

Affordable Modular Housing as a Panacea to Lagos's Housing problems: A Survey-based research, with Focus on Dolphin Housing Estate in Lagos, Nigeria

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Abstract: Access to shelter is a basic human need. It plays an integral role in people's physical and mental well-being. However, in cities like Lagos, Nigeria, the provision of "affordable shelter" has not kept pace with the drastic population growth. For this reason, various innovative technologies have been introduced by the Lagos state government, of which affordable "modular housing" plays a central role. In this paper, we conduct survey-based research to establish whether "modular housing" projects can mitigate the housing crisis in Lagos. In particular, we evaluate residents' sentiments towards these projects' affordability. Based on the survey's outcome, we identify the benefits and analyze the key issues and risks of modular housing. Finally, we provide recommendations that policymakers and stakeholders should consider in managing these issues.

Index Terms— Affordable Housing, Housing issues, Housing policy, Modular housing

I. INTRODUCTION:

Access to housing is a fundamental human right. It is an integral component of the urban economic development of any country. The socioeconomic stability of any country is almost always tied to the housing affordability of that country. For this reason, "affordable housing" has become a valuable asset essential for the well-being of individuals, families, and communities [1]. While the exact definition of "affordable housing" is a very complex matter, the term basically describes housing that recognizes lower-income households in obtaining and paying for appropriate housing without experiencing undue financial hardship [2, 3].

The idea of affordable housing has already been publicized in developed countries. However, it has primarily been neglected in most developing countries. In Lagos, Nigeria, for instance, the provision of affordable dwellings has not kept pace with the rapidly expanding urban population. Over time, administrations have tried to bridge the housing gap in the state, with some administrations engaging in social housing [4]. Despite the government's attempts to provide sufficient housing, rapid population growth stresses the inadequate affordable and infrastructural facilities. This issue has led to extreme slum overcrowding and pollution. Living costs have driven people to live in low-quality slums and shanty houses in some parts of Lagos. Areas with concentrated disadvantages are slums. Extreme environmental pollution issues, lack of access to basic social services, poverty, deprivation, crime, abuse, general human insecurity, and life-threatening diseases define life in slums [5]. In [6], Daramola and Ibem reported that in 1981, World Bank assisted urban renewal project and highlighted 42 "blighted areas" in the metropolis of Lagos alone, which have expanded to more than 100 over the years [7]. The growth of slums has been attributed to public negligence, and unabated population increase [8]. According to Rotimi [9] between 1985 and 2000, 1.6 million new housing units were required, and between 2000 and 2015, another 1.9 million units were needed.

At present, the demand for affordable housing in Lagos is tremendously increasing [10]. Largely, the numbers of affordable housing units provided by the government, developers or individuals have been insignificant relative to an ever-growing demand in Nigeria. The key root of the problem is that the government cannot afford to spend billions of dollars on the massive construction of housing projects. With the increasing demand for housing, the government needs to find alternative and useful ways to meet this expanding problem.

According to Norris and Shiels [11], this increasing housing demand can be met using innovative technologies such as "Modular Housing System". Modular buildings are sectional prefabricated buildings with multiple sections called modules [12, 13]. "Modular" is a method of construction that is different from other methods (e.g., "stick-built" and other methods such as off-site construction). The modules are six-sided boxes constructed in an exterior (sometimes remote) facility and then delivered to their intended site of use. The modules are set onto the building's foundation and joined together to make a single building using a crane. They can be positioned side-by-side, end-to-end, or stacked, allowing various configurations and styles in the building layout [14]. Modular buildings differ from mobile homes in two ways. First, modular homes lack axles or frames, meaning they are transported to their site using flatbed trucks [13, 15]. Second, modular buildings should conform to local building codes for their proposed use. Some residential modular buildings are constructed on a steel frame (known as on-frame modular) that meets local building codes and are regarded as modular homes rather than mobile homes [14].

Compared to conventional buildings, modular buildings incur fewer construction costs and are much more convenient for "affordable housing" projects [16, 17]. Along this line, the building of "modular homes" in Nigeria is evolving with varied kinds

of building systems. Thus, this study evaluates how housing needs can be met using modular homes in response to Lagos's housing problems.

Study Area:

The scope of this survey was limited to private real estate firms and residents of Dolphin Estate of Lagos, Nigeria, given that the residents of the area are mostly of the educated middle class, developers and government officials. Educated people are usually ready to accept or adapt to changes and technological developments without fear or doubt. Moreover, Dolphin Estate is an area where modular homes were built, and the cost of living is moderate, that is to say, not too high or low. The research questions will address the problems challenging housing needs and the potential of modular housing in solving these needs from the government agencies and Estate developing firms. The study focused on the Lagos metropolis due to its vibrant property market (being the undisputed commercial capital of the country) and serious housing needs.

Research Questions and Objectives:

The study evaluates how housing needs can be met using modular homes. We proceed by asking the following research questions: What is the condition of houses in Dolphin Estate? What is the level of satisfaction expressed by the residents? What are the key issues and risks associated with modular housing? We then move ahead to answering the questions by 1) Evaluating the housing condition in Dolphin Estate, 2) Identifying the benefits of modular housing provision, 3) Identifying and analyzing the key issues and risks associated with modular housing, and 4) Determining the impact of modular housing in the housing sector.

II. RESEARCH DESIGN:

Sources and Collection of Data:

The two types of data collected for this study include; primary and secondary data. The primary sources are the residents. The primary data is obtained from residents living in Dolphin Estate. The full survey is preceded by a reconnaissance, which aided the gathering of limited data on the physical location of the Estate and the sample units (residents). Direct field observation and data collection through "questionnaire" is the preferred method for collecting primary data for this survey. The questionnaire was designed to cover the variable types of modular housing and the housing situation in Dolphin Estate. To achieve content validity, the questionnaires included a variety of questions on the knowledge of the respondents on how housing needs can be met using modular homes in Dolphin Estate. The full survey obtains 1) the respondents' knowledge of the housing condition in Dolphin Estate and 2) the respondent's level of satisfaction and knowledge of modular housing. The questions were aligned with the research objectives to achieve the research aim. Secondary data include those obtained from other sources during this research. This includes data to be analyzed, theories to be explained, and other data to substantiate the theories and conclusions further. In all, 300 respondents were involved. This includes 50 staff, and management members of "Biodun Odeleye Company and Fairfield Estate," on their perspective of the housing situation in Lagos and the prospect of modular housing curbing the housing challenges in Dolphin Estate, and 250 respondents who live in Dolphin Estate, with insight on the housing situation and modular housing prospects.

Data Analysis and Interpretation:

For analysis of closed-ended questions, the "Statistical Package for Social Sciences (SPSS)" software was used in this research. Descriptive and inferential statistics were used to code and analyze the data gathered. The data analysis also employs the use of tables to explain the research findings, making the findings visually appealing and easy to understand.

Out of the 300 questionnaires distributed, 227 were completed and returned. Therefore, the overall response rate was 75.7% (see Table 1). Table 1a shows that majority of the respondents are male, constituting 55.1% of the total 227 respondents, while the remaining 44.9% of the total respondents are female. Table 1b reveals that 37.4% of the total 227 respondents are of the age bracket 18-30years. The age bracket 31-50years constitutes the majority of the respondents (46.3%) while the remaining 16.3% of the total 227 respondents are 51 years and above.

Table 1c shows that 15.4% of the total respondents are Ph.D. holders, and 47.1% of the total respondents are M.Sc./MBA holders. Moreover, 32.2% of the total respondents have B.Sc./HND as an educational qualification. The educational qualification of the respondents indicates that they are endowed with a good knowledge of modular housing and housing conditions. This also implies that they will provide reliable data for this study.

It must be stated that during the interpretation of the tables, the percentage value of "strongly agree" and "agree" was added together to arrive at the percentage value of those that agree while the percentage value of "strongly disagree", and "disagree" was added together to arrive at the percentage of those that disagree.

Table 2 shows the grading of each index identifying the housing condition, risk and impact of modular housing in Dolphin estate. The various ratings were calculated using the formula.

$$\frac{\text{Frequency} \times \text{Quantified Response}}{\text{Total Number of Respondents}}$$

Regarding affordability, 54.2% of the total 227 respondents agreed that houses are more affordable in Dolphin Estate than the available houses. In contrast, 36.1% of the total respondents disagreed with this. Thus, it can be inferred that, indeed, the house rent is high because of the affluent location of the estate. In Table 2, “1” is the lowest rating, and “5” is the highest.

Gender	Frequency	Percentage
Male	125	55.1%
Female	102	44.9%
Total	227	100%

(a) Gender of The Respondents

Age	Frequency	Percentage
18-30years	85	37.4%
31-50years	105	46.3%
51years & Above	37	16.3%
Total	227	100%

(b) Age of The Respondents

Level of education	Frequency	Percentage
Ph.D.	35	15.4%
M.Sc./MBA	107	47.1%
B.Sc./HND	73	32.2%
OND/NCE	10	4.4%
WAEC/GCE	2	0.9%
Total	227	100%

(c) Educational Qualification of the Respondents

Table 1.: Response Rate

Housing condition	Ratings (1 to 5)
Building exterior (painting and cladding)	2.07
Condition of house interior	2.16
Affordability	3.33
Condition of water supply	3.5
Plumbing works	3.6
Real estate appreciation	3.9
Effects of flood on building	3.96
Living space (noise and visual privacy)	4.0
Strength of buildings	4.0

(a) Housing condition in Dolphin Estate

Key Issues	Ratings (1 to 5)
Estate investor prefer conventional houses	4.1
Prefab attracts non-professionals	3.9
Prefab are emerging concept in Nigeria	3.5
Cheap nature of modular can lead to overcrowding	3.54

(b) Issues and risks associated with modular housing

Modular housing impacts	Ratings (1 to 5)
Reduces the burden of housing provision	3.1
Modular housing will create conducive affordable homes	3.7
Will affect the overall cost of accommodation	3.91
Will boost the overall profitability of housing	3.88

(c) The impact of modular housing to the housing sector

Table 2.: Housing condition and key issues associated with modular housing in Dolphin Estate

Condition of houses in Dolphin Estate:

Out of the 227 respondents, 90.4% agreed that housing in Dolphin Estate is generally not good-looking anymore like it used to be, while 9.6% of the total respondents disagree. Hence, the conclusion can be drawn that housing in Dolphin Estate is bad looking and needs maintenance.

The survey revealed that 75.8% of the total 227 respondents agreed that most residents of Dolphin Estate have poor interiors, while 16.8% of the total respondents disagree with this. Therefore, it can be inferred that most residents of Dolphin Estate do not have a presentable living space in their building, but for the residents in the semi-detached, it is vice versa. 64.3% of the total 227 respondents agreed that the plumbing works are in good shape, while 24.6% of the total respondents disagree with this.

Regarding water supply, 61.7% of the total respondents agreed that water supply is not a challenge, while 27.7% of the total respondents disagreed. This is due to the nature of the existing system; every family unit pumps its water from water corps, and some preferred a better option than such practice. Moreover, 78.9% of the total 227 respondents agreed that they experience a good level of privacy, while 13.6% of the total respondents disagree with this. Therefore, it can be inferred that the method of construction and materials used did not compromise the quality of the building.

From the total 227 respondents, 75.8% agreed that flood disturbs the texture and feel of the buildings, from the painting to the ground floor mat, while 11.0% of the total respondents disagree with this. Therefore, it can be generalized that the flood does not crack the buildings because it is prefabricated or pre-cast concrete with no presence or use of blocks. Water only makes concrete stronger, not destroy it. 71.4% of the total 227 respondents agreed that the buildings in Dolphin are still strong despite their outrageous looks, while 17.1% of the total respondents disagreed with this. Thus, it can be inferred that the looks of the exterior do not compromise the strength of such construction.

Sentiments on Modular Housing:

The survey revealed that 77.5% of the total 227 respondents agreed that modular houses are easy to construct, while 9.7% of the total respondents disagreed with this. Thus, it can be inferred that modular houses are easy to construct; therefore, local authorities can meet their target housing needs. This is in line with the concept that modular housing has the potential to meet the housing need in Dolphin Estate.

In addition, 83.3% of the total 227 respondents agreed that estate investors may still prefer traditional houses over modular houses, while 7.9% of the total respondents disagree with this. This means that most developers and homeowners still prefer conventional buildings over modular housing. 84.1% of the total 227 respondents agreed that the relatively low-cost construction of modular houses might attract non-professional constructors who will take advantage of the public. In contrast, 7.1% of the total respondents disagree with this.

Of the total 227 respondents, 61.2% agreed that modular houses are emerging concepts in Nigeria and, therefore, have not been fully embraced, while 17.2% of the total respondents disagree. Therefore, it can be generalized that modular houses are emerging concepts in Nigeria and, therefore, have not been fully embraced.

According to the survey, 63.9% of the respondents agreed that modular housing would reduce the housing crisis in Lagos, while 17.6% of the total respondents disagreed. In terms of affordability, 67.0% of the respondents agreed that modular housing would create conducive affordable homes for low-income earners, while 13.6% of the total respondents disagreed with this. On another measure, 73.6% of the total respondents agreed that modular housing would affect the overall cost of accommodation in Lagos state to become cheaper, while 9.3% of the total respondents disagreed. However, the cheap nature of modular houses can lead to an overcrowded urban population. 57.3% of the total respondents agreed with this notion, while 18.1% of the total respondents disagreed with this.

Regarding the profitability of the housing market, 74.4% of the total 227 respondents agreed that modular housing would boost the overall profitability of the housing sector in Lagos state. In contrast, 10.6% of the total respondents disagreed with this.

III. CONCLUSION AND RECOMMENDATIONS:

This section presents the summary of the findings, the conclusion and recommendations. While many Nigerians have done well out of the housing market, there is a growing pool of people who cannot access affordable housing, appropriate or otherwise. The idea of affordable housing recognizes the needs of households with insufficient incomes to allow them to access appropriate housing in the market without assistance. This survey aimed to evaluate whether the housing crisis in Lagos state can be resolved using modular homes.

Conclusion:

Based on the survey conducted on 227 respondents in the Dolphin housing estate, the concluding remarks have been summarized below:

- Based on the analysis presented in section 2.2, it can be concluded that the majority of the respondents have good sentiments on modular housing, with the belief that modular housing could be the solution to Lagos's housing crisis. About 67% of the total respondents believe that modular housing will create affordable homes for low-income earners, while the remaining 33% have mistrust in the private housing sector. One reason was that modular houses' relatively low construction cost might attract non-professional constructors who will take advantage of the public. This is where the government must intervene by instituting proper regulations for this vibrant sector to eliminate "bad actors". Maintenance is another issue cited by the respondents. Out of the 227 respondents, 90.4% agreed that housing in Dolphin Estate is generally bad looking and needs maintenance.
- For the real estate sector, about 78.9% of the respondents agreed that modular houses demand fewer building materials and, therefore, incur fewer construction costs compared to traditional buildings. About 74.4% respondents agreed that modular housing would boost the overall profitability of the housing sector in Lagos state. However, about 83.3% of the respondents agreed that most developers and homeowners may still prefer traditional buildings houses over modular ones. Indeed, this may be due to the fact that "modular housing" is less explored; thus, developers see it as a risky sector and are reluctant to explore this area of the construction sector.

Recommendations:

Based on the survey findings, the following are recommended:

- The Lagos state government should consider modular houses as a viable and possibly cheaper alternative to the housing demands in the state.
- Proper maintenance on existing modular facilities (e.g., Dolphin Estate) should be done to encourage residents. A more sophisticated examination of costs beyond the purchase price is required to consider the certainty of costs, maintenance costs and living expenses post-occupation.
- More effort and research are required to understand consumers' perspectives regarding modular housing. Further knowledge is also needed regarding possible management approaches to allay the impact of the changes to working arrangements in a modular housing setting and achieve greater efficiency. Further empirical evidence is required for the costing of specific prefabricated housing innovations. The Lagos state government should incentivize developers and owners of "modular housing" through tax relief to enable the sector to be more attractive to stakeholders.

The unique value of this survey is immense as the findings provide solutions to the housing crisis within the Lagos state. The survey also serves as a roadmap for constructing affordable "modular housing" facilities in other Nigerian states and developing countries in Africa. In the future, a more objective and empirical study should be carried out on the perception of property consumers/homeowners towards modular houses.

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