart cities.
8	Cretu, L. G.; <i>Smart cities design using event-driven paradigm and semantic web</i>	2012	The architecture of Event-driven Smart City is the kind of city where digital artefacts enable the interoperability between Internet of Services.
9	Deakin, Mark. <i>From Intelligent to Smart Cities: CoPs as organizations for developing integrated models of eGovernment Services.</i>	2012	European cities using the intelligence of communities of practice (CoPs) as the organizational means to be smart in developing models of eGov services.
10	Beniamino, M.; Giuseppe, B; <i>Cities and Smartness: A Critical Analysis of Opportunities and Risks.</i>	2013	Coordinating and harmonizing urban players through ICT.
11	Claudio Marciano; <i>Unpacking a Smart City Model: The Hegemony of Ecological and Information Paradigms in Urban Space</i>	2013	Maintaining a sustainable and zero energy lifestyle.
12	Emre Ronay Roman Egger; <i>NFC Smart City: Cities of the Future A Scenario Technique Application.</i>	2013	The implementation of ICTs in cities is the key success factor to encounter the global problems like achieving sustainability.
13	Khan, Zaheer & Anjum, Ashiq & Kiani, Saad. <i>Cloud Based Big Data Analytics for Smart Future Cities. Journal of Cloud Computing.</i>	2013	Use of Big data for processing data, Cloud-based analysis service that can be developed to support decision making.
14	Bettencourt, Luís. <i>The Uses of Big Data in Cities. Big Data.</i>	2014	The use of big data must be to continue to enable the creation of new knowledge by people and not replacing it.

15	Angelidou, M. <i>Smart city policies: A spatial approach. Cities</i>	2014	Certain spatial factors differentiate smart city development policies.
16	Wenge R, Zhang X, Dave C, Chao L, Hao S <i>Smart city architecture: a technology guide for implementation and design challenges.</i>	2014	Architecture designed from different perspectives of technological knowledge to address the sustainability challenges of future
17	Neirotti, P.; De Marco, A.; Cagliano, A.C.; Mangano, G.; Scorrano, F. <i>Current trends in smart city initiatives: Some stylised facts.</i>	2014	Policy makers in leadership roles must find ways to relieve the path dependence on technology adoption.
18	Moir, E.; Moonen, T.; Clark, G. <i>What Are Future Cities? Origins, Meanings and uses.</i>	2014	The concept of digital city have been almost totally replaced by the concept of the smart city, which aims to operate integrated cities.
19	Korea Communications Agency. <i>Smart City of Major Countries around the World Analysis Case; Policy Research Division Fusion Policy Research Department in Korea: Seoul, Korea</i>	2014	Songdo city will be built as a high-tech business city with ICT convergence through the Songdo City Integrated Operation Centre
20	Angadi, Srinivas & Padmavathi, M & Mamillapalli, Raja; <i>Challenges in Adopting Smart City Concepts and their Sustainability in Indian Conditions.</i>	2015	Concept of a smart cities is as a system consisting of multiple systems, with no preferred framework of adoption.
21	Sethi, Mahendra; <i>Smart Cities in India: Challenges and Possibilities to attain Sustainable Urbanization.</i>	2015	The urban planning effort of harmonizing technology, government policies, urban planning and sustaining all by ICT.
22	Mattoni, B., Gugliermetti, F., & Bisegna, F. <i>A multilevel method to assess and design the renovation and integration of Smart Cities. Sustainable Cities and Society</i>	2015	A way to integrate the various aspects of a Smart City is a balance among hardware and software aspects, technology and human capital through the definition of the relations existing among all the subsystems of the city, considered as a whole (human) organism.
23	Haq, Muhammad & Merish, Adnan & El-Abd, Mohammed. <i>A Smart City Model Implementation.</i>	2016	The use of a hierarchical control structure model to solve major environmental problems.
24	Cilliers, Liezel & Flowerday, Stephen & McLean, Sean.; <i>A crowdsourcing, smart city model for a developing country</i>	2016	Adopting a smart city to a developing country majorly requires; the city management, trust of citizens and the crowdsourcing system.
25	Karakiewicz, Justyna; <i>EVER SMARTER, CITIES THAT LEARN: the application of complex adaptive systems theory to urban development.</i>	2016	Adequate attention should be given to the city structure design through the implementation of complex feedback loop systems in creation of resilient cities.
26	Dlodlo, Nomusa. <i>The internet of things for the safety and security of smart cities.</i>	2016	The adoption of IoT in in carrying out various city logistics like crime detection indicators, crowdsourcing and crowd sensing.
27	Adnan, Yasmin & Hamzah, Hasniyati & Md Dali, Melasutra & Md, Dali & Daud, Mohd & Alias, Anuar. <i>Comparative Overview of Smart Cities Initiatives: Singapore and Seoul.</i>	2016	Singapore's highest place in the ranking index was assured by its full commitment in using ICT to improve all facets of city development.
28	Arroub, A., Zahi, B., Sabir, E., & Sadik, M. <i>A literature review on Smart Cities: Paradigms, opportunities and open problems</i>	2016	Many Smart City initiatives are intensively using technology (ICT).
29	Bifulco, F., Tregua, M., Amitrano, C. C., & D'Auria, A.; <i>ICT and sustainability in smart cities management</i>	2016	Development of new smart city models that integrate drivers, ICT, and sustainability in an all-in-one perspective.
30	Peyman, K., Hamid, F., and Samira, M.; <i>Planning for Future Urban Services in the Smart City Era: Integrating E-services in Urban Planning Process</i>	2016	An integrated conceptual service delivery process as well recommendations for integrated development of e-services from different planning dimensions.

31	Charles Consel, Milan Kabáč. <i>Internet of Things: From Small-to Large-Scale Orchestration.</i>	2017	IoT infrastructures range from small scale (e.g., homes and personal health) to large scale (e.g., cities and transportation systems).
32	Gebhardt, Christiane. <i>Humans in the Loop: The Clash of Concepts in Digital Sustainability in Smart Cities.</i>	2017	The transition from normal cities to smart cities is a socio-economic problem of ensuring sustainability and a visionary government.
33	Matijosaitiene, Irina & Petriashvili, Ana; <i>Urban Planning and Design for Terrorism Resilient Cities. Journal of sustainable architecture and civil engineering.</i>	2017	Professionals should consider Crime Prevention Through Environmental Design (CPTED).
34	Hasbini, Mohamad Amin & Tom-Petersen, Martin; <i>The Smart Cities Internet of Access Control, opportunities and cyber security challenges.</i>	2017	IoT is the best option in access control in overpopulated metropolises around the world however it poses a threat to cyber security which is still under perfection.
35	Taylor Buck, N. <i>Competitive urbanism and the limits to smart city innovation: The UK Future Cities initiative</i>	2017	The development of new technologies made possible the connection of independently developed devices share data.
36	Parth, J S;, Theodoros A;, Arkady Z;, Sara B: <i>A stochastic optimization framework for planning of waste collection and value recovery operations in smart and sustainable cities</i>	2018	Harnessing IoT in smart city management using sensors.
37	M Nagabhushan, K.Nikitha, C.Lakshmi, C.Karthik; <i>Internet of Things on Smart Villages</i>	2018	IoT combines the benefits of multiple technologies, the result is an intelligent city.
38	Achmad, Kusuma & Nugroho, Lukito & Djunaedi, Achmad & Widyawan, Widyawan. <i>Smart City Model: a Literature Review.</i>	2018	Review of IoT systems that deal with peoples demands improving living conditions of populations and encourage creative economy.
39	Sinha, Deepak; <i>The Counter Terror Dimension to the Planning of Smart Cities.</i>	2018	Counterterrorism requirements should have statutory backing in order to make not just smart but safe cities.
40	Smart City Stakeholders <i>Stakeholders Analysis, SMART CITY SOLUTIONS.</i>	2018	The level of stakeholder integration, and their close collaboration is integral to the achievement of mutually beneficial end results.
41	I Makarova, A Boyko, I Giniyatullin and A Ahmadeeva; <i>Development of transport infrastructure in smart cities.</i>	2019	Develop smart mobility system using eco-friendly smart mobility systems.
42	Jiongxu Mou; <i>Mining and forecasting of infectious disease transmission data based on smart cities</i>	2019	In disease management and pandemics introduction of technology in the form of smart indicators and prediction systems result in early detection and better management.
43	Dora S; <i>Measuring the smart cities performance in the capital cities of the EU</i>	2019	Smart city definitions are basically 3 groups which are; technology oriented, complex theories and ranking method.
44	Khalatbari Limaki, Armita; <i>Climate change and urbanization responsibility: A review of smart city importance in reducing the negative impacts of urbanization.</i>	2019	For better energy conservation in cities Architects must design intelligent structures that synergizes the fundamental items of intelligence; Big data, IoT and ICT.
45	Anthopoulos, Leonidas & Janssen, Marijn & Weerakkody, Vishanth. <i>A Unified Smart City Model (USCM) for Smart City Conceptualization and Benchmarking</i>	2019	The model uses ICT and technology to create a more enabling thriving environment.
46	Nigel J. W. Browne; <i>Regarding Smart Cities in China, the North and Emerging Economies—One Size Does Not Fit All</i>	2020	Emerging economies cannot rely on one model in adopting IoT.
47	Gustavo C. N., Elaine T.; <i>Assessing the Role of Big Data and the Internet of Things on the Transition to Circular Economy</i>	2020	Circular economies (CE) are driven by population pressures.

48	Michal Lom & Ondrej Pribyl; <i>Smart city model based on systems theory</i>	2020	The Information management approach i.e. the strength lies in information sharing.
49	Schwarz-Herion, Odile. <i>The Role of Smart Cities for the Realization of the Sustainable Development Goals.</i>	2020	The demand of energy amount and resources needed in running a smart city would hamper the attainment of the SDGs.
50	Mervi Hämäläinen <i>A Framework for a Smart City Design: Digital Transformation in the Helsinki Smart City.</i>	2020	The framework considers a smart city from the perspective of four dimensions: strategy, technology, governance, and stakeholders.

RESEARCH DISCUSSIONS

This section of the research discusses the results of the 50 selected articles, the discussions include the similarities and trends, to highlight the critical indicators that define the typology of a smart city model for Nigeria. The discussion categorises the themes from the articles in 6 smart city phrases which are: Smart Economy, smart people, smart governance, smart mobility, smart environment and smart living, as much as this phrases are used in categorising the thematic summary on scholars' discussions, it does not meant they are exclusive to the discussion on the subject matter. The smart city topic is a complex one that entails an intertwined relationship between all categories for it to be successful nonetheless. This phrases common to the smart city context are further broken down to make clear their emphasis under the subheading in the research discussions.

Categories

Table 4.1: Showing the trend in years and progression of smart city themes

SN	YEARS	TRENDS	THEMES
1	2000 - 2005	Smart city policies	Smart Governance Smart Economy
2	2005 - 2010	Access to and sharing of information amongst governments by the use of ICT	Smart Governance Smart Living
3	2010 - 2015	The Sustainable development goals	Smart Living Smart Environment
4	2015 - 2020	Harnessing the power of IoT to fully achieving Smart cities	Smart People Smart Mobility

DISCUSSIONS

Smart Environment

India uses sustainable policies as a result of their demographic make. These adoption fosters harmony between government planning and the urban populace confirming smart city development as a social problem and it has treated it as such, the Nigerian makeup is a demography comprised of different units or sub systems no different from India and both environments having an alarming population, contrary to the way sustainability in smart cities are portrayed as a green flourishing city and even though it would be one, running a smart city in Africa requires a lot of energy and it seems unlikely that the 2030 deadline for the SDGs is anyway realistic date. Through design professionals in the built industry especially architects can guide the progression of this curve and for starters prevent crime by adopting sustainable methods of designing smart cities such as the use of CPTED, other sustainable design considerations can be made to usher Africa smoothly into an era of smart cities, but firstly, a conscious mind set in design.

Sustainability is a multifaceted topic and there is a need for deeper understanding of the disciplines involved in ensuring a sustainable society to break the wide silo mentality amongst environmental science professionals and create a sustainable balance between hardware,

software, technology and human capital to propagate Smart living, proper pollution and waste management ensuring attractive natural conditions.

Smart Mobility

The incorporation of ICT into urban development has brought about IoT which involves the use of many electronic sensors to collect and manage data. In fact in a comparative study of Seoul and Singapore, a major contributor as why Singapore ranks highest than Seoul in the study and also tops the smart city index rankings is as a result of its commitment to using ICT in developing several facets of its developments in the country. Looking at the budding population of Africa it is easier to understand the role it would play in IoT incorporation, according to data on mobile subscription in 2015 the result showed 7.2 billion subscriptions worldwide with three-quarters of that coming from Africa and Asia, this young internet hungry population is a reservoir which this numbers can aid in information management. The use of IoT combines many technologies and devices already in use to send back an information about a city they are already in, although there is a disadvantage in overpopulated areas when it comes to internet of access control, this threats creates an opportunity in advancing cyber security. The big city data would continue to create and enable new knowledge and not replace it, by making people smarter.

A key advantage of adopting IoT in designing future smart cities is that they can leverage small to large infrastructure, from as little as a start light or signage on a storey building the cloud based big data is able to generate intelligent information to support decision making in the city, from vacancy of spaces for rent down to the weather report a constant loop of intelligent transfer.

In waste management in the city smart bins can be used to gain feedback on type of waste collected, in tourism and also in logistics to track and ensure security.

IoT incorporation encompasses living in good health conditions and public security, in the category of data mining and model prediction; a comparison study between using traditional infectious disease management and smart indicators in the case of a pandemic to detect and curb the spread and death tolls, the introduction of ICT in form of the ARIMA model to detect arising cases proved effective, this model uses a learning algorithm to predict future trends, in china where the study was carried they face an important challenge in low detection rates, low pathogen diagnosis rate, low screening rate and high drug resistance rate. Early prediction warning models improve the chances of survival of infected patients and based on this reduce the effect of the pandemic.

Smart Living

E-governance offers collaborative opportunity between government and in all forms of smart governing the use the cloud based big data to be able to support decision making, smart governing provides opportunity for transparency in government and also policy making, global sustainable actions like having a circular economy is checked towards ensuring sustainable cities creative and collaborative economies. The smart city governance is one that ensures dialog before decision making in the smart ecosystem. In Europe the smart governance ecosystem is funded by global international organisations as digital urban development is a prioritized agenda to ensure sustainable environment development, smart governance is like being a government part of a coalition of government with similar global agenda such as achieving the sustainable development goals.

Smart Economy

Public and Private partnership are encouraged in achieving this vision since both are stakeholders and beneficiaries in the eventuality of a smart city, currently different researches are going on around the world for countries to create their own smart city; creative channels

for city building encouraging local innovations, the possibilities of CE and other smart city innovations in different scales across the major key stakeholder sectors, the smart city model encourages the smartness of an individual or a the people this can further foster the smartness of the city and improve security by making use of crowd sensing, street lighting to give feedbacks, this can surely be supported by partnership of these sectors. Critical study revealed that economically the smart city uniformly deals with innovations (mostly ICT-based) in the urban space that aims to enhance 6 dimensions (people, economy, government, mobility, living and environment) in other words smart cities would encourage running an innovation based economy, which is a more sustainable economy just like the CE rather than the crude oil economy which encourages unsustainable practices. In the limitation to such innovations a study on the future of U.K cities draws attention to weakened capacity of urban governments to control their infrastructural destiny and also constraints on the ability of the public and private sectors to innovate.

Smart Governance

Certain Progressions in governments are implored to create policies that support technological advancement in the design of urban areas, such as using IoT systems to harmonize key urban players by the government in urban planning, to produce high value services and economical innovations after observing citizen demands; the government's willingness and responsibility to address some of this demands will yield in a more sustainable community, adoption of a smart city can in fact help understand the plight of the people, through feedback from sensors that retrieve data in the most affected areas. In prioritizing dialog as a government with key stakeholders before making smart city decisions, the discussion becomes inclusive harnessing crowd sourcing and crowd sensing for better progression. In Helsinki governance attracts various organisations and stakeholders, smart city governance ensures an approach that secures all stakeholder interest and manage their common affairs, providing strategic leadership that considers long term financial needs such a political environment is what is needed to a thriving economy, in the planning of a smart city there is slow progress in political rivalry. Leadership should encourage adoption of smart city as it reduces a wide range of corrupt practices because governance becomes transparent, this sole reason can however be a major reason why the most corrupt countries are sort of hesitant into adopting smart city ideas. But the stakeholder integration, and collaboration between stakeholders is important in the achievement of mutually beneficial end results like flexibility of labour market, sustainable resources management and public and social services provision.

Smart People

How smart can a city really be without involving its citizens, this first hand is essential to a fully functional smart city. Having the confidence of the citizens in the smart city initiative is one of the variables to ensure success, because unless a large amount of people participate the project cannot be successful. In crowdsourcing which is an integral aspect of ensuring a successful smart city model, fuelled by population pressure crowd sourcing takes into account two important constructs; information security and user experience. Many cities are adopting the use of ICT and taking advantage of the citizen participation to effectively share information within the cities, just as in the use of social media, almost everyone in the cooperate world has an email or a Facebook account, today Facebook is amongst the biggest sellers of information and this large amount of data would not be possible without people participation. In the planning of urban policies civil societies and citizenry must participate as it helps for transparency and builds trust. Smart living entails healthy living conditions of individuals in a smart community, innovations for infectious disease spread through the use the data collected

from citizens is able to forecast more accurate results on spread according to a research in china, the accuracy is relative to the citizenry participation.

POLICY IMPLICATIONS AND CONCLUSION

The study revealed the need for relevant sharing of information amongst agencies in Nigeria. This information sharing will in turn provide a safer environment, one with more accountability to enable better tracking of individuals. Insurgency and other vices that result in insecurity would be curbed with necessary biometric data of individuals collected and used in investigative purposes.

The era of ICT brought a lot of opportunities which negligence on the part of the people and government has paid a big role in not tapping from; to the people a lot of public sensitisation should be put out to create awareness on what really this new technologies bring and its advantages. On the part of the government a commitment to ensuring that this sensitisation is carried out in the most public friendly manner and not imposed on them, because it is important for the citizenry to participate wilfully. The use of IoT oriented infrastructure to give relevant feedback for proper data recording, like in the case of an offender this sort of innovation should be welcomed, so that certain civil disobedience and vices like whenever an individual neglects a traffic law or sign a CCTV camera can be pick the details of the individual ready to be downloaded for further actions by the relevant agencies involved in prompting quick response to such crime scenes.

IoT in the built environment has led to innovations in designs and a city should run as a smart buildings would, smart signage that give individuals information on traffic are some of the innovations that yield in improved fluidity in navigating around the cities with high population and traffic. This paper calls on a national adoption and pro-activeness in the aspect of ICT adoption in urban development in the country, as the country faces a rapid growth of population in many parts while also experiencing a slow growth in Infrastructure.

The SDG deadline approaches and it should be the responsibility of every individual or company operating within Nigeria or Africa to adopt sustainable practices and sustainable design. Professionals in the built environment need to be more vocal and practical about their design decisions, the activity of one person should not cause discomfort to another person or worst make an inhabitable environment for future generation, from the drawing board the topic of sustainability should not be an option, where if a designer is making his design decisions, he may or may not decide to adopt sustainable design measures, it should be a mandatory action of every designer, from conceptualisation to material selection and construction methods.

There is also a need for a transition into a circular economy to reduces wastage and promote recycling, Nigeria already has a lot of local recyclers who have taken it upon themselves to locally gather and recycle materials however, the introduction of ICT and providing smart bins opens the world of recycling to every location where a smart bin can be placed leading to a more effective circular economy which would in turn make safer ocean habitats and reduce drainage blockage which causes flooding.

In conclusion, the study features a comparative review of articles in Fig. 3.2 to arrive at themes that guide easy adoption of a smart city model, the findings of this research has opened more research possibilities in line with this study. It has also revealed that in taking the smart city agenda more serious it ensures a more effective and sustainable environment, observing the kinds of crisis Nigeria goes through whether it be in the health, economy or its territorial integrity a problem of security has been a reoccurring issue. The comparative study in this research reveal similar challenges in other countries and proffers solution in addressing some security challenges as is discussed in the research discussion. It would be beneficial to the Nigeria if the government and Africa as a whole shows more interest in preparing for a future

with a high population and the intricacies of not preparing for it. With the appropriate infrastructure and sensitisation put in place the road to a more sustainable future for cities with high population becomes clearer, however it is not late if proactive measures are put in place now before the government is left with a reactive management crises of population growth. Furthermore, the findings of this study suggest that a city is truly smart when it is able to capitalize, harness and harmonize all its resources through a sustainable approach.

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