COMBATING CLIMATE CHANGE USING INFORMATION COMMUNICATION TECHNOLOGY; A CASE STUDY OF NIGERIA

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ABSTRACT

Information and Communication Technology (ICT), the mover of all technological innovations has transformed all fields of human endeavour to researchable compact elements of the Globe and thereby proffers unique solutions to various problems emanated in our habitants due to unchecked population growth. Geometric growth in human population has increased energy consumption, soil and other non-renewable resources at human disposal, which adversely exposed our Cities to risk of climatic changes such as: severe weather events, heating, soil erosion, and flooding which is current in States of Nigeria. The outright solution to all these identified issues are embedded in the concept of Smart City that is characterised with smart economy, smart people, smart mobility, smart environment and smart living. As it obtained in Cities like Singapore, Barcelona, New York City and many others. If Nigeria is to meet its goal on safer environment, devoid of any natural disaster which is mostly caused by climate change, the idea of smart cities should be looked into. This paper has shown that ICT can be used as a better instrument of cleaning up our environments better than it though. As a solution, the smart city concept would help Nigeria to realise her national goal on environment.

Keywords: ICT, Compact elements, Smart City Concept

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INTRODUCTION

The planet earth faces an increasing number of challenges involving Environment, Energy, Food, Water, Transportation, Infrastructure, Society, Healthcare, Education, Governance, Security and economy downturn. On the upside, it gained more on the digital revolution, technological revolution, environmental revolution as well as social revolutions shaping more integrated, inclusive, or sustainable world. (Abdoullaev, 2011)

Despite the increase in human knowledge, due to science advancement, industrial revolution which has led to creation of more wealth, the social ills of the society are still prevalent everyday lives, hunger, unemployment, diseases, wars and the major one environmental degradation.

A city is a core aggregation and socialization paradigm for the mankind, where trade, technology, art and culture can help in designing and building the solutions to many core global issues (i.e. economical double dip, fossil energy and other resources exhaustion, environmental climate change and pollution, social pressed by unemployment, poverty and demographic growth, cultural for radical changes in communication in digital life and globalization, biodiversity loss, etc.(Toppeta, 2010)

In Nigeria here, we have large populated cities, and it is high time we face these environmental threats by leveraging on digital technologies to increase the quality of life of the citizenry, increasing economy base and most importantly; less pollution of the

environment. Nigeria as a developing country will qualify for a place in this production chain through heavy investment in education, Research and Development, and infrastructure.

On the course of these paper we shall be checking on how the country can combat climate change by leveraging on advance human technology that will lead to all its major cities being turned into a constellation of smart cities.

BACKGROUND STUDY

A city is can be described as a geographical location n that in habits population without reference to race, colour, gender e.t.c. Cities in Nigeria face the challenge of combining competitiveness and sustainable urban development simultaneously such as Lagos, Port Harcourt, Aba, where human population and industries are seriously dense, one can deduce the level of environmental degradation such as flooding, high sun impact e.t.c. in these cities. More than half of the population of the Earth now live in urban areas (United Nations, 2012). Modern cities face many challenges and opportunities because of this. This challenge is likely to have an impact on issues of Urban Quality such as housing, economy, culture, social and environmental conditions changing a city's profile and urban quality in its composition of factors and characteristics. The challenges range from providing a good quality of life for citizens to ensuring appropriate socio-economic development year on year, while the opportunities can be seen in businesses becoming more efficient and innovative. The concept of making cities “smart” has grown out of the need for cities to meet these challenges and opportunities. This project deals with medium-sized cities and their perspectives for development.

Even though the vast majority of the urban population lives in such cities, the main focus of urban research tends to be on the ‘global’ metropolises. As a result, the challenges of medium-sized cities, which can be rather different, remain unexplored to a certain degree.

Medium-sized cities, which have to cope with competition of the larger metropolises on corresponding issues, appear to be less well equipped in terms of critical mass, resources and organizing capacity. To enforce an endogenous development and achieve a good position, even these cities have to aim on identifying their strengths and chances for positioning and ensure and extend comparative advantages in certain key resources against other cities of the same level. City rankings are a tool to identify these assets. Although they are quite common in recent time, rankings are very different in their approaches or methods.

Due to different interests behind rankings and the indicators and methodological approaches used it is also normal that one city is ranked very different in different rankings. Additionally, medium-sized cities are often not or only partially consideration

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GROWING RATE OF CITIES AND ITS EFFECTS ON ENVIRONMENT

The increasing birth rate of Nigeria, has led to more creation of cities, out of townships. The major cities in Nigeria have witnessed major explosion in terms of population. It is known that the major reason for the increase in population of the major cities are due to; urban services, housing, infrastructure, unemployment e.t.c. Basically, once population increases, the consumption of energy, soil and other non-renewable resources at human disposal will increase. There will be difficulty in managing waste, altered climate, pollution will be increased and many more. Concentrated energy use leads to greater air pollution with significant impact on human health. Automobile exhaust produces elevated lead levels in urban air. Pollution promotes loss of urban tree cover. Animal populations are inhibited by toxic substances, vehicles, and the loss of habitat and food sources. According to the World Health Organization's air quality standards, the concentration of suspended particulates (made up of airborne smoke, soot, dust, and liquid droplets from fuel combustion) should be less than 90 micrograms per cubic meter. The risk attached to this is a high climatic change

which includes: severe weather events; heating; soil erosion; extreme precipitation, all these which will lead to ecosystem alteration, flooding in areas near to rivers and seas e.t.c, which is the current state of Nigeria mega cities.

There is also an operational risks from changes like rising electricity prices or transportation costs linked to fossil fuels and other depleted natural resources, like potable water (exposed to exhaustion and pollution).

A critical example was given in a report that released by the World Bank titled “Turn Down the Heat details the devastating impacts of a world in crisis”. If current policies and trends continue, the planet could become an average of 4 degrees Celsius (39.2 degrees Fahrenheit) hotter by the end of the century. This scenario would result in a ―new normal‖ of extreme temperatures, massive flooding and devastation among the poorest nations. An internet based website called in-habitat stated on 27th January, 2014 that Delhi's Air Pollution was Even Worse than Beijing's Smog. It noted that China gets all the attention when it comes to terrible air quality, but the truth is that the worst day in Beijing is really just an average day in Delhi. Though it gets far less notice, the air in Delhi is some of the most polluted on the planet. In fact, India‘s citizens have some of the weakest lungs, highest rates of asthma and highest mortality rates from respiratory issues of any nation in the world. In January 2014, Beijing closed major highways and issued urgent health warnings to those living within its borders. On the other hand, life in Delhi has gone on like normal, despite the fact that on average the city‘s harmful air particulates are nearly double that of Beijing. Delhi averaged a measurement of 473, while Beijing averaged 227. Beijing reached its worst day, a measurement of above 500 (the highest range that the scale can reach) on January 15, 2014. Delhi, on the other hand, had reached that measurement range 8 times by mid-January 2014.

Experts estimate that as a consequence of urbanization over $40 trillion dollars will be invested in urban infrastructure over the next 20 years mainly in transport, housing, hospitals

and other social amenities all of which will be consuming energy. This may also produce adverse impact on climate change due to increased CO_2 emissions. The challenge for urban policy makers is - to meet the demand of growing energy and to go for alternative renewable sources for efficient energy generation as this will help in reducing the carbon footprint. In all the paper will be focusing on these three aspect; what is a smart cities; is smart cities a possibility in Nigeria and how does smart cities help combat environmental issues such as climate change.

LITERATURE REVIEW

The Smart City Concept

The origin of the concept of Smart Cities can be traced back to at least the Smart Growth Movement of the late 1990s. (11) Gabrys(12) find the roots of the concept earlier, namely from what they call the "cybernetically planned cities" of the 1960s, in proposals for networked or computable cities in urban development plans from the 1980s onwards .The concept of a smart city is still quite a vague one and there are a number of different definitions which are not always consistent. The UK government in its smart cities background paper argues that "There is no absolute definition of a smart city, no end point but rather a process or series of steps by which cities become more "liveable" and resilient and, hence, able to respond to new challenges". In addition a smart city could also be defined as a city which uses information and communication technology to ensure that its critical infrastructure and the public service it offers are more interactive

''a city can said to be smart when investment in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable physical and economic development and a high quality of life, with efficient management of natural resources, through participatory action and engagement'' Caraglin and Nijkam (2009)

According to IBM, it successfully stated that a “smart city” is a complex infrastructure of “system of systems”; Just a decade ago, the 7 largest megalopolises (Indo-Gangetic Plain, Pearl River Delta, Blue Banana, Yangtze River Delta, Taiheiyo Belt, Great Lakes Megalopolis, and Northeast Megalopolis as Boston - Washington) covered about 10% of human population, so taking a lead in overpopulation, energy consuming, air, water, light, and soil pollution, urban sprawling, ecosystems degradation, and unsustainable urbanization. Nowadays, many municipalities are embracing the Smart City strategy, installing municipal wire line or wireless broadband networks; implementing e-government by providing a digital access to ministry departments’ web sites instead of going physically; integrating public transit. with intelligent facility systems such as light gauge rail line and cable car line ; developing distributed RES networks cutting carbon footprints, applying eco principles to reduce, recover, recycle, and reuse the urban resources, that have been put to waste.

Despite different positions on the definitions of smart cities, there is a common denominator that cross across the said following definitions which is the use of information communication technology to transform life and working environment with our cities. As it can be rightly putted that the evolution of human science is what lead to battle the environmental spoilage using smart cities. Last year’s climate talks in Paris, COP21, conveyed the clear message that our energy mix needs to be diversified. Renewable energy sources such as solar, wind, and energy from waste not only reduce greenhouse gases but are becoming economically attractive.

The Characteristics and factors of a smart city includes but not limited to

1. **SMART ECONOMY (Competitiveness)**

   Innovative spirit

   Entrepreneurship

Economic image & trademarks

Productivity

Flexibility of labour market

International embededness

2. **SMART PEOPLE (Social and Human Capital)**

   Ability to transform

   Level of qualification

   Affinity to life-long learning

   Social and ethnic plurality

   Flexibility

   Creativity

   Cosmopolitanism/Open mindedness

   Participation in public life

3. **SMART MOBILITY(Transport and ICT)**

   Local accessibility

   Inter-national accessibility

   Availability of ICT-infrastructure

   Sustainable, innovative and safe transport systems

4. **SMART ENVIRONMENT (Natural resources)**

   Attractivity of natural conditions Pollution

   Environmental protection

   Sustainable resource management

5. **SMART LIVING (Quality of life)**

Cultural facilities

Health conditions

Individual safety

Housing quality

Education facilities

Touristic attractively

Social cohesion

Source:

IS SMART CITY A POSSIBILITY IN NIGERIA?

No smart city sprungout from nowhere, there we're all existing cities before the bold step was taken, to turn them into smart city. Nigeria cities have vast opportunity in realising the ambition of becoming smart. Lagos for example with its vibrant 24 hours economy, suffers from environmental damage as it is evident in the flooding, high sunlight, acidic rainfall e.t.c. One of the major reason on writing this paper is to evaluate the smart city option for the country cities, so as to combat environmental challenges.

Nigeria is making efforts at developing smart cities in some states of the Federation including the Federal Capital Territory (FCT), Abuja through coordinated and concerted opportunities by the government in partnership with the Private Sector. Prominent amongst the cities being developed is the Eko Atlantic City and that of Lekki which is jointly being handled by the Lagos State Government, Commercial Banks and Private Investors. One can see that when these projects come into fruition, the environmental landscape of Nigeria will change for

good. Majority of world renowned smart cities were developed to mitigate in coming environmental hazards.

This paper will be taking a cursory look on examples of smart cities across the world.

Singapore

The Republic of Singapore has announced its quest of becoming the first smart nation. A program launched by Prime Minister Lee Hsien Loong in late 2014 calls for an unspecified number of sensors and cameras to be deployed across the island to track everything from cleanliness to traffic. In any case, the number of sensors being installed across the island will be large. Already, the city can detect if people are smoking in unauthorized zones or if people are throwing litter out of high-rise buildings.

Spain (Barcelona)

The capital of Catalonia region in north eastern Spain, Barcelona has made extensive use of sensors to help monitor and manage traffic. City planners recently announced their plan to remodel the flow, which they say will be reduced by 21%. The city is doing more than using smart-city technology to reduce traffic. It has installed smart parking technology as well as smart streetlights, and sensors for monitoring air quality and noise. It is also expanding a network of free Wi-Fi in public spaces. In Juniper Research's recent roundup, Barcelona fell a rung from the leading spot it had past year. Still, the research agency praised the city's environmentally sustainable projects, which it said was measurably better than either New York City's or London's.

From these two countries, one can see that the possibility of making Lagos or the entire country smart is a possibility, all the country needs is good policies and the right personnel's to drive the vision.

COMBATING CLIMATE CHANGE THROUGH SMART CITY PROJECTS.

In facing the menace of environmental degradation, the best route out is to create policies that will achieve the MDG on climate change. These policies will drive the smart city idea from being just concept to a reality. Nigeria has a whole has all it takes if it serious about making its environment safe, healthy and prosperous. Checking current forecast by NIMET, it gives a concern if by the next century some certain cities in this country will still be existing. While taking a good example to show how smart city was used in solving environmental disaster in the city of Seoul, South Korea, where the city had these challenges namely; Insufficient public waste bins, low recycling rates, overflowing waste bins, the problem was solved by Installation of 85 Clean Cubes for general waste and recyclables in the city centre, Real-time monitoring with Clean City Networks (CCN), Hourly report to track collection efficiency, Route optimization for waste collections.

Major technological, economic and environmental changes have generated interest in smart cities, including climate change, economic restructuring, the move to online retail and entertainment, ageing populations, urban population growth and pressures on public finances. The European Union (EU) has devoted constant efforts to devising a strategy for achieving 'smart' urban growth for its metropolitan city-regions.

The EU has developed a range of programmes under 'Europe's Digital Agenda". In 2010, it highlighted its focus on strengthening innovation and investment in ICT services for the purpose of improving public services and quality of life. Arup estimates that the global market for smart urban services will be $400 billion per annum by 2020. Examples of Smart City technologies and programs have been implemented in Milton Keynes, Southampton, Amsterdam, Barcelona, Madrid and Stockholm.

An important cluster of Smart City technological companies exists in Israel with Tel Aviv being awarded the World Smart City Award in 2014. Israeli companies are implementing Smart City solutions worldwide.

As a solution, the smart city concept would help Nigeria to realise her national goal on environment, and greatly assist in ensuring that all citizens own or have access to decent housing accommodation at affordable cost. The solution could also help in drastically cutting the total amount of carbon dioxide emissions in the country currently standing at 22,700 metric tons of carbon.

EMPIRICAL FRAMEWORK

Toppeta (2010) in his paper titled "The Smart city vision: how innovation and ict can build smart "liveable", sustainable cities." The work focused on the best approach in order to define what really a smart city is. He listed Developing human resources and social capital; Smart People; Economics 2.0: Smart Economy for competiveness, Quality and Sustainability of living; Ecosystem: Sustainable Environment, renewable energy and other resources; E-democracy, e-Government 2.0, Smart Government. As the criteria for smart cities.

Andres Monzon (2015) on his paper "Smart cities concept and challenges: bases for the assessment for smart city projects" wrote that smart city should give response to any challenges cities are facing in the 21st century. He also found that smart city projects should efficiently respond to complex and different urban challenges without leaving behind its main object of improving the quality of life of their citizens

In a presentation by TPL. Ayo Adeniran at the 5th Urban dialogue of the University of Lagos noted that the promoters of smart cities in Nigeria will use a practicable approach to tackle a practicable approach to tackling complex challenges of the cities, such as flooding, traffic congestion.

In a paper by Adio-Moses and Oladiran of University of Lagos titled "Smart cities Strategy and sustainable development goals: a literature survey" it was agreed upon by the authors that

since smart cities uses the ICT, novel systems, in an environment that favours cutting-edge technologies.

NIGERIA PROSPECT ON SMART CITIES

With the current trend on climate changes around the world, and the evolution of smart city, it is earlier noted that Nigeria too has followed the trend, with its most populous state Lagos taking the lead on smart city. The Eko Atlantic city which is a collaboration between Nigeria, Lagos and the City of Dubai from United Arab Emirates will be the first amongst others to be developed. Although the level of technological is still low, coupled with high low level of information contributes to why it is not yet known to many citizens. Currently with the country making concerning efforts at developing these cities the prospect of Nigeria is bright with investments coming in while its objective of a cleaner environments will be achieved. The Ministry of environment, science and tech, with Land and Housing has developed policies, programmes that will make it a reality.

CHALLENGES TO THE DEVELOPMENT OF SMART CITIES IN NIGERIA

Nigeria is facing many challenges on the development of the smart city due to various reasons to be highlighted below:

1. Poor access to land for development.
2. Inadequate and non-availability of medium to long term finance for housing development. Inadequate coordination and policy changes.

3. Lack of adequate land use planning
4. Inadequate power for driving cities
5. Inadequate penetration of broadband for major cities in the country.

RECOMMENDATIONS:

1. Climate change, smart city concepts should be first considered.
2. The land use law and rights should be reworked in order to ensure god planning and developmental control
3. Government roles for the provision of the enabling environment for the private sector to thrive, this government is currently doing, it is thus important for the private sector to take up the challenge to continue to see the potentials in having smart cities and also in the transport sectors.
4. Smart cities, no doubt are money spinning avenues for government at all levels, the opportunity must be explored to address the problem of slums in our cities.
5. The requisite human capital development must be built for smart cities to evolve, this should be done.

CONCLUSION

If Nigeria is to meet its goal on safer environment, devoid of any natural disaster which is mostly caused by climate change, the idea of smart cities should be paramount. Smart cities provide cleaner environment, no environmental disaster, as most used commodities and source of energy that will be used are renewable, I believe upcoming towns or cities been noted by government to establish should all be made smart. This will help the country not to

suffer any kind of climatic problems. This paper has shown that ICT can be used as a better instrument of cleaning up our environments better than it though. As a solution, the smart city concept would help Nigeria to realise her national goal on environment, and greatly assist in ensuring that all citizens own or have access to decent housing accommodation at affordable cost.

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