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Chapter

Perspective Chapter: Achieving Sustainable Housing for Low and Middle-Income Earners

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Abstract

The problems confronting cities and urban areas in many developing nations include urban sprawl, housing, massive disregard of urban planning and development regulations, poor urban environments and traffic congestion. Of all these challenges, housing issues poses one of the most serious challenges especially on low and middle-income earners. Issues of human well-being, having access and affordability of housing units to low and middle income earners are of grave interest not only to the people of the developing countries but also to the world at large given the significant impact that housing has on socio-economic development of man. Access to decent housing in cities and urban areas in developing countries continues to be a problem, especially for low and middle-income households. This paper highlighted the benefits of applying prefabricated systems, mass customization to the low-middle family homes; the challenges faced in integrating affordable, sustainable housing and strategies for solving sustainable affordable housing challenges among low and middle-income earners through literature review.

Keywords: housing, affordable housing, sustainable housing, low and middle-income earners, prefabricated construction, mass customization design

1. Introduction

Housing cannot be seen only as just a roof over ones head as it has become a component of man's evolvement and development. Virtually all human activities on planet earth revolves around a house. Housing is widely accepted as one of the indices through which the welfare of humans can be measured [1]. Similarly, housing has equally been reported as a major contributor of human development, especially in the areas of employment generation and the development of the economy of nations. Sharifzai et al. [2] reported that housing is a major indicator of sustainable development in the society. Sustainable development itself is categorized into: social, economic and environmental development. In social development, housing does not only provide shelter but also offers a sense of protection to occupants as having a house is also considered as the ultimate plan in a family's lifetime. In economic development, housing generates significant contribution to the construction industry sector which leads to increase the GDP of a country annually [3]. In environmental development,

housing should be liable to reduce a green house gas emission, optimize energy usage and material and also improve waste management. However, in spite of the benefits of building and living in sustainable houses, reports have shown that sustainable houses are in gross undersupply especially among low and middle-income earners across the globe.

Low income earners are considered those whose household's disposable money income per consumption unit is lower than 60 percent of the equivalent median money income of all households. The proportion of the population falling below this income limit is called the low in come rate [4]. Low income economies as explained by Adabre and Chan, [5] are countries with GNI per capita, especially when calculated by the World Bank Atlas method, of $1045 or less in 2014 while Middle-income economies are countries with a GNI per capita, of more than $1045 but less than $12,736. Middle-income earners are those with average income within the overall population of a country. Low and Middle Income Countries are the countries identified by the Organization for Economic Co-operation and Development as having low-income or middle-income economies, as may be updated from time-to-time by the OECD [6].

Similarly, Ismail et al. [7] reported that the population of the homeless among low and middle income earners around the world stands at 863 million and fast approaching a billion because they reside in shanty towns and informal settlements. Amoatey et al. [8] affirmed that more than 61.7% of the population of Africa are homeless. A recent study conducted by Igwe et al. [9] in Nigeria affirmed that between 17 and 20 million Nigerians are homeless. Evidence from research indicates that the low income earners are among the heaviest sufferers of these housing shortages [10–13]. The studies shows that the problem of housing shortages and inadequacies is far worse for low and middle income earners in developing nations like Nigeria. Low and middle-income earners which constitute over 90% of the population in Nigeria are displaced with respect to housing as a result of their inability to afford the cost (rental, building or outright purchase) of housing occasioned by the increasing costs of building materials, deficient policies of housing, cost of land for housing development, increased interests and inflation rates among others [14–16]. Goh et al. [17] reported that in Malaysia demand for houses has exceeded 37,000 units nationwide in 2015. Also in Kenya, housing market price underwent massive price expansion over the past fifteen years which it continues to grow annually [13]. In South Africa, Kutty, [18] reported that it has become difficult for low - middle income households to buy property when as house prices are becoming higher by the day.

Sustainable affordable housing emerged from of the integration of the aspects of sustainable housing into affordable housing. Sustainable housing according to Nubi and Afe, [19] originated from the concept of sustainable development. Sustainable development as a concept was reported to have emerged from the report titled "Our Common Future" of the United Nations World Commission on Environment and Development (WCED) [20]. The WCED report which is popularly referred to as the Brundtland Report defined sustainable development as that type of development that is made for securing present generational needs of the people while conserving the capacities and capabilities of incoming generations to meeting their own needs when they arise [4]. In order to secure the needs of the present generation and also guarantee the capability of addressing the needs of future generations as contained in the WCED report, sustainable housing need to achieve social, environment and economic balance in the pursuance of developments [21].

Affordable housing are usually housing units which a family group or group of families can acquire within a given period of time, especially within 15 to 30 years [22].

According to Nwaba and Kalu, [23], affordable housing are small housing units that use low cost materials and built on cheap land at the edge of the city. Integration of affordable and sustainable housing is the combination of housing that can be owned at minimal price, considers safety, allows for healthy living, and covers with sustainable aspects. The construction of houses that enables low and middle income people to gain affordable homes requires the adoption of cost-effective, innovative and environmentally friendly housing technologies [24]. The houses should be built, affordable and equipped with all of the elements of healthy living, learning, and working.

The measurement of housing affordability is different between countries and regions but the most accepted measurement is the ratio between a household's' income and the housing cost. The most acceptable practice around the world in measuring affordable housing include considering housing cost at a value less than 30% of the household income of the occupants [25]. Thus, affordable housing cost is not more than 30% of the households income. In sustainability, housing quality should is major principle in designing and building houses because sustainable development is important for achieving the required balance between human activities and nature without jeopardizing social and economic systems for future generations. Thus, sustainable housing should be socially, economically, environmentally and technically feasible [26]. Sustainable houses should be made to be easily accessible to all and sundry. It should be well equipped with every elements of healthy living, cost-effective and constructed within a well-connected neighborhood to enhance the quality of life housing development which is essential from the economic, socio- psychological and environmental perspectives.

Many developed and developing countries around the globe view sustainable housing development as unaffordable for low-middle income families and this makes integrating sustainable aspects in providing affordable housing quite challenging. Failure to improve housing affordability will affect long- term economic development, urban development fatality rate and intergenerational equity. Thus, the aim of this paper is to highlight the challenges faced in integrating affordable, sustainable housing and strategies for solving sustainable affordable housing challenges among low and middle-income earners through extensive literature review.

2. The challenges of integrating affordable, sustainable housing among low and middle-income earners

It has been observed that the phenomenal rise in population, spontaneous increase in size of most Nigerian cities and other developing countries of the world have led to acute shortage of decent and affordable housing units. These have led to numerous problems in the urban centers such as overcrowding, deplorable environment, poor living conditions, inadequate infrastructure, homelessness, and so on. It is a critical challenge to governance to provide adequate and sustainable housing delivery towards progressive urbanization in Nigeria and many other developing countries of the world. Some of the challenges are enumerated as follows:

2.1 Institutional challenges

The government is one of the main institutions that have a major influence over the development of any industry. The government's demand in providing affordable and sustainable housing will put pressure on construction practitioners.

In addition to the socio-economic state of the families, other factors which influence the phenomenon of homeownership worldwide are the government policies which determine the construction practices, selling prices for housing units, the terms and condition for purchase and selling of these houses and the rental policies [27]. In Nigeria such government policies covers how to access to land, how to access to mortgage or finance facilities, how to obtain building permit and other documentation. Policies have a great influence to homeownership in many developing nations. Chukwujekwu, [28] reported the import tax on building materials affect the cost of buildings as building materials constitute over 60 percent of the cost of buildings in Nigeria. Meanwhile, majority of building materials used in the country are imported. Policies on building materials tariff affect homeownership for low-middle income earners in many developing nations of the world including Nigeria. However, developers do not emphasize sustainability issues due to the lack of monitoring and enforcement by the government in most developing countries [29]. They often perceive that environmental protection is the sole responsibility of the government. Government policies in many developing countries including Nigeria are very fragile because many developers often shy away from implementing the sustainable housing concept in their projects. Most sustainable housing development in Nigeria involve a complicated process which takes a long time to gain the approval plans of local councils which discourages most developers from implementing the affordable sustainable housing units.

2.2 Over dependence on foreign/imported building materials

Sustainable housing requires ecological building materials, energy saving and esthetic design [30]. The adoption of eco-friendly products in many developing countries are quite expensive which makes it difficult to be applied to low-medium cost projects. Many building contractors and stakeholders are facing major difficulties in obtaining green products in the local market due to the non-acceptance of local building materials by the buyers [2]. Developers in most developing countries are demanding green materials from foreign countries because it portrays a higher quality, thus leading to high dependence of imported building materials. This overdependence on imported building materials eventually lead incurrence additional cost building construction processes [31]. The higher cost incurred for importing green materials and technology is a challenge to the shift towards sustainability. Another challenge lies in determining ways to make sustainable housing affordable as there is a belief that each sustainable housing project is usually planned and designed in detail to comply with its target buyers' financial status, interest, and expectations. Bons et al., [14] stated that most a times, target buyers are mostly high income earners and foreigners who can easily own sustainable houses, as these reflect their lifestyle. Thus, many local builders have to deal with local buyers ranging from low, medium-low and medium-high income earners [26].

2.3 Professional challenges

The lack of urgency to provide affordable and sustainable housing by the government and builders in most developing countries further adds to the challenges. Profits are generated by targeting low medium cost houses which still dominate the industry while developers are comfortable with their business marketability and are reluctant to commit to something new [25]. Many developers are interested to pursue

sustainability practices but it will lead to additional project cost. Big developers have greater financial capacity, better experience and, higher commitment as well as the required expertise to pursue sustainable practices [17]. These developers are more aware of sustainability practices by executing proper planning, design and allocation of budget. However, the majority of developers in many developing countries including Nigeria are from medium and small sized companies. Many of these medium and small sized companies are reluctant to devise their own methods in building design and development. They accept the latest technology which may incur little or no additional cost and in most cases, they may accept sustainability practices if consultants can provide a good design within the project budget [3]. These medium and small sized companies are aware of sustainability issues, but they believe sustainable practices may affect their profit margin [4]. Hence, they are able to implement sustainable practices by incorporating sustainable elements in their small or medium projects by focusing on the design and orientation of houses, providing more green spaces and improving social needs through the upgrading of facilities.

2.4 Technological challenges

In developing countries of the world, the implementation of sustainable technologies is still at an early stage where specifications and other contract documents have not been documented properly [23]. These challenges make construction practitioners delay the implementation of affordable sustainable practices in housing development. The construction of affordable and sustainable housing units for low and middle income earners requires expertise qualified developers. However, the local knowledge for incorporating green technology and sustainable practices in building construction in Nigeria is still at a developmental stage. This has resulted to just a few handful of builders integrating the affordability and sustainability concept in their building projects [5]. Also as a result of lack of qualified expertise in sustainable construction, many developers in Nigeria are resorting to hiring of foreign expertise to help in implementing sustainable construction practices. Unfortunately, this is posing a hindrance to the local expertise to develop their skills, increase the dependence to foreign experts and incur additional cost. The difficulties of obtaining green technology and materials from the local market in many cases has lead the developers to import green products, which bring about the increase of product costs [17]. Imported green products are mostly produced based on their origin countries' climate which is mostly is different from climate of most developing countries. So local developers have to request for custom-made products to suit the local climate which usually add to the cost, on top of the delivery expenses.

3. Strategies for solving sustainable affordable housing challenges among low and middle-income earners

3.1 Institutional strategies

A key institutional strategy of sustainable affordable housing in developing countries is to empower the private sector in the delivery of mass housing as recommended in the enabling approach [32, 33]. The studies stated that with the involvement of the private sector, issues like corruption, politicization that have held the housing sector aback can be addressed. The continuous review as well as updating of

housing policies in accordance with existing realities as recommended by sustainable affordable housing practices will also help to address the low-income earners housing needs. A sound housing policy is an all-encompassing housing document because it addresses issues related to land for housing, building materials, housing types, all income groups and many more.

Additionally, a key institutional strategy of sustainable affordable housing is centered on a procurement process that is effective and transparent [23]. The incidences of favoritism, incompetence and undue desire for profit can be addressed with the adoption of a transparent and effective procurement process in the building sector. This will ensure a smooth transition of government initiated housing units to the low and income earners. A lot of cost will also be saved when a transparent and effective procurement process is in place. Studies from Adegun et al. [34] shows that a lot of time and resources can be saved by decentralizing and shifting building project approvals to local authorities, as it would serve as an incentive to local developers. The overall goal delivering more housing units to the low and middle-income earners will be achieved.

3.2 Technological innovation

The continuous rise in the cost of building materials coupled with the degradation of the environment due to over exploitation which is often occasioned by developmental activities calls for the need to develop and upgrade local resources to sustainable standards. An important technological strategy of sustainable affordable housing should be on the promotion of the use of reusable, renewable and recyclable materials [35]. Through this, the environment shall be further conserved and the incidences of disaster can be further managed. As a way forward, Gooding, [36] stated that there is need to promote technological innovation among building stakeholders in order to ensure sustainable affordable housing for low-middle income earners. There is need for promotion, growth and development of local and rudimentary technologies which is a technological strategy of sustainable affordable housing, [37]. By promoting the development and growth of local technology, the scarcity of skilled labor can be addressed while direct employments can as also be created. The huge finances spent by developing countries on hiring and maintaining foreign building experts will be saved. As a result, housing prices will drastically reduce thereby increasing the low-income earners access to housing.

3.3 Environmental strategies

The building and construction industry contributes nearly one third of Global Greenhouse Gas (GHG) Emissions which has led to serious discomfort both in and within the built environment [6]. Low and middle-income countries finds themselves in the middle of this discomfort and even suffer more discomfort as a result of the inadequate situation of their dwellings. Against this backdrop, Twumasi et al., [38] called for the integration of energy efficiency construction practices in developing new projects. The environmental strategy of sustainable affordable housing will help to promote energy conservation through the use of energy efficient lighting systems, solar heating technologies, energy efficient heating systems, ventilation and air condition systems, installation of water efficient appliances improved rain water harvesting technologies and improvements of the housing envelops generally [39, 40]. Although these practices can increase the housing cost and make housing units

unaffordable to the low and middle-income earners, the introduction of an incentive driven housing market, can make the houses to be affordable to low and middle-income earners. Murphy, [41] supported by stating that the adoption of current energy conservation strategies will lead to up 80% reduction in energy consumption in buildings. This will certainly lead to more comfort in both indoors and outdoors environment for the low-income earners.

Furthermore, there is need for promotion and use of local resources among low and middle income countries [42, 43]. Sustainable affordable housing through its environmental strategy, encourages the usage of local resources in the form of tax reliefs and incentives to developers. The development and usage of local resources by Nigerian developers will eventually lead to a drastic decline in the price of imported building materials in the country. Thus, making the entire cost of housing units affordable to the low and middle-income earners which will also promote job creation.

3.4 Economic strategies

Most countries in the world are empowering the private sector with the responsibility of the provision of housing while the government of these countries act as an enabler and promoter. The development of housing in Nigeria and in most developing countries is hampered by the unavailability of incentives to private investors and developers. Onu, and Onu, [44] confirmed that private sector developers are profit oriented hence, most of their outputs are unaffordable to the low and middle-income earners. The burden that the cost of housing comes with are transferred by the developers and investors to the households through rent or outright purchase thus making the low and middle-income earners unable to access the available housing units [45]. The strategy of providing investors/developers with incentives (loans, tax rebates etc.) can help address the challenge and by extension, grant the low and middle-income earners greater access to housing. Incentives through flexibility of building designs and construction will help to motivate the builders to construct more affordable housing units with lower prices for the low and middle-income earners.

The poor financial status of low and middle-income earners in most developing countries especially Nigeria has also been reported as one of the reasons why housing is in limited supply to these set of people [46]. Studies show that prices of most housing units are outside the reach of many low and middle-income earners as a result of their poor and weak financial status. However, the recent provision of housing subsidies in the form of loans and mortgages at lower interest rates by the Nigerian government to low and middle-income households has been well accepted praised around the country [43]. Similarly, Garde, [46] noted that the economic focus of sustainable affordable housing is to provide households with incentives in the form of reduced transportation as well as other non-housing costs. In general, the provision of financial incentives will cushion the economic power of the low and middle-income earners thereby resulting into better housing for them.

3.5 Social strategies

The incidence of poor maintenance culture and abandoned management of public facilities has also been reported as a challenge limiting the low and middle-income earners access to adequate housing globally [42, 47]. Poor maintenance has led to an increased proportion of aged and deficient infrastructures especially in many

developing countries [33]. These aged and deficient infrastructures are unfortunately home to low-income earners. Roumboutsos, and Macário, [32] noted that retrofitting of aged infrastructures to sustainable affordable standards is less costly and more economical compared to outright project demolition and reconstruction. The studies added that through the retrofitting of aged infrastructures which is one of the social strategies of sustainable affordable housing, the facades of the infrastructures are retained, more employments are created while an almost 80% reduction in energy usage can be achieved thereby boosting the low-income earners housing conditions.

Low and middle-income earners as a result of their low financial status are confined/restricted to city/urban outskirts where infrastructural facilities are absent thus making their housing conditions more like slums. However, Murphy, [41] reported that reduction and elimination of income/wealth segregation through the promotion of social capital, inclusion and cohesion is one of the social strategies of sustainable affordable housing. Social cohesion brings about a sense of belonging, social solidarity and emphasizes on the need to interact within families and communities. Additionally, inclusion promote easy access of households and families to resources and promotes efficient participation and involvement of the households in economic, political and social activities within the community. All of these put together can foster the relationship as well as inter relationship between the low-income, middle income and the high income households thereby reducing drastically, the incidence of income/wealth segregation.

4. Impacts of applying prefabricated systems to the low-middle family homes

Prefabrication is a method of construction where the elements of a building, ranging in scale from a component to a complete building, are manufactured at some distance from the final location. These elements are then purchased and carried to the final location where they are assembled and normally attached to pre-prepared foundations. Prefabrication is the production of housing or housing components using factory mechanization. The factory setting enhances affordability through a combination of bulk purchase of materials and mass production assembly techniques. Prefabrication can take one of three forms namely; prefabricated housing components, modular housing, and manufactured housing.

The prefabrication of housing components consist of the separate production of components such as windows, doors, and cabinets. Separate production of such housing components helps in keeping costs down by reducing on-site construction and high cost labor. Modular housing involves the prefabrication of sections of housing that are then assembled on-site thereby reducing on-site labor costs. Modular housing is based on prefabricated, factory-produced, easy-to-transport modular units, which minimize the cost of production. Final structures are designed from the inside out using a series of standard modules of use. Such housing units from these modules have the potential to be configured in a variety of ways, according to the specific requirement of the site or client. Manufactured housing are housing units which are specially produced in factories using unique specification, transported and eventually assembled onsite for the clients [48]. Manufactured housing which are fully built in the factory and today's structures are virtually indistinguishable from their site-built counterpart. Entire houses, containing the same amenities as site built homes, are shipped to the site and placed on a permanent foundation. Manufactured housing is durable, desirable and a viable form of affordable housing.

In Nigerian cities, the low and middle income earners suffers from high housing costs and poor service availability with the subsequent impact on other features of economic and over-all well-being. The main characteristics of the Nigerian housing system is marred with long waiting lists, high rents, thousands homeless, millions living in insecure or unsuitable dwellings and a generation of young people priced out of the housing market [49]. Housing supply is failing to keep up with demand while home prices nationwide are rising at twice the rate of incomes and three times the rate of inflation. The affordable housing crisis continues to be a major problem in Nigeria and in most developing nations of the world. This dysfunction has forced the low and middle-income income earners to secure housing outside formal housing provision. However, the fact shows that, conventional construction process could not minimize the high demand of houses due to affordable cost within short time and quality production. Any strategy to address this challenge will need to take into account the particular constraints linked to developing societies. In fact, the need of alternative construction process is the best solution to address these and other related challenges and build sustainable housing for the majority of the population.

The difference in the levels of development and distribution of economic opportunities has resulted in rural–urban drift. People seeking a better living and employment opportunities migrate from rural setting to urban areas thereby increasing population growth. The migrant furthermore, are unemployed and poorly housed set of urban residents. The process of urbanization in many Nigerian cities has resulted in low and middle-income migrants, occupying the urban slums and also seeking to solve their problem of accommodation informally. They are now become dominant and, in most cases, transforming the city to meet their needs, more often in a conflict and substandard housing. Therefore, the alternate options should also lead to building massive houses in a high speed at a less costly and quality materials and also preserve natural resources and energy efficient.

5. Benefits of applying prefabricated systems to the low-middle family homes

Based on available literature, some of the advantages of the integration of prefabricated housing units for low and middle-income earners in Nigeria include the following:

a. **Reliance on local material:** The availability of indigenous material such as clay, bamboo, rafter, sharp sands is an advantage for housing provision. It has been confirmed that locally produced building material can replace the expensive imported materials. Also, it has been reported that those locally produced materials also exhibit, functionality, esthetic, durability and structural stability that enhance sustainable buildings. Cost of building with local materials cost less, than using conventional material, also local building material are affordable and cheap. Arumala, and Gondal, [50] reported that earth is one of the oldest building materials readily available and very cheap among others. Normally local building materials are not bought, the cost incurred in obtaining them are for only those who will fetch the material e.g. hiring people to cut palm font, dig earth and cut bamboo. This makes it cheap and affordable for obtaining local material for building purpose.

b. **Provision of affordable building for low and middle-income earners:** Low and middle-income earners in many developing countries like Nigeria find it very difficult to build or even purchase homes due to high cost of housing units. However, reliance on local materials for the production of prefabricated housing units across Nigeria will ensure that houses are produced at affordable rates for low and middle-income earners. This will also empower more low and middle-income owners to be able to build, buy and own houses at affordable rates across the country. The local alternative materials will also provide safe, comfortable, and durable dwellings for rural communities.

c. **Reliance on local skill and technology**: Indigenous building technologies are the skills or methods in building constructions that are local in its origin. The advantage of the building technology is that it is within the reach of the masses. The cost is very cheap and affordable. The tools to carry out the construction process are equally available and very cheap. The adoption of prefabricated construction practices in Nigeria will help local builders and developers to upskill on the area of prefabricated construction. Upskilling on prefabricated construction practices by local developers will prevent local construction firm from hiring and maintain expensive expertise abroad thereby saving construction costs which will eventually lead to production of affordable prefabricated units for low and middle-income earners in the country.

6. Impacts of applying mass customization design to the low-middle family homes

Mass customization is a system that uses information technology, flexible processes, and organizational structures to deliver a wide range of products and services that meet specific needs of individual customers at a cost near that of mass-produced items. In housing, individual customization is traditionally seen as hiring an architect to creatively design a unique home, ideal for the family. Mass customization in housing is a combination of two strategies; mass housing production and individual customization of housing units. Mass housing production, on the other hand, is when large numbers of identical homes are built and then sold for much less than the uniquely designed homes. Individual customization units is a uniquely designed product that better fit the user's needs with mass production efficiency and costs. It is being adopted in many housing contexts worldwide to provide families with dwellings that suit their individual needs at affordable costs.

Mass customization of housing has been linked to environmental and social sustainability. By providing dwellings that better suit the individual needs of the family, there is less need for renovations and the waste it creates. Furthermore, construction for mass customization often adopts practices, such as prefabrication, which also reduce waste and water and energy consumption. The custom home also increases the users' sense of identity and ownership towards it. However, a drawback of this process is the lack of flexibility in terms of considering requirements of different household profiles especially for low and middle-income earners. Similar to other developing countries, such as Ghana and Kenya most Nigerian housing programs for the low and middle-income earners rely on repetition and high standardization of products with the aim of keeping costs low. Such a standardization also allows for less complicated contractual and financial procedures, contributing to the economy

of scale. However, the ability to deliver houses that meet customers' needs in Nigeria while maintaining production efficiency has been a long debate in the house-building industry. This is because most developers also want to benefit from economies of scale by having a high degree of repetition. Thus, applying mass customization ideas to the building sector seems to be an opportunity to accommodate the trade-off between variety and costs.

Government as is often the case in Nigeria always tries to solve the social problems of housing; it does this through the formulation of policies and their subsequent implementation. Jibril and Garba, [51] stated that the failure of the 1991 National Housing Policy was the repetition of the same house type throughout major cities across country. While Akinkunmi, [52] agreed with this view, it stated that the recognition of the failure of Policy prompted the federal government to formulate a New National Housing Policy of 2002 that sought to ensure that Nigerians have access to decent, safe and affordable housing through private initiative. This policy signaled the growth of speculative house building in urban areas and cities in an attempt to meet the set goals. Since then there have not been any meaningful efforts to develop or upgrade the building construction practices in the country especially in the area of mass customization.

7. Benefits of applying mass customization design for low and middle-income family homes in Nigeria

There are several benefits that could be derived from providing mass customized housing units for the low and middle-income earners in Nigeria; some of them are discussed below;

1. **Reduction in overall house cost:** The cost of a house is often borne by the prospective owner regardless of when he gets the house. The current practice of the housing provision ensures that the house is completed before the prospective house owner pays for it and it is only then that the owner knows which house is his. In most cases while the owner tries to adapt to the house he has to carry out some form of modification to suit him. These modifications cost money thereby increasing the overall cost of the building for the owner. However in the case of mass customized buildings the building is already designed and constructed to meet the needs of the prospective owner hence the cost of modification is eliminated. The reduction in overall housing cost will enable more low and middle-income earners to be able to afford rent or outright ownership of such buildings.

2. **Reduction of post constructional changes:** Post constructional changes on buildings affect the appearance of the building, increase maintenance problems and in general the overall esthetics of the housing site or estate. The reason for this kind of problem is that most of the modifications are carried out without recourse to the architect or developer with the concept for the estate. Mass customized buildings will help maintain the initial concept because the architect would have already captured the aspirations of the prospective owner in the overall design scheme. This will therefore eliminate any form of post construction changes. Low and middle-income earners who happen to acquire and live in such mass customized houses will be able to maintain such houses as the maintenance cost will be very affordable.

3. **Creation of identity:** The process of housing customization allows for individual houses to become user specific and because human beings are different, therefore their houses will ultimately be different. This difference is what will account for the individual identity in the buildings within the housing scheme. It will also help give character to various buildings and the estate as a whole.

4. **Improvement in user satisfaction:** The aim of an architect whenever he designs a structure is for the owner or end users to be satisfied, however this not often achieved in speculative mass housing. This user satisfaction can be achieved using customization principles to design the houses for the prospective owners because their needs and aspirations are expected to have been captured and taken care of during the design and construction of the houses. Improving the user satisfaction will enable low and middle-income earners to be able to enjoy the comfort of good sustainable homes and buildings.

5. **Reduction in speculative housing:** construction projects as practiced in Nigeria is based purely on speculative owner's methods and hence it costs money to provide and market to the prospective house owners. In some cases some houses remain unoccupied for a long period of time thereby holding down capital. Mass customization of buildings will help eliminate the issue of speculative housing in that the prospective owner is already known. It therefore means that no house will be constructed without an owner and money will not be held down unnecessary. The process will equally help ensure that the proposed houses get to the targeted population (low and middle-income earners) and not prospective commercial landlords or middle men.

8. Conclusion

One of the greatest challenges facing developing nations is the provision of infrastructure to enhance construction of sustainable houses for low and middle-income earners. Also, the responsiveness of the construction industry to the preservation of natural resources for the benefits of future generation has been very poor in developing countries. There is the demand for sustainable shelters to house the growing population of people, especially among low and middle-income earners. Building energy efficient houses does not only contribute to better living conditions, but also a better environment thereby culminating into creating sustainable communities. Therefore effective adoption and implementation of the sustainable strategies for providing affordable housing as discussed in this paper will go a long way in helping low and middle-income earners in affording decent sustainable houses.

Mass customization is a development strategy that stands for the ability to develop high value-added housing units for clients or building occupants within short period of time at relatively low costs. Prefabrication on the other hand is the production of housing units or housing components using factory mechanization which enhances affordability through a combination of bulk purchase of materials, mass production assembly techniques which results in keeping costs down by reducing on-site construction. Through mass customization and prefabricated construction, construction companies can use industrialization techniques to utilize the benefits of industrialization without compromising the opportunity to customize the offering to the customer. The adoption of mass customization and prefabricated construction by

developers in many developing countries will help to lower unit cost, increase quality, and provide affordable sustainable housing units for the low and middle-income earners. Therefore, mass customization and prefabricated construction techniques should be widely promoted and adopted especially among developing nations like Nigeria so as to offer the low and middle-income families with dwellings that suit their individual needs at affordable costs.

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