

MODERN METHODS OF CONSTRUCTION A TECHNIQUE IN ACHIEVING AFFORDABLE HOUSING IN NIGERIA

Abstract

The urban environment in Nigeria accounts for over 51.16% of the population and is the main source of economic development within the country. With the increase in population as a result of rural-urban migration, population growth, urban development, decrease in mortality rate amongst others, there is a need for affordable housing provision. It has been argued based on extensive research, that the development of good housing and infrastructure, can increase the average life expectancy of people, quality of life, increase the health standard and also attract investment and thus, further develop the economy. Unfortunately, the discourse on affordable housing has not developed a model that meets the Nigerian urban populace that is in desperate need of housing. With a larger percentage of Nigerians living in these areas, coupled with the continual rise in rural-urban migration, it is imperative to ensure that focus should be placed on the developing modern methods of construction (MMC) that can meet housing needs. Modern methods of construction is a broad terminology that embraces a variety of offsite manufacturing and onsite practices that provides a range of options to traditional house buildings. In light of these facts, this paper analyses the effects of affordable housing in the urban environment and the role MMC plays in its development. This qualitative study is based on current knowledge from preliminary research, analysing how affordable housing can be achieved with MMC. The conclusion of this research will suggest the benefits of MMC practices and create an avenue for further research on affordable housing.

Keywords: Affordable housing, Growth, Modern Methods of Construction, Sustainable Development, Urban Development.

INTRODUCTION

The development of affordable housing has been a major part of the growth discourse concerning the urban environment. The need for affordable housing all over Nigeria has reached its highest peak in recent times. There has always been a need for low-cost housing developments which would meet the needs of this housing crisis. In Maslow's hierarchy of needs, Maslow proposed that the need for physiological things, which includes housing, is one of the fundamental needs for human beings (Uysal, et al, 2017). Kofi Annan noted that "Almost 1 billion, or 32 percent of the world's urban population, live in slums, the majority of them in the developing world" (UN-Habitat, 2004). The number of people living in slums, since 2003, has continuously increased to about 863 million people in 2014 (UN-Habitat, 2014). This increase has been

blamed, partially on the increased rural-urban migration that occurs across the world. People living in rural areas move to the urban centres in search of greener pastures are sometimes faced with the inability to buy or rent decent houses due to the cost. This thus results in them living in favelas or slums. The problems most migrants face that result in living in such an uncondusive environment are due to, unaffordable housing, high poverty rate, low-income groups which amounts to a huge population of Nigeria's workforce, inadequate housing finance initiatives amongst others (Ayedun and Oluwatobi, 2011). Some of these problems also affect urban dwellers in developed societies. There is insufficient affordable housing as low-income families are unable to afford decent housing or any form of housing at all. It has been noted that there is an estimation of about 330 million households currently stuck in slums and this number is estimated to grow to 440 million in 2025. This will place the estimated number of people living in slums at 1.6 billion people (UNDESAPD, 2014).

The number of people living in slums in Nigeria is estimated at 143 million of the 178 million Nigerians (Nkah, 2013). The Centre for Affordable Housing Finance in Africa notes that "Almost half of Nigeria's population live in cities, with 80 percent living in slum conditions. The rapid growth of cities have engulfed nearby towns and villages, and pushed back mangroves, while the lack of adequate infrastructure and planning have caused deforestation, congestion, poor health, and poverty" (CAHF, 2015).

Among the issues facing the housing deficit in Nigeria, there is a shortage of homeownership. The Centre for Affordable Housing Finance in Africa noted in their report that an estimated 25 percent of Nigerians own homes. This number is abysmal when compared with Indonesia with 84 percent homeownership, Kenya with 73 percent and South Africa with 56 percent of its citizens owning homes (CAHF, 2015). This appalling situation is caused by a combination of issues that include inadequate access to finance, the continual escalation of the cost of owning a house, the slow administrative procedures and the high cost of land registration and titling. Also, critics have argued that the Nigerian Land act use of 1978 has hampered the development of the housing industry (Dada, 2013).

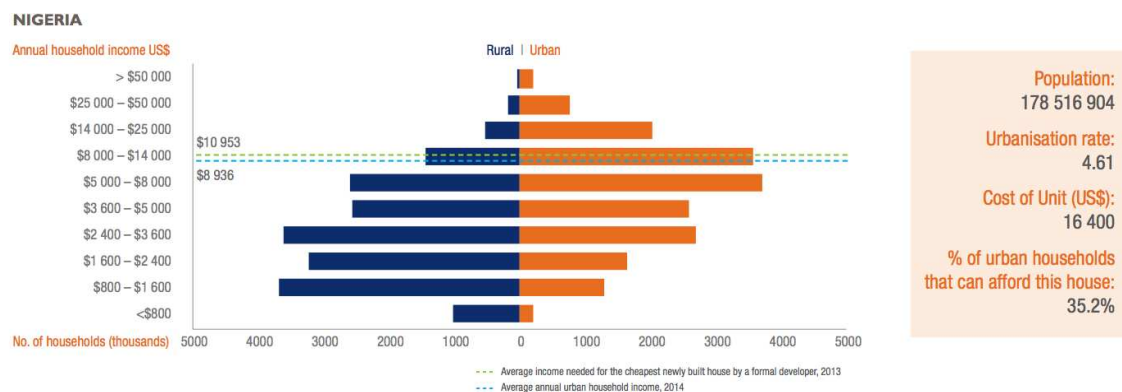
These various issues have mandated research to ensure affordable housing can be attainable to solve the housing shortage in developing countries. One of the suggestions is to rethink construction processes to be leaner, faster, affordable and relatable to the manufacturing Industry (Wolstenholme, 2009). Although this call for change is more prominent in developed countries like the UK, US, Germany, Australia, Amsterdam, Japan, Norway amongst others where there has been greater use of various modern methods of construction. In developing worlds like Nigeria there has been concern raised to consider other forms of construction such as prefabricated housing construction (Nkah, 2013). Data collated from industry experts in the Nigerian construction sector suggest that there is an urgent need to move from the conventional systems of construction to a more adaptable and faster way of building affordable homes (Ashkin, 2013). Modern methods of construction is a system that supports better products and processes, which aim to improve efficiency, quality, customer satisfaction, environmental performance, sustainability and programme (Arup, 2020). This paper looks at the benefits of adopting MMC in the delivery of affordable housing in Nigeria.

LITERATURE REVIEW

Problems of Housing in Nigeria

The World Bank estimates that there is a deficit of 17 million houses in Nigeria (Kolo, et al, 2016). This has not been met with the current rate of housing construction but has been exacerbated by the demolitions of slums. Property developers have focused on housing for the upper class and middle-class strata. The cost of renting properties are relatively expensive and landlords typically demand one to two years' rent upfront due to the cost of land, building construction, non-payment of rent and location (Ibukun and Kay, 2014). Therefore, even though the real estate sector in Nigeria has grown to become one of the major sectors of the economy next to oil it has not catered for the majority of its citizens. It is estimated to grow at an average of 10 percent per annum for the next few years (Frontier Economics, 2015). The major growth drivers in the sector have been credited to: an increased inflow of foreign investment; increased institutional investment from local companies including PFAs and Mutual Funds; the growing population of High Net Worth individuals; and the targeted intervention of the Federal Government in the housing finance sector. This has unfortunately placed decent housing beyond the reach of the majority of Nigerians whose household earnings fall below the average cost of housing (World Bank, 2016). Figure 1 below shows the annual household income in comparison to the number of households.

FIGURE 1: ANNUAL HOUSEHOLD INCOME



Source: World Bank, 2016

The minimum wage for a civil servant in Nigeria remains N30,000 (Approximately US \$60) per month irrespective of annual inflation of about 9.3 percent (Solaja, 2015). With this kind of earning it is very difficult for an average Nigerian to own property due to the high cost of construction materials, interest rates in mortgages, taxes, bureaucracy, land laws, inflation, lack of well trained artisan labour and logistical factors that have in many ways, affecting the cost of housing in Nigeria (CAHF, 2015). 60 to 70 percent of the total construction input goes to building materials and labour costs (CAHF, 2015). Kolawole (2014) noted that as a result of the high cost of housing in Nigeria, 51 percent of Nigerians live in rented accommodation. Kabir (2004) noted that although the federal and state government has under many circumstances, intervened in an attempt to provide housing for Nigerians, these houses are only affordable by the rich. According to Ayedun and Oluwatobi (2011), they

noticed that the Nigerian Construction Industry are not forthcoming in the adoption of modern technologies. Also, the UK is not farfetched as it is a norm within the construction sector (Nadim and Goulding, 2010). As the demand for housing affordability is trending the industry has gradually realised the need to adopt a more adaptable and faster way of construction (Dada, 2013). Necessary infrastructures and facilities must be provided for MMC to be adopted within the Nigerian context due to the challenges this new idea faces just like any other new idea/concept. The several barriers faced in MMC will affect housing delivery but these factors are linked to individual contexts whether it's developed or developing countries. In the Nigerian case, these problems are higher than in developed nations. Also, with the drastic rise in population, a huge number of growths will take place in developing countries which should call for a drastic change in housing production (Ademiluyi, 2010).

Benefits of Affordable Housing Development

Lubell and Brennan (2007) in their research showed that the stability of an affordable mortgage or rent can have profound effects on childhood development, school performance, and can improve the health performance of families and individuals (Lubell, et al, 2007). These benefits extend beyond just individuals but also to the capacity of members of society to function optimally. Wardrip, Williams and Hague (2011) argue extensively for the economic advantage of affordable housing. They note that without a sufficient supply of affordable housing, employer and entire regional economies can be at a competitive disadvantage because of their subsequent difficulty attracting and retaining workers. Their research has pointed to the fact that more people are willing to take up jobs in places that have better housing. There though are other factors surrounding affordable housing that still affect these decisions.

The term affordable housing takes many forms and is subject to several interpretations. It refers to housing that is low cost in their production. This cost could be due to subsidies in construction, enhanced housing policies that help reduce cost or more affordable mortgage/rent plans (Wardrip, et al, 2016). Another definition of affordable housing seems to cover the impacts of programs and policies that reduce housing-related expenses (such as energy and transportation costs) or that provide sound, unsubsidised mortgage products to low- and moderate-income households. In developing affordable housing, there are long term and short term economic benefits that are a direct result of the construction of these houses. Their construction process provides jobs, for the duration of the construction as well as post-occupancy for the locals. The construction sector can generate a significant amount of jobs and it is one of the best paying jobs with decent wages for its workers. This can have an indirect effect on the local economy (MGI, 2014). In a study published by the Urban Land Institute (2007), they found out that more than 300 companies surveyed admitted to finding it hard to retain entry-level and mid-level employees due to the lack of affordable housing (Urban Land Institute, 2007). They, therefore, were continually losing these workers to organisations located in areas with affordable housing. The availability of affordable housing in a locality has been proven to affect an employer's ability to attract and also retain employees. Gambale (2009) reports that the availability of affordable housing is a strong determining factor for businesses wishing to relocate or establish a new facility (Gambale, 2009). In 2014, a report presented for G15 and the National Housing Federation suggests the link between affordable housing and health was emphasized. This report showed that there is a large body of research suggesting that poor housing conditions such as overcrowding can lead to poor health and quality of life (Wardrip, et al, 2016). The research found evidence that

tenants that moved into new social houses reported a significant increase in their overall health, quality of life and quality of space. There were also recorded to make fewer visits to the doctors and also evidence of improved mental health was found in the studies (Frontier economics, 2016). The G15 Report and other research papers published on the issues of affordable housing indicates a strong connection between health and the availability of these houses for people. The already monumental problem of people living in slums is argued as a reason for the strain on the health system (Wilkinson 2001). The benefits of affordable housing stretch over to education and the performance of students. Though the evidence has been limited, Friedman (2010) cited the National Child Development Study in their report. They have linked overcrowding with poor health and hence an increased number of school days missed (Friedman, 2010).

Frontier economics (2016) notes in their report that investment in affordable housing supports multiple social objectives. Improved housing can deliver improvements in health, crime, labour market outcomes, wellbeing, education, and community cohesion. These numerous researches have gone into understanding the viability of affordable housing. The affordability of housing varies from locality to locality. This is due to the varying levels of industry in those places, the availability of skilled workers and artesian, the earning power of locals, the available construction materials, the available natural resources, the policies in place (both local and national) and the available local supporting structure for a mass affordable housing project. This research though focused on Nigeria will only be highlighting the prospects of attaining affordable housing in Nigeria.

Modern Methods of Construction and the Opportunity for its Adoption in Nigeria

Modern method of Construction is classed as a wide terminology that embraces diverse techniques of offsite manufacturing and onsite systems that facilitates alternatives to traditional house building. MMC spans from the construction of whole homes being built from the factory via volumetric modules, to other techniques such as panelised systems, sub-assemblies, site-based MMC and pods (Arup, 2020). The history surrounding MMC dates back post-war period when there were drastic needs to boost the country's house building output. In the UK with various changes to construction methods lead to new approaches to achieve speed in housing delivery, improved quality, reduced labour costs, renewable/reusable materials and housing affordability (NHBC, 2018). Over the years there has been consistent interest in MMC, with more developers participating in project trials and going on to utilising varieties of systems available to provide housing within the UK. In 2017, the UK government white paper expressed support for the contribution MMC is predicated to solve the nation's housing crisis and achieve the step-change in housing output that is needed. Based on statistics pointed out MMC has the potential to enhance 30% improvement in the speed of construction, 25% reduction in costs and potential savings in improving quality and energy efficiency (MHCLG, 2017).

Analysis and Discussions

MMC can offer a range of benefits and advantages that overall help to meet the housing needs.

- **Faster Construction:** The method of delivery in comparison to the traditional brick and mortar method of construction has an obvious benefit concerning the construction time. As all construction components are made

within a factory-controlled environment the production delays are reduced.

Greater efficiency in the use of resources, both materials and labour.

- Increase in the number of homes delivered: With the various systems available MMC offers the ability to build custom/self-built homes and affordable mass housing.
- Market Absorption for innovative designs: MMC creates an opportunity to introduce innovative designs. It offers alternative products to the market in comparison to the traditional method that is rigid.
- MMC can reduce construction impacts: It creates an opportunity to carry out construction in small restricted areas, infill sites and city centres. Another aspect is a reduction in construction waste, leaner processes, renewable and reusable materials and sustainable construction techniques.
- MMC offers high building standards: The method of production of housing is within a controlled factory environment with high precision engineering. The quality control can be easily managed to ensure high standard homes are built using sustainable materials and reduced waste.
- Design flexibility to solve every size and scale of project: MMC offers a broad range of design options available means that materials, massing and design details can be designed to the site and the local vernacular.
- Reduction in energy consumption, site construction risks and fewer deliveries to the site: Due to composite production of building fewer materials are sent to the site. Also, the MMC methods of construction are more energy-efficient throughout the entire life cycle (Arup, 2020; Pitt et al, 2009).

Barriers to using MMC to build homes includes

- Lack of certainty with regards to which techniques come under the banner of MMC.
- Negative perceptions due to past failures
- Difficulties adjusting the property and repairs after damage
- Difficulties getting warranties, insurance and mortgages for MMC homes
- Lack of historical data to determine its longevity and proof of resilience to flood and fire.
- Lack of skilled workers trained with MMC construction. (HCLGC, 2019)

In the Nigerian case, it is known that a large volume of waste is produced in most construction sites (Ajayi, 2008). This waste can be a result of oversupply of material, demolition works on-site, construction alterations and overall waste during the building process. According to research conducted by WRAP, it was determined that 70% to 90% of waste reduction could be attained with the use of MMC (Wrap, 2007). Waste is easily gathered and recycled within a factory based environment in comparison to the traditional construction method.

Process and lifecycle improvement

Due to various uncertainty experienced within most construction projects, there is a delay in delivery of the overall project and this can be easily managed using MMC (Gibb and Pendlebury, 2006). Construction delays are mostly affected by materials availability/shortage, skills shortage, mismanagement, bad weather, local planning

agencies approvals and mobilisation of funds. In regards to MMC most of these problems can be addressed because individual components are produced in the factory and transported on-site for installation therefore the entire duration is reduced (Taylor, 2009). Also, the entire lifecycle can be easily managed from design, construction, post-occupancy and demolition. The overall cost of production and maintenance is reduced due to the machine production process and industrial manufacturing which make the whole process easily managed (Arif and Egbu, 2010).

Cost/Value and productivity

MMC is perceived to be more expensive than the traditional method of construction. But research conducted alongside the current cost of homes stipulates that MMC can be used to achieve cost savings and reduced risk over the entire lifecycle. There is also better quality homes which increase longevity, reduce maintenance cost, reduce site overhead and more value for money (Gibb and Pendlebury, 2006). In Nigeria, this will help improve the overall quality of homes and housing delivery if this method is properly adopted (Kolo et al, 2014).

Quality Improvement

The Nigerian context has witnessed a poor level of housing construction over the year and MMC is perceived as a method in producing high standard quality homes. MMC offers the opportunity to control the production and supervision of ensuring standards are not compromised. In works of Fussell, Blismas, and Arif, Bendi, based on researches conducted in India, Australia and UK, it was deduced that achieving high-quality standards was one of the major benefits of MMC and also one of the key drivers to its adoption (Fussell et al, 2007; Arif et al, 2012). Quality can be attained within a factory controlled environment and for this reason products, consistency can be attained (Gibb and Pendlebury, 2006). MMC can be used in achieving both the production of mass housing and instilling high-quality standards to produce affordable homes in Nigeria.

Improved Logistics and Site Operation

With the current housing deficit in Nigeria, it is paramount to produce houses at a faster pace ensuring quality is introduced and efficacy in the overall construction delivery. This is possible by ensuring there is a reduction in wet trades, site disruptions and having certainty over the control of projects (Gibb and Isack, 2003). Some projects can suffer disruption in transport services, noise/air/environmental pollution and health/safety. MMC is a method that can ensure logistics and site operation is reduced to facilitate the delivery of the project.

CONCLUSIONS

Various factors have hampered the provision of housing in Nigeria (Emmanuel, 2000). One of the key factors that affect housing delivery is population growth, which creates pressure on the available housing market. As stated in this research MMC can create turn around to housing deficit if implemented properly by providing affordable housing based on the speed in housing provision alongside high-quality homes (Gibb and Pendlebury, 2006). There is research stating that MMC can save time by 30 to 50 percent in comparison to other methods alongside materials waste reduction, implementing high standards in housing construction and skills improvement.

It is also stated that one of the key problems is the shortage of skills in implementing MMC. Based on the various techniques associated with MMC, there is a need for

fewer tradesmen's who can be trained within weeks as a result of the mechanical/automated method of producing these homes (Blismas and Wakefield, 2009). The current issue in most countries including Nigeria is the slowness and unwillingness in adopting these techniques which could be due to awareness, cost, incentives, training, materials, skills shortage, investors amongst others (Arif et al, 2012). This studies carried out has highlighted how MMC can be used to enhance housing delivery to provide affordable homes. Stakeholder's engagement and collaboration are some of the foremost approaches in achieving the implementation MMC within the Nigerian context. Although for MMC to become a norm within this context it is vital that barriers that hamper the uptake of MMC such as negative image, stakeholder perception, perceived high cost, and reluctance for technological adoption would need to be improved on (Kolo, et al, 2014). The uptake of MMC can be influenced by the thought process of housing developers as they are the key drivers to its adoption. Public awareness can be enhanced by providing training, short courses, using visualisation and simulation technologies, providing discounted homes and incentives. For MMC to become a norm in Nigeria's housing industry needs to carry out studies and consultation with key experts and stakeholders into its large scale adoption.

The current housing deficit amounts to about 18million and it is vital to tackle this problem as housing provision helps to stabilise the economy, quality of life and welfare of people (Dada, 2013). For the Nigerian housing sector to adopt MMC, it is vital to study case studies on how developed countries like the UK, Australia, Netherlands, Germany, Norway and USA have implemented MMC. With government intervention through initiating project sample geographically, research and development, forums, stakeholders consultations, providing implementation frameworks and adopting Building Information Modelling (BIM). There is a huge potential for MMC adoption based on the quantity of research and case studies and these can be the first step towards understanding and creating a roadmap for its successful implementation in Nigeria.

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