



AFFORDABLE-SUSTAINABLE-INNOVATIVE HOUSING TECHNOLOGIES AND SOLUTION FOR NIGERIA

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ABSTRACT

The rapid rate of urbanization, economic and population growth in Nigeria, estimated at 2.6% per annum are the key factors that have put a lot of pressure on housing demand and investment. Consequently, the housing deficit has recently been estimated to be up to a backlog of about 22 million units. In order to attain a sustainable economic development in the Nigeria housing sector, this study is aimed at developing an affordable/sustainable pedagogical framework for innovative housing delivery. The study adopts a mixed method approach, as well as, using a case study of an existing model. The result of the framework is a model for affordable housing delivery with 30% savings that can be used towards the provision of affordable water and electricity. The significance of this model is its uniqueness as the Siamese triplet of achieving affordable housing in Nigeria with modular system of construction, using 3 in 1 components of fibre glass + concrete IBS for columns, beams and Walls.

Keywords: *Development, sustainable, innovative, urbanization*

INTRODUCTION

The rate of urbanization is currently estimated at 4.32% per annum. Nigeria for a period of time experienced a stable economic growth averaging 8% over the last 10 years. With the rebasing in 2014, Nigeria is deemed the second largest economy in Africa. Recently economic growth stalled and the country has just come out of recession, the Nigerian economy is expected to grow by 1% in 2017 and 2.5% in 2018. The rapid rate of urbanization, economic and

population growth estimated at 2.6% per annum are the key drivers that put pressure on the housing sector and the demand for housing and investment in Nigeria. The housing deficit has been estimated to be up to a backlog of 17 million units. The need for housing is increasing in major cities such as Lagos, Abuja, Port Harcourt, Calabar and Warri. Nigeria is faced with increased rate of urbanization, with different urban centres emerging as a result. There are both positive and negative impacts of urbanization on the nation. Apparently, the negative ones outweigh those that are positive, and the former affect the urban populace than the positive variables. Nonetheless, most of them are hinged on the housing deficit which keeps increasing because it is not affordable to majority of the population. Nigeria does not need any new policy because of the fact that implementation is very key at this defining moment. Sustainable Development is about making sure that people throughout the world can satisfy their basic needs presently, while making sure that future generations can also look forward to the same quality of life. It therefore recognizes that the three 'pillars'-the economy, society and the environment – are inter connected. Sustainable development could therefore be termed as the use of renewable resources in a manner that does not eliminate or degrade them or otherwise diminish their renewable usefulness for future generation while maintaining effectively constant or non-declining stocks of natural Sustainability in relation to environment according to Oduwaye (2009) stated that there are programmes required to achieve sustainable physical development in the less developed world. The illustration of indigenous construction materials and construction technology in the country is such that various issues of buildings with bottles, containers, stabilized earth, interlocking dry construction, angle iron lintel, cross wall roofing, 2 in 1 lintel and binding course with useless to useful ideas had been fully taken care of. The complex construction industry is a building and transforming industry where different professionals including architects and builders use different materials, equipment, tools and ideas, coming together at different stages to form a unit whole. The combined effort of them will still contribute to a large extent if the following issues are well addressed:

Industrialized Buildings

Industrialization as a process implies the organization or re-arrangement of labour, equipment or materials and other resources in a highly efficient process that out-performs previous craft- oriented methods. Industrialized buildings do take the forms of either panelized (2d), modular (3d), containers or mobile housing units. In this case, most buildings of the next decades have been predicted to include this technology. Hence, architects and builders will

be involved in this effort to contribute their quota in the national transformation through industrialization.

Relief Housing

According to Ing (2000), housing the citizen is one of the social services which the government of any country must offer. The in-adequacy on the qualitative and quantitative aspect of housing in Nigeria clearly indicate the level at which the government failed to meet this aspect of her obligations. In order to assist the government as they can never provide everything, architects and builders are prominent in the services provider of relief housing units to victims in case of violence, insecurity, fire, collapsed building incidences and other man-made or natural disasters. Such materials in this category include polystyrenes, 3d-printed houses and prefabs.

Low- Cost Housing

Diogu (2002) proclaimed that the low income earners in Nigeria over the years have been experiencing harsh housing and environmental conditions, living in substandard environments, often without basic infrastructures and services. Architects and builders can offer functional approach to develop basic information base for formulating functional programmed options for effective mass low-cost housing for the poor with guidelines on planning, design, construction, supervision and maintenance of low- cost housing.

Emergence of New Construction Materials

Mostly, in Nigerian construction sites, the common materials are steel, timber, concrete, and stones e.t.c. New technology had made it possible to build with less associated risks and problems with the use of composite building materials, and petrol-chemical compounds, such as polystyrene, propylene and polyester and recycling wood materials, such as cork (BQ, 2011). To choose among these, appropriate materials need to fit in a specific function is a specialized contribution of the architects and the builders which pave way for a national transformation.

Emergency of New Construction Methods

According to (BQ 2010), a construction crew in the south-central Chinese city of Changsha completed a 15-storey hotel building in just 6 days! The work crew erected sound proofed hotel with all pre-fabricated materials, tripple glazed plastic windows and roofs, light weight steel construction with 150mm, thermal insulation for walls, external solar shading, heat insulator, fresh air heat recovery and LED lighting structure built to withstand a magnitude 9 earthquake. Such among other amazing construction technology

can be well handled by the architects and builders in Nigeria for a positive national transformation.

Eco-Friendly/Green House

The Interaction between human race and its environment are becoming more intensive, thereby exerting increasingly heavy pressure on their natural context was captured by Paul, (2006). Impact of man activities and environment are evident on our construction, designers and constructors need to be more environmental conscious in a way to reduce, re-use and recycle the re-newable energy (sun, wind, tide, water, wave, etc.) and other resources effectively and efficiently.

In theory, there are some necessary ingredients responsible for the modular construction. Such economic benefits of construction infrastructure include creating a significant number of new jobs for the working class. Another benefit is the generation of economic growth when money flows through the economy as families spend their incomes and business reinvest profits. Good governance by putting all positive things in the right direction. Infrastructure development is the basis of measuring the performance of democratic leader and it is the foundation of good democratic governance. Level of education in relation to poverty line is also very important in carrying everybody along. If there is high percentage of illiteracy, the poverty will be on the increase as the level of awareness to current trend will be difficult. Emergence of public and private participation will go a long way by unlocking all the difficulties and utilizing all the available potentials. Therefore, Low-cost housing delivery and life expectancy deals with the aspect the life span of construction project which should conform to global standard practices so that it can last the time for the purpose being meant for.

INNOVATIVE AND TECHNOLOGICAL SOLUTIONS FOR CONSTRUCTION

The creative and innovative thinking of solving construction problems are evident in site planning, behavioural and organic architecture, landscaping, floor planning, detailing, construction technology, construction materials, and construction methods. The focus here is on floor planning and behavioural and organic architecture. Hence, it is very important to train a new generation of Environmentalists in designing low-cost housing (National Economic Empowerment and Development Strategy {NEEDS}, 2005). The existence of modules in the building elements conforms to standardized repeating patterns in the same size, shape and scale. In the quest to a better future of building construction processes and procedures in Nigeria, hence the possibilities of modular coordination systems which will pave way for

perfection, cost effectiveness, waste reduction, speedy construction among others of industrialized construction infrastructures using IBS.

METHODS

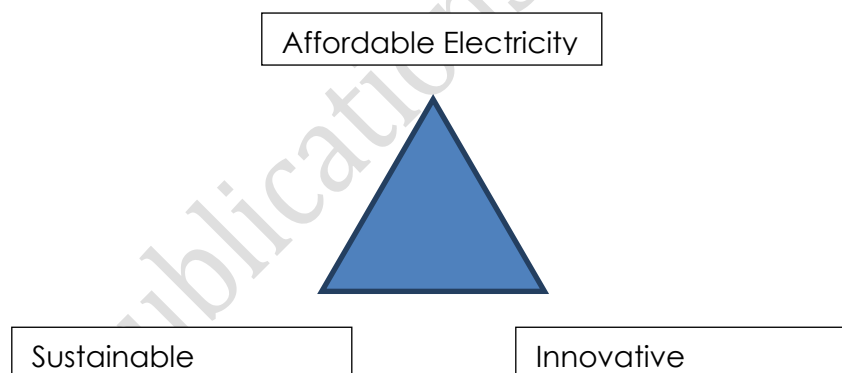
A mixed method was used in carrying out this study; a critical literature review and a case study of Hajj Rosli Industrial Building System (IBS) based in Malaysia (20 years of success).

RESULTS

A model was proposed, where Hajj Rosli method is use to build affordable housing normally 30% savings is achieved and this 30% would be channel for the provision of water and electricity as site and services concept.

DISCUSSION

HAIJ ROSLI MODEL: This model from the above is unique in such a way its call the siamesse triplet of achieving affordable housing in Nigeria. This model would be taught and in cooperated in housing delivery curriculum and outcome can serve as guideline for educationist and policies makers in Nigeria as learning and teaching method in theory and practical applications.



Source: Developed by the Authors, 2020

CONCLUSION

To translate dreams to reality; it will be a crucial prerequisite to undertake affordable-sustainable pedagogical solution for Nigeria housing Institution using innovative technologies in construction projects at a very low cost as this will tend to produce comfort and privacy for the masses. Secondly, future development through Professionals in Building Industry, with Institutions as enshrined in this paper harnesses will enhance law enforcement, so that architects and builders will have the best human resources that are competent

enough to carry out their day today activities of construction. Formation of cross-cutting cleavages using modular construction 3 in 1 components of fibre glass + concrete IBS for columns, beams and Walls will be made possible. Lastly, necessary provision of expertise in the Built Environment, Industry and Institution is needed to transform the various affordable-sustainable construction projects. This is the more reason, why emphasis has been laid on technical pedagogy application of modular construction with standard material make-up along with the construction technologies and methods so that the current obstacles being faced with such constructions would be greatly revamped in the recent future in Nigeria.

REFERENCES

- Adedeji Y.M.D. (2011), "Sustainable Housing in Developing Nations: The Use of Agro-Waste Composite Panels for Walls", *The Built & Human Environment Review*, Volume 4, Page 36.
- Anyakora et al (2013), "Impact of Open Space Conversion on Planned Residential Neighbourhood Quality: The Case of Festac Town, Lagos", Nigeria available online at <http://www.elixirpublishers.com> (Elixir International Journal)
- Building Quarterly (BQ) (2010), "Central Bank of Nigeria Head Office, Abuja -An Intelligent Building", (BQ) Journal Series, Vol. 10 No. 1, Page 19-22.
- Building Quarterly (BQ) (2011), "Cork and Other Composite Building Materials", (BQ) Journal Series, Vol. 11 No. 1, Page 9- 10.
- Dikko H. A. (2002), "Cost Control Models for Housing and Infrastructure Development", Washington, D.C. USA, *Energy Efficiency Series - International Energy Agency* available online in an extract from https://www.fig.net/pub/fig_2002/TS10-1/TS10_1_dikko.pdf
- Diogu J. o. (2002), "Housing The Poor In Nigeria: The integrated Project Approach", *AARCHES Journal* Vol. 1 No 2 2002, Page 40—47.
- Ing. S.O. I. (2000), "Housing Disaster Industry- The Nigerian Situation", *Journal Of The Association Of The Architectural Educators In Nigeria Journals (AARCHES Journal)* Vol. 1 No 5 2000, Page 74—76.
- NEEDS (2005), "National Economic Empowerment and Development Strategy- Creating Affordable Housing, Central Bank of Nigeria Head Office, Abuja". Page 25.
- Oduwaye L. (2009), "Challenges of Sustainable Physical Planning and Development, In Metropolitan Lagos", Vol. 2, NO. 1, *Journal Of Sustainable Development* available online in an extract retrieved from <http://www.ccsenet.org/journal.html>
- Paul B. Haruna (2006), "Architecture And The Environment", *Journal Of The Association Of The Architectural Educators In Nigeria Journals (ARCHES Journal)* Vol. 5 No. 2, Page 45—51.
- Sanda and Jambol (2010), "An Appraisal Of Housing Conditions In Bauchi Metropolis: A Case Study Of Yelwa", *University of Akure Journal*, Section 6, Pages 269-275.
- Sumaila S. and Adamu M. (2008), "Adapting Renewable Energy Systems To Low-Cost Housing: Planning And Design Implications", A paper presented at The National Conference Of The School Of Environmental Technology, Federal Polytechnic, Bauchi.