Sustainable housing development dynamics in the Global South: reflections on theories, strategies and constraints

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Abstract. *Background:* Sustainability has been on the front burner of global debates in the 21st century because of the three commons: economic development, social equity and environmental stability. Central to the debate on sustainability is housing. Housing, as a fixed, physical structure, can undermine development by constituting threats to the physical environment, and housing as an economic commodity can invigorate the process of development by increasing GDP through diverse job creations and revenue generations. However, the intersection of housing development, physical environment and sustainability in the Global South has been under-reported.
Aim: The aim of this paper is to contribute to the debate on sustainable housing provision in the Global South based on three valid questions: How can affordable housing be produced for the teeming population, how can sustainable, quality housing be produced, and how can the impacts of housing on the physical environment be regulated?
Results and conclusion: The paper discusses housing deficits, sustainable housing development strategies, challenges of sustainable housing provision and potential solutions to sustainable housing development in the Global South region. This paper has useful policy and practical implications for housing development in developing countries.

Contents:

1. Introduction

Developing countries, especially in Africa, are on the verge of a housing crisis, which stems from a multiplicity of reasons including humongous populations, slow economic growth and housing policy debacles (Agbola, 2005; Aribigbola, 2008; Arku, 2009; Bah et al., 2018; Aliu et al., 2018). The world population is at the seven billion mark, and two giant developing countries, namely India and China, contribute about one third to this enormous population. Africa, with about 1.18 billion people in 2015 and projected to reach 2.44 billion people in 2050, with an urbanization rate of about 3.5 percent, faces the most critical housing deficit challenge in the 21st century. Four African megacities, namely Lagos, Cairo, Johannesburg and Kinshasa account for 20 percent of their respective countries' populations (Bah et al., 2018). By 2050, urban population in sub-Saharan Africa is expected to grow by almost 800 million. Unfortunately, Africa's slow economic growth does not match her population acceleration. With the planet's population continuing to grow, and the quality of life of billions in the developing economies declining daily, the demand for housing inevitably grows. Unless handled well, this will create negative impacts, such as the growth of urban sprawls, increasing slumnization, housing deprivations and unmitigated homelessness.

Sustainable development is a concept that universally focuses on striking a balance between society, economic growth and ecological stability (Smets & van Lindert, 2016; Lewandowska & Szymańska, 2021). The proponents of sustainable development have argued that all stakeholders in economic production, including housing, should exercise great caution in using environmental resources for human consumption, urging a culture of frugality. Housing sustainability is, in the larger spirit of sustainable development, all about providing adequate housing for present and future generations. Sustainable housing is therefore a planning idea that seeks adequate shelter for humanity at all time scales. It is an attempt to banish homelessness at every state of human existence.

Housing and sustainability are two development-related issues that have received tremendous global attention in the last decade-and-a-half of the 21st

century (Choguill, 2007; Smets & Van Lindert, 2016). This is partly because of their relevance to human advancement and partly because of their inexorable nexus in the development equation. The centrality of housing as a basic social need to man and his continued existence warrants no polemics. Housing not only provides man shelter against the natural elements and climatic vagaries, it also provides for him varying biological, health and psychological benefits (Mabogunje et al., 1978; Gough et al., 2003; Ibem, 2011; Gbadeyan, 2011; Aliu & Adebayo, 2013; Bah et al., 2018; Gbadegesin et al., 2020). In addition, housing performs cultural and economic roles within society; hence, housing is more than mere shelter, but an economic property and a measure of social status in the society (Rapoport, 2001; Gough et al., 2003).

While recent studies have widely explored the social and economic dimensions of sustainability, the intricate relationships between housing and sustainable development have been severely glossed over. Little has also been done to explicate the intrinsic components of sustainable housing development generally. The objectives of this paper are therefore to:

1. express the housing deficits in developing countries,
2. discuss the theories of housing, sustainable development and housing sustainability,
3. identify and discuss the basic sustainable housing strategies,
4. identify and discuss the major constraints to housing sustainability.

This paper is organized into five sections – introduction, theories of housing and housing sustainability, results and discussion, and conclusions and policy implications.

2. Housing and housing sustainability theories

2.1. The housing development theory

The housing development theory encapsulates the conceptualization, provision and distribution dynamics of housing units in the society. Housing has a multiplicity of connotations, and it is only for purposes of convenience that housing is defined

simply as mere shelter. Indeed, housing is a product that represents the shell or structure of a dwelling, designed with basic built-in equipment for the allocation of space to heating, sanitary, sleeping, resting and a process by which shelter is provided in a safe and comfortable location relative to transit and transportation, places of work, schools and hospitals, religious and recreational centres (Aliu & Adebayo, 2013). According to Beyer (1965), housing is a complex economic product that is bulky and immovable and serves as a store of economic value in that it could be traded in the stock markets. From Rapoport's (2001) point of view, housing is more like a cultural artifact indicating the level of socio-cultural development of the society at a point in time. Housing is a bundle of services consisting of neighbourhood services – schools, parks, location services – accessibility to employment, amenities; and structural services – living rooms, kitchen, baths (Aliu & Ajala, 2014; Izadi et al., 2021). Housing therefore is a cultural creation of man that affects and can be affected by the environment. Agbola (2005: 4) defines housing as a product and process of conceiving, planning and constructing a dwelling for the purposes of achieving social, cultural and economic ends and the totality of the immediate physical environment, largely man-made, in which families live, grow and decline. Nigerian Housing Policy (NHP 2002) defines housing as a process of providing safe, affordable, comfortable, attractive and functional shelter in a proper setting within a neighbourhood. Because of the spatial dimensions of housing as a "brick and mortar" constituent of the environment, it easily gives the spatial form that every society wears.

Housing development is a process of producing a group of housing apartments of similar sizes and design for personal dwelling, sale or rent. It comprises interconnected processes of action including fundraising, land acquisition, building plan preparation, housing construction, delivery and occupancy. Housing development also involves policy formulation and market operation. It usually consists of the conception, predevelopment, construction, occupancy and ongoing operations (Akinluyi et al., 2020). This complex network of processes involved in the housing production and delivery requires a lot of professional expertise and experts who are supposed to be versed not

only in practice but also in idealization. Although a special kind of commodity, housing units are provided and dispensed through the instrumentality of the housing market (Bourne, 1981; Mayo & Gross, 1987; World Bank, 1993). As an economic armature, the housing market operates based on the interaction between the two levers of demand and supply to produce the outcomes – housing units – in quantity and quality. To the economist, housing is, like land, a derived commodity whose demand could be always inelastic. Every society has overwhelming demand for housing probably because of its inexorable usefulness to man. The housing market – which often signifies a framework where the invisible hands of price mechanisms dictate the order of accessibility and consumption – functions on the interplay of demand and supply (Gbadeyan, 2011; Towry-Coker, 2012). Housing supply simply indicates the sundry sources through which housing is provided into the housing market and it is a leverage of the market that is constricted by a varying number of issues – land, funds, access to mortgages, interest rates, and building material costs. These therefore preclude a balance of strength between supply (pervasively in shortage) and demand, which is pervasively in surplus. The housing supply sources to the housing market include individuals, government (public) and the organized private sector (property developers).

Housing demand, which is often regarded as the quantity and quality of housing services that a household could effectively obtain, is readily available only when the socio-economic dynamics of the economy permit near equity and therefore is a subject of critical worry where socio-economic inequality pervades. Disregarding the economist ranting on the essentialness of capacity to pay for housing services, housing demand can normatively be equated to the consumer population in numerical terms. But this is also a very dodgy generalization. The said population must be enamoured sufficiently by effective and visible financial capacity to offset the price of the commodity needed. Assume that the supply arm of the housing market is guaranteed, then demand for housing is easily determined by the factors of household income, household size, family formation rate, affordability of houses, price of property, age of property, housing starts, and level

of socio-economic attributes of consumers (Mulder, 2005; Aliu & Ajala, 2014).

Housing is inherently spatial and the discrepancies among housing qualities and market outcomes within large built environments have been a major policy concern for decades (Buist et al., 1993; Aliu & Ajalaa, 2014). Housing markets generally display segmentation or variation and therefore require elemental analysis for qualitative and quantitative differentials and similarities. For, as observed by Aliu and Ajala (2014:11), "the housing market is not a monolithic phenomenon, but a framework that displays wide variations in quantity, quality and prices. The housing market area analysis is simply the explanation and description of the various housing segments within a given spatially bounded region or place." This exposes the quality and quantity polarization within a big city (Aliu & Ajala, 2014). The housing market area analysis is important for a number of reasons: it exposes the attributes of each segment of the housing market and facilitates the understanding of housing choices and preferences; it allows for the analysis of the full range of housing demand and need; it informs on the need to base local housing analysis on functional market areas that have some intrinsic rationale; and it permits an understanding of the current trends and imbalances in the housing market.

2.2. The theory of sustainable development

Sustainable development is often defined in the words of the Brundtland's World Commission on Environment and Development WCED (1987) as "the development that meets the needs of the present generation without compromising the ability of future generations to meet their needs". Sustainable development is an environmental, social, economic and ethical concept that seeks to achieve economic growth, social equity and ecological stability simultaneously (Ajala et al., 2010; World Bank, 2013; Smets & van Lindert, 2016). It derives from the long tradition of development scholars' idea that humanity's perpetual occupation of planet Earth will depend more on the preservation and conservation of the earth resources such that generational requirements for survival are at the least risk of compromise. In other words, unhindered human

development depends on the sustainability of resources. Sustainability requires that development will not be detrimental to the stock of resources of the environment and will infinitely occur through generations. Development is a multi-dimensional concept not confined to the realization of sustained economic growth alone but a drastic improvement in the general well-being of the people, socio-political transformation and reduction in inequality (Todaro & Smith, 2003). Hence, development is not just one indicator concept but a combination of varying socio-economic and political indicators.

The concern of the proponents of sustainable development is about how to achieve economic growth without compromising the integrity of the ecosystem. Drawing copious inspirations from the neo-Malthusian negative implications of exponential population growth over arithmetic resource growth and the Food and Agriculture Organization (FAO) Club of Rome's *Limit to Growth* report of 1972, sustainable development has become a well-accepted theory of development predicated upon the means of extending human progress without endangering natural resources beyond the foreseeable future. Because most of the environmental resources are not only scanty but non-renewable, the need for everyone to preserve usage and lessen consumption is of paramount importance. The concept of sustainable development canvasses four man–nature-related principles: environmentalism, topophilia, anthropocentrism and eco-centrism. All these principles canvass the logic of maintaining equilibrium between human activities and nature.

In a wider context, sustainable development is often invoked as a means of reconciling important objectives that include respect for human rights, promotion of socially and environmentally sustainable economic growth and protection and wise use of the natural environment. All main definitions of sustainable development share three characteristics: first, achieving sustainable development requires integrating policies related to social justice, environmental protection and economic development; second, the interests of future generations are seen as inviolable; and third, transparency and public participation at all levels of decision-making from local to global scale are essential. Sustainable development presupposes the

sustainability of natural and artificial resources, including housing and the built environment.

2.3. The sustainable housing development theory

Housing sustainability is simply the process of providing shelter in such a way that both present and future generations' housing needs are taken into consideration. When the elements of adequate housing are provided in consonance with environmental principles, the realization of the human right to housing, land, a healthy environment and sustainable development is foreseeable. Sustainable housing ensures: the access to natural resources necessary for community survival and livelihoods; the use of green technologies and adherence to ecological building codes; the construction of disaster-resistant housing; the location of housing on environmentally safe sites; proximity to work, education and healthcare; the use of culturally appropriate and indigenous materials; and the design of housing provision that ensures tenure security and protection against eviction and guarantees the prior informed consent of affected populations (UNHABITAT, 2012). Table 1 gives elaborate and very specific indicators of sustainable housing that align with the realization of the Sustainable Development Goals (SDGs). It is apparent that, in order to attain sustainable housing, the housing sector must be efficient at resource utilization for optimal housing provision, and that the prediction of housing need must envisage changes in natural resources and in the socio-economic and demographic attributes of people. However, adequate housing, it must be noted, is more than an exponential increase in housing provision – it is also an increase in more qualitative dwellings for residents. Housing has great implications for the physical environment in positive and negative terms. Hence, housing sustainability is viewed from three perspectives – how to produce adequate affordable housing sustainably, how to produce quality housing sustainably, and how to regulate the influence of the housing shell on the immediate environment.

In the context of sustainability, sustainable housing refers to housing in terms of social vulnerability, housing in the context of economic viability and housing in the context of environmental sustainability (Mehmood & Parra, 2013, cited in Smets & van Lindert, 2016). In the context of housing sustainability, social vulnerability includes satisfaction of needs for housing and basic services and facilities, social inclusion and engagement, social cohesion, cooperation in communities with stakeholder citizens, identity formation, empowerment, and reflexive governance. Economic viability includes suitable production and consumption, neighbourhood and home-based production, sustainable social entrepreneurship, participatory decision-making based on local knowledge, adaptive management, micro-finance

Table 1. Specific indicators of sustainable housing

According to UNHABITAT, 2012, sustainable houses are those that are designed, built and managed as:
• Healthy, durable, safe and secure
• Affordable for the whole spectrum of income levels
• Using ecological low-energy and affordable building materials and technology
• Resilient to sustain potential natural disasters and climatic impacts
• Connected to decent safe and affordable energy, water, sanitation and recycling facilities
• Using energy and water most efficiently and equipped with certain on-site renewable energy generation and water recycling capabilities
• Suitably located in terms of jobs, shops, health-and child-care, educational services
• Not polluting the environment and protected from external pollution
• Properly integrated into and enhancing the social, cultural and economic fabric of the local neighbourhood and wider urban areas
• Properly run and maintained, and renovated and retrofitted in a timely manner

Source: According to UNHABITAT, 2012

initiatives and strategic investments. Environmental sustainability includes diversity of habitat solutions, environmentally friendly building materials and technologies, socio-ecological transitions of habitat conditions, effectiveness of techno-optimism, flexible and adaptive governance, and densification of built-up areas.

3. Methods

This study employed a perspective approach to examine housing development challenges and housing sustainability in the Global South. This approach deals with the housing deficit issue and the basis for continued struggle with housing provision in the developing economies. Many studies on housing provision and housing policy debacle were assembled and critically examined to give support to the arguments being marshalled in the paper, which is not purely a review of existing studies but a comprehensive discussion of issues inherent in sustainable housing provision in the Global South for several decades. First, housing crisis issues were described. Secondly, the concepts of housing, sustainability and sustainable housing were discussed. Thirdly, the strategies for achieving

sustainable housing were evaluated. And lastly, the solutions and policy implications were given.

4. Results and discussion

4.1. Housing production deficits and backlogs

Although there is a general sense of residential inadequacies in all societies of the world, the situation is more precarious in developing economies than in developed economies (Headey, 1978; Aribigbola, 2008; Arku, 2009). In developing economies, housing inadequacy and deficits are major sources of social deprivation for the poor. This is perhaps due to the expensive housing budget, the socio-economic peculiarities of people and the policy orientation operating within different jurisdictions (Huang, 2012). According to Table 2, Africa is faced with huge housing deficits ranging from 20,000 to about 17 million per country. While the situation is a little better in the northern countries, it is worse in the western African countries, with Nigeria accounting for a huge housing backlog in the region to the tune of 17 million. As a continent, Africa has over 50 million housing deficits. Countries with high housing deficits include Nigeria (17 million), Egypt (3.5 million), DR Congo (3 million), South Africa (2.3 million), and Madagascar, Mozambique and Kenya each having 2 million housing deficits (Bah et al., 2018). In fact, Fig. 1 further illustrates
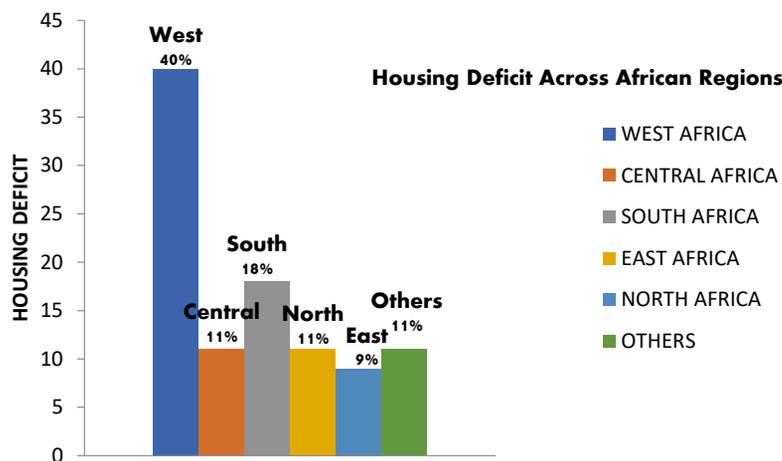

Fig. 1. Regional disparities in housing deficits
Source: own elaboration

Table 2. Housing backlog and urbanization rates in Africa as at 2015

Country	Housing backlog	Urbanization rate 2000–2015	Percentage urban share @ 2015
Algeria	1,200,000	2.76	70.7
Mauritius	20,000	-0.11	39.7
Morocco	600,000	1.92	60.2
Egypt	3,500,000	1.70	43.1
Mauritania	50,000	4.03	39.9
Libya	350,000	1.52	78.6
Nigeria	17,000,000	4.78	47.8
Ghana	1,700,000	3.78	54.0
Mali	400,000	5.35	39.9
Cote D'Ivoire	600,000	3.31	54.2
Liberia	200,000	3.72	49.7
Guinea	140,000	3.51	37.2
Ethiopia	1,000,000	4.55	19.5
Uganda	1,600,000	5.27	16.1
Kenya	2,000,000	4.60	25.6
Rwanda	109,000	7.00	28.8
Central African Republic	1,000,000	2.26	40.0
DR Congo	3,000,000	4.05	42.5
Cameroon	1,200,000	3.74	54.4
Gabon	200,000	2.94	87.2
Angola	1,900,000	5.34	44.0
Cape Verde	82,000	2.29	65.5
South Africa	2,300,000	2.04	64.8
Mozambique	2,000,000	3.31	32.2
Madagascar	2,000,000	4.60	35.1
Zimbabwe	1,250,000	0.96	32.4
Zambia	1,500,000	3.95	40.9
Namibia	80,000	3.98	46.7
Africa	50,562,000	3.50	40.4

Source: Bah et al. (2018) p. 7

the regional disparities in housing deficits, with the West African subregion being the worst hit and accounting for 40% of the African deficits, followed by the southern region that accounts for 18% deficits and the central and northern regions that account for 11% of deficits each. The essence of the picture given in Table 1 and Fig. 1 is that, in each African country, the rate of housing provision must be accelerated to meet housing demand. To meet everyone's housing needs in the nearest future, the world over will require billions more housing units than we presently have. But resources to achieve this target are not potentially inexhaustible. This involves re-strategizing and re-jigging existing strategies for housing production.

There are two indicators of housing deprivations – the proportion of home ownership and the level of homelessness. In developed economies, home ownership is easier and more feasible to achieve than in developing economies, where people, especially the poor, struggle to own or rent an apartment and aspire throughout their life to build at least a housing unit. Homelessness is a common denominator of developing African countries, and housing deprivation is more the rule than the exception (UNHABITAT, 2008; Bah et al., 2018). This is partly due to the inability of the stakeholders to properly harness all possible resources for providing adequate housing and partly because of the levels of population growth (demand), socio-economic variations (affordability) and deficit

financing (Sule, 1981; Onibokun, 1985; Buckely et al., 1993; Jiboye, 2011a; Towry-Coker, 2012).

4.2. Reflections on sustainable housing provision strategies

There are three aspects of the sustainable housing provision debates. The first aspect is how to produce sustainable and affordable mass housing that will eliminate homelessness or shelter deprivation, the second aspect is how to produce sustainable quality housing that will guarantee endearing social interactions, and the third is how to provide sustainable housing that will have minimal impacts on the environmental resources. Each of these posers consists of a complex set of interconnected activities involving several material and professional inputs. Sustainable housing provision requires the provision of sustainable neighbourhood and dwelling services, as well as monitoring of the economic and social
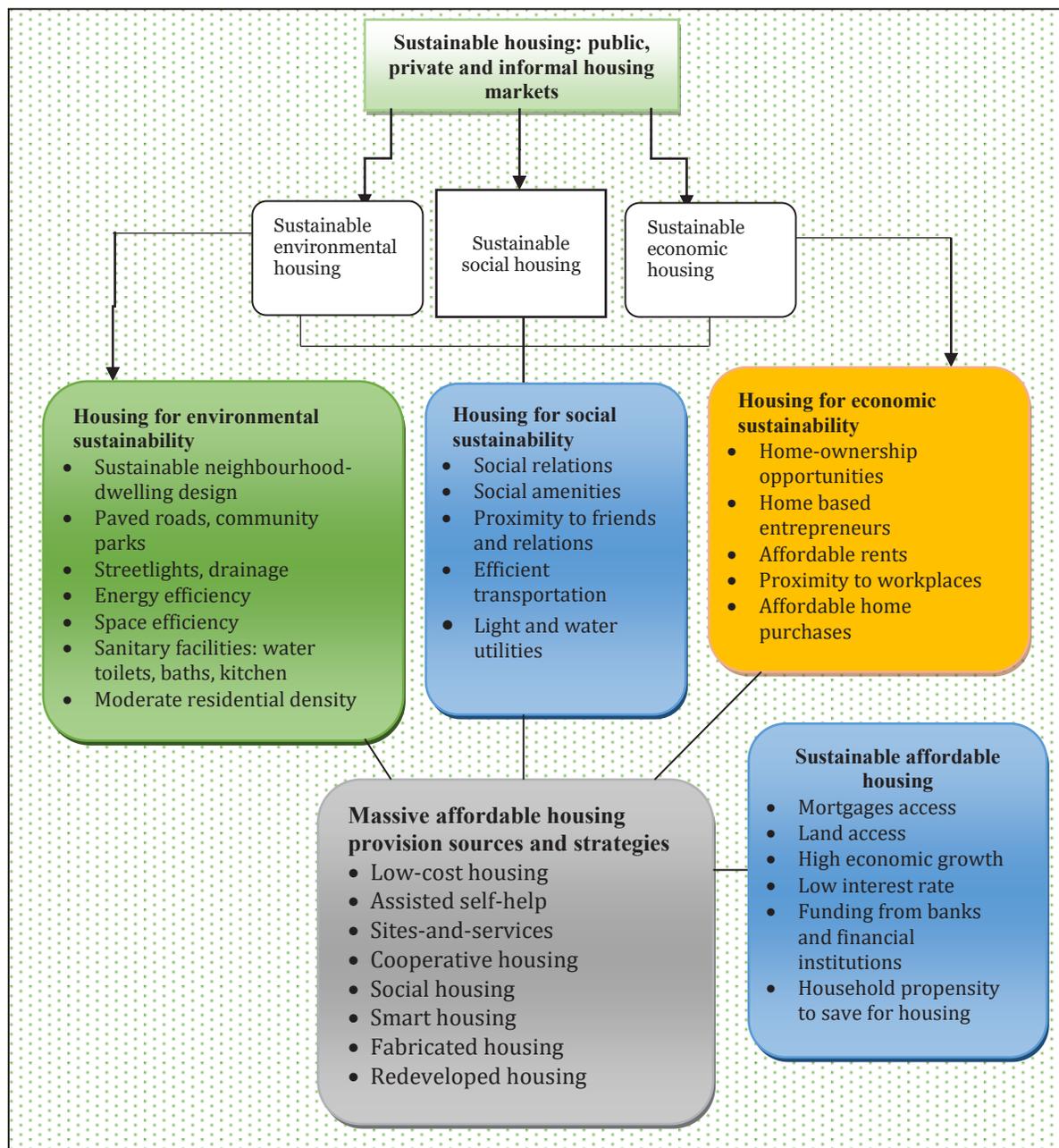
Fig. 2. Sustainable housing development framework
Source: Author's impression

impacts of housing (construction and usage) on the immediate physical environment for deteriorations, degradations and instabilities or perturbations.

4.2.1. Provision of economically affordable housing

The first aspect of the housing sustainability issue is how to produce sufficient affordable housing for all residents in a given place regardless of their social status. Central to the realization of sustainable housing in the Global South generally is the provision of affordable housing for the poor, who are in the majority in the region (Jiboye, 2011b; Choguill, 2007). According to UNHABITAT (2012: 3):

> *"...affordable housing is out of reach for millions of low-income families in the global south, as a consequence of their limited incomes and because of national and local housing policies that fail to reach the urban poor... Genuinely sustainable houses are those that are inclusive and affordable for all and addressing the issue of affordability is therefore a necessary condition for transformation towards suitable housing.".*

Theoretically, housing affordability is somehow familiar but very difficult to understand, perhaps because of its intricate association with household economic conditions and partly because of the changing dynamics of the economic and housing supply systems. In simple terms, housing affordability is the ability of a household to pay housing price or expenditures without resorting to borrowing or indebtedness (UNHABITAT, 2012).

Empirically, housing affordability is measured in three ways: housing-price-to-income ratio, housing-expenditures-to-income ratio and household residual income. The three measures of housing affordability are neoclassical economic approaches where housing consumption is seen from the comparison of housing prices to consumers' effective demand. Of course, there are geographic approaches to housing affordability that take cues from planning views where housing is often perceived in relation to locational opportunities using transport costs, proximity to public facilities and residential quality. In all of these instances, housing affordability

is a challenge to the poor, who often are jobless, rely on meagre incomes, subsist with high family size and are unable to save for housing from their earnings. Resolving housing sustainability therefore involves the production of housing that the poor could have access to at minimum financial risks or efforts.

However, as can be seen in Fig. 1, in all societies of the world, housing is always provided by a tripartite framework comprising individuals, the private organized sector (often regarded as developers), and the government (Mabogunje et al., 1978; Sule, 1981; Chonguill, 2007; Jiboye, 2011a; Makinde, 2014; Aliu et al., 2018). Each of these housing provision sources has its challenges and importance, especially in most developing societies polarized by gross income inequality. The first providers form the informal housing sources, while the private sector and public government housing constitute formal housing sources. Urban scholars have long recognized the place of public housing in urban sustainability and have therefore continually been interested in the policy debate and frameworks that could facilitate mass provision of housing to the majority of the urban residents (Ibem & Amole, 2010; Kadiri, 2005; Aliu et al., 2018). However, due to poor policy performance, urban public housing has largely remained a mirage in developing countries. In most developing economies, for instance, public housing has consistently been inadequate both in quantity and in quality. In developed economies these challenges have been resolved to a greater degree than in developing economies, where little progress has been reported.

The organized private sector consists of the developers, primary mortgage institutions (PMIs), housing cooperative organizations (HCOs) and community-based organizations (CBOs) or non-governmental organizations (NGOs). However, unlike the public housing system, the private sector housing is often costly and insensitive to the variegated spectrum of the society, whose majority is poor. The third source of housing – and the most important source of housing provision in any society – is individual housing. Regardless of the operating ideological or cultural persuasions, housing is generally viewed as a personal responsibility for which individuals must be responsible. In fact, one of the basic reasons for working and engaging in any

economic activity is to achieve the life goal of shelter. Individual owner-occupier housing is no doubt the highest producer of housing in any society. Normally, from the proceeds of their economic functions or jobs, people save and construct housing – mostly for family members and sometimes for letting – thereby improving their economic status However, in developing economies, the quality of individual housing is quite suspect and varied, creating slum housing, which is an informal set of spatial practices and tactics, a makeshift approach to housing and shelter and a precarious form of inhabiting the city (Vasudevan, 2015).

The developing economies have been experimenting with many affordable and sustainable housing programmes for a very long time, although mass production of cheap and affordable dwelling units has remained elusive to the region (Aliu et al., 2018). A look through the contemporary literature shows that developing countries are using different strategies to achieve sustainable affordable housing provision, and these strategies include the following:

- Smart housing
- Low-cost housing
- Sites and services housing scheme
- Cooperative housing
- Assistance self-help housing
- Social housing
- Redeveloped housing

A smart housing is a dwelling that makes maximum and efficient use of both external and interior spaces, and of construction materials. It provides dwellings for the maximum number of dwellers by economizing materials and optimizing space use through technology and technical means. Smart housing also involves the design and construction of shelter for natural hazard mitigation, especially in vulnerable regions. Social housing is a form of housing usually provided by local municipal authorities with the goal of reducing home deprivation of the poor by massive use of cheap materials through public and private strategies. It is a means of rapidly increasing the number of homes needed by low-income earners through cooperative, subsidized loans, non-governmental organizations, labour unions and local municipalities. In developing countries, social housing includes low-cost housing, sites and services or assisted self-housing (Aliu et al., 2018).

An essential way of achieving mass social housing production is to encourage the use of cheaper, re-cycled waste materials, local materials and energy-saving products for shelter. While cement is derived from limestone, which is not readily available in all locations and undergoes critical production processes before being used, it is often suggested that earthen materials be used instead. Earthen material is not only ubiquitous and cheaper; it also has better energy conserving properties than cement blocks. Houses can also be constructed from wooden materials interlaced with fired earthen materials. This method of housing provision is common in developed economies and has been the thrust of social housing provision in the United States for decades. Lastly, sustainable housing provision can be engendered through redevelopment of abandoned and obsolete structures. In many cases, some dwellings were abandoned for varying reasons ranging from obsolesce to inconvenience or non-satisfaction. Such houses could be rehabilitated, or restructured to a level quite satisfactory to the contemporary users. This increases the amount of housing units and involves fewer materials and lower costs than constructing new buildings from the scratch.

Unfortunately, very little sustainability is considered in the housing provision strategies of developing economies. From recent writings by housing and urban scholars, the complex interconnection between housing and sustainability can be disentangled into four threads, namely housing production technology, social considerations, economy and ecology, and target policies (Choguill, 2007; World Bank, 2013; Smets & van Lindert, 2016).

One, to achieve sustainable housing, the technology for the production of building materials and construction of houses must be reconsidered. Depending on contextual situations, environmentally friendly, durable and affordable construction materials may be produced locally, based on relatively simple technologies using local materials such as bamboo, *Raphia*, adobe bricks, compressed earth blocks, interlocking soil blocks – or a mixture of these materials may be used in producing low-cost housing (UNHABITAT, 2012). With appropriate technology, pre-fabricated buildings from recycled waste materials and

environmentally derived materials such as sea shells could be constructed for affordable poor housing.

Two, the place of ecology and economy in sustainable housing production is crucial. There is a need to lower the carbon footprint and reduce natural hazards in the built environment. These could be achieved from the intervention of planning policies that prevent settlements and buildings from being located in fragile ecosystems and in areas that are very susceptible to natural hazards, winds, and hurricane and erosion threats. Economy at both local and national scales is central to housing sustainability. The poor households that are the target of affordable housing production need to be invigorated and their economic strength enhanced. The general economy of the nation, including the financial market, mortgage infrastructure, banking systems, the industrial sectors that employ people, and the building construction sectors are integrated into a whole system that requires proper management and coordination (Smets & Lindert, 2016). There is an increasing tendency to use dwellings as home-based economic activities, which could stimulate individual economic improvement and neighbourhood transformation (Gough et al., 2003).

Three, urban policies are needed to target the greenhouse gas emission and hazard reduction. Target planning policies are crucially required to improve collaborations between national and local governments and operators, which will invariably foster private–public partnerships among all stakeholders. In order to radically improve housing production, especially for the poor, national and municipal housing institutions, as well as private sector operators, are needed to provide sustainable housing in all jurisdictions. Lastly, the social aspect of housing sustainability, which involves optimal engagement of community-based organizations (CBOs) or community development associations (CDAs), housing cooperative organizations (HCOs) and private mortgage institutions (PMIs) is crucial to housing development at sustainable levels for supporting identity profiling and social cohesion at community scale. Sustainable housing is tremendously encouraged in many developing economies where informalities prevail and local residents often seek self-help housing through age-group association and community personal

collaborations (Ajala et al., 2010; Mehmood & Parra, 2013; Aliu et al., 2018).

4.2.2. Provision of sustainable structural quality housing

The second aspect of the sustainable housing dynamics is how to provide qualitative housing that could facilitate greater social and health wellbeing for the occupants. In order to realize sustainable quality housing, planners and urban developers need to provide the following:

- Dwellings that optimize sunlight and energy efficiency
- Dwellings that promote appropriate space, privacy and security
- Dwellings with car parks, garages and secured yards
- Dwellings with sanitary services such as water, toilets, baths and separate kitchens
- Dwellings with private and communal open spaces
- Residences with comfortable density and waste services

Firstly, a way of increasing quality housing sustainably for social interaction is through the optimization of sunlight and radiant energy (UNHABITAT, 2012). This can be achieved by embracing green buildings. Green housing is a form of housing intended to provide energy-efficient shelter. It is a form of housing that manages well radiant energy and artificially provided energy within the housing shell. Green energy housing is constructed from low energy-radiating materials and designed to accommodate greenery neighbourhoods. The orientation of the dwelling and its internal layout can affect levels of daylight and sunlight and will thus influence not only the amenities of the occupants but the energy demand for heat and light. The efficiency gains derived from the solar energy can be enhanced by designing individual dwellings so that solar heat collection is maximized, that is, when living rooms, dining rooms and main bedrooms have the right orientation. Overshadowing will generally only cause problems where buildings of significant height are involved or where new buildings are located very close to adjoining buildings. Planning

authorities should require that daylight and shadow projection diagrams be submitted in all such plans.

Secondly, dwellings should provide appropriate spaces for living and resting rooms. Space is an important element of residential design and contributes towards the sense of privacy and security felt by people in their homes (Ajala et al., 2010). Where ground floor dwellings have little or no front gardens, it is important that defensible space is created behind the public footpath, for example, by means of a plant strip, and the design of ground-floor windows will need to be carefully considered. Similarly, at the rear of dwellings, there should be adequate space – traditionally about 21 m for two-storey dwellings – between opposing first-floor windows. However, such rules should be applied flexibly– the careful positioning and detailed design of opposing windows can prevent overlooking even with shorter back-to-back distances. Windows serving halls and landings do not require the same degree of privacy as, say, balconies and living rooms. Designers can also contribute towards better safety by ensuring clear definition of private, communal and public spaces, preventing unauthorized access to backyard gardens by means of suitable boundary treatment, maximizing natural surveillance of the street from windows, and avoiding blank facades to the public domain.

Thirdly, car parking standards need to be set at realistic levels and having regard for proximity to public transport in order to avoid vehicular obstruction on residential streets in the evenings or at weekends. Parking can be provided in an on-cartilage arrangement or in a grouped format depending on the type of neighbourhood layout. In the latter case, it should be well overlooked by adjacent dwellings and appropriately landscaped. Underground parking could be considered in higher density developments and should be well-lit and well-ventilated. Where possible, designers should seek to create child- and pedestrian-friendly car-free areas, especially in higher density schemes, through the careful location of access streets and parking areas. To avoid vehicular obstruction within yards, parks or garages need to be provided in each dwelling, too.

Fourthly, all houses (including terraced, semi-detached and detached) should have an area of private open space behind the building line. The

area of such private space will be influenced by the separation between buildings and plot widths. Smaller patio-type rear gardens may be acceptable in more innovative layouts where communal open space in the form of a courtyard is also available. For terraced houses in particular, this can often be more appropriate as it offers a method of accessing the rear of all dwellings (by residents only) and can be visually more attractive than narrow fenced-in gardens. The provision of adequate and well-designed private open space for apartments is crucial in meeting the amenity needs of residents; in particular, usable outdoor space is a high priority for families. Private open space can be provided in the form of rear gardens or patios for ground floor units, and balconies at upper levels. It is important that in the latter case adequate semi-private or communal open space, in the form of landscaped areas, should also be provided.

Fifthly, quality housing should, as a matter of fact, consist of water running and sanitary services such as toilets, baths and kitchen. In this way, these facilities ensure that the cooking, bathing and excreting activities are carried out in decent environments (UNHABITAT, 2012). Access to improved and safe water within the dwelling unit is important, and access to improved water running in toilets as well as kitchen will engender hygiene and sanitation. It is instructive to note that water, sanitation and hygiene (WASH) is a critical aspect of the SDGs and its realization depends on availability and access by the residents of a dwelling.

Sixthly, circulation within housing layouts, including access to individual buildings, should have regard for the varying needs of occupants over their lifetimes, especially those needs related to mobility difficulties and the normal frailty associated with old age. Innovative dwelling design should facilitate the potential future provision of adaptable and accessible accommodation for both able and disabled. Adequate provision needs to be made for the storage and collection of waste materials, with appropriate reference to the projected level of waste generation, collection frequencies and types and quantities of receptacles required. Developers should ascertain the relevant local authority requirements for waste management storage and collection at the pre-planning stage. Houses without side passages or pedestrian or vehicular access to rear gardens

should be required to provide a covered or screened area for the storage of wheel-bins at the front of the house. The dwelling features of sustainable housing, like the neighbourhood features, have effects on the housing choices and preferences of residents (Aliu & Ajala, 2014).

4.2.3. Provision of sustainable environmental quality housing

The third aspect of sustainable housing is how to produce housing with the least impact on the physical environment. As a "brick and mortar" phenomenon, the house has direct and indirect relationships with the environment, and these make one to wonder how housing can easily undermine sustainable development in the long run. The importance of having a sustainable built environment has been emphasized by Agbola (2005: 2–3), who stated that:

> One of the physical components of the environment – in which planners operate and which catches the most significant and sensitive attention of the public – is the housing component. In land use classification of cities or any major settlements, housing occupies 50% and above. As a result of the complex linkages which housing has with other land uses as the basic origin of most urban interactions and because of its ability to evolve, grow, age, decay and possibly rejuvenate, its planning and continuous analysis is central to the involvement of a virile, livable and sustainable urban and rural development.

This implies that residential dwellings are essentially a major component of the environment and the way they are produced and consumed is determined by the resources available and by the sustainable utilization of such resources. For construction of dwellings, such resources as granite, limestone (cement), iron ore, laterites, sands, woods, aluminium zinc, barb wires and water are needed at the foundation, walling and roofing stages. Besides, the professional services of builders, architects, planners, and artisans are paid for in cash. The financial resources of meeting these professional services make housing construction

a hugely difficult exercise. After constructing the dwelling, consistent use and re-use lead to structural and neighbourhood decay. The structure will be maintained and managed with partial or complete replacement of parts of the housing shell and neighbourhood (Aliu & Adebayo, 2013). These complex processes of building construction greatly influence both the quantity and quality of housing provided in any place at any time.

All built environments, whether small or large, make impacts on their surroundings. The quality of these built environments has long-term impacts both on the community and on the surrounding neighbourhoods. Sustainable housing presupposes the delivery of quality homes and neighbourhoods in places that people are ready to live, work and raise families – and locations that will function efficiently and will continue to function effectively for present and future generations. Providing sustainable housing therefore indirectly requires the existence of sustainable neighbourhoods. A sustainable neighbourhood is a community that exhibits the efficient use of land, high-quality spatial design of housing, and the effective integration of physical and social infrastructure to create a convivial built environment. Housing sustainability is all about the integration of community facilities, transport and employment amenities with housing development process in a timely and cost-effective manner. In order to engender sustainable neighbourhood, attention must be directed at the following:

- Enforcement of universal design that saves space, transport and materials
- Provision of community facilities
- Efficient use of resources
- Provision of life-quality-enhancing amenities
- Convivial built and natural environment

Firstly, developing a sustainable neighbourhood should be guided by the principle of universal design. Universal design is the design of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability. By considering people's diverse needs and abilities throughout the design process, which reflects the life-cycle approach, environments that meet the needs of all can be achieved. In this way, sustainable design and universal design are inextricably linked

and sustainable design when incorporated from the early stage of planning integrated neighbourhoods will reduce the need for costly and wasteful retrofits from the medium to long term. Design is about creating a vision for an area and then deploying the skills and resources to realize that vision. A key design aim in delivering sustainable communities is to reduce as much as possible the need to travel (particularly by private car) by facilitating mixed-use development and by promoting the efficient use of land and of investment in public transport. Such policies will help to sustain viable local services and employment. Good sustainable neighbourhood planning consists of context, connectivity, inclusivity, variety, efficiency, distinctiveness, layout, adaptability and amenities. Secondly, sustainable neighbourhoods require the presence of a range of community facilities, and each district/neighbourhood will need to be considered within its own wider locality, as some facilities may be available in the wider area while others will need to be provided locally. In this context, planning authorities should seek to ensure that facilities for social and cultural use (such as community centres) and for personal and community development (such as resource centres) are available within the wider community. Particular attention, however, should be paid to the efficient and integrated provision of streetlights, schools, childcare, healthcare facilities and community halls.

Thirdly, a sustainable neighbourhood envisions sustainable energy management. The built environment accounts normally for about 25% of the carbon dioxide (CO_2) emissions in any settlement. The planning process – development plans and development management – can help reduce such emissions by promoting sustainable approaches to the design and layout of new development, and by encouraging the use of renewable energy sources where appropriate. Such measures will complement the objectives of the building regulations for increased energy efficiency and conservation. Passive solar design of new housing schemes contributes to a reduction in energy demand and thus in CO_2 emissions. In high-altitude regions, energy conservation can be in the form of taking maximum advantage of available sunlight, by orientating as many dwellings as possible within 30° of south and by avoiding obstructions that block light from reaching the windows. The greatest energy savings are achieved when passive solar design principles are also applied to the design of the individual dwelling units. Passive solar design needs to be integrated with other design objectives of the development to ensure a balanced energy budget. Where feasible, south-facing elevations should not be overshadowed by other buildings or plants; ideally, a distance of 21–25 m between two-storey dwellings is needed to provide reasonable sunlight. In tropical regions, green energy houses are needed as structures that permit air flow. Residential developments offer the potential to benefit from renewable energy sources within the district or even the site. Suitable energy technologies may include small-scale wind energy plants – or combined-heat-and-power schemes, particularly in higher-density developments and where biomass (e.g. wood pellets) provides the energy source.

Fourthly, a sustainable neighbourhood should make provision for life-quality-enhancing amenities such as open space, green fields, walkways and public transport corridors. These community amenities have strong impacts on the social and health well-beings of people. Also a neighbourhood should consist of not only residences but natural environments, historical buildings, flood plains and a sustainable drainage system. Incidentally, all these neighbourhood design features have been shown to influence housing satisfaction, choice decision-making processes and residential values (Jiboye, 2011b; Aliu & Ajala, 2014).

4.2.4. Provision of sustainable socio-cultural housing

The fourth component of the sustainable housing production is all about using housing development to enhance the socio-cultural aspirations of the people (UN-HABITAT, 2012). Housing is naturally a social framework for achieving different socio-cultural purposes such as raising families, celebrating achievements, obtaining privacy and dignity, sleeping, worshipping, and engaging in domestic shores like cooking, bathing, washing and coupling. Sustainable housing therefore is housing that tends to achieve all the social, cultural and health objectives of human development. The argument

here is to produce housing in such a way that it respects, reflects, accommodates and enhances the socio-cultural heritage of the residents. As indicated in Fig. 2, socially sustainable housing provides houses that allow access by all groups, including the poor, and that allow social relations, social stability, cultural preservation, proximity to friends and relations, efficient mobility, social amenities and utilities. Housing must be able to guarantee comfortable social relations, sleeping spaces and good sanitary conditions for sound health and to inspire a natural sense of pride and accomplishment.

A sustainable house must be transformed into an ideal home, which is beyond mere shelter but a socio-spatial structure that engenders individualism and a psychological boost and that is conducive to socialization and communal affinity. In this way, every house should be a social space for engaging in mutual communication – in private dialogues among and between households and neighbours. In a traditional Nigerian setting, and in Africa generally, houses are designed to bind families (especially extended and nuclear) socially and culturally. Even when the children have gone away from the family in marriage, they are still attached to the root and share many affections and celebrations. The modern housing designs in Nigerian cities are becoming increasingly detached from the society and families, creating isolation and anomie. In addition, sustainable housing is provided to ensure access to work, friends, relations, healthcare and security of tenure.

4.3. Reflections on sustainable housing provision constraints

Given the enormity of housing challenges and economic limitations in the developing region of the world, can sustainable housing be ever realized or achieved in developing economies? This poser has become almost inevitable because of the numerous challenges that have stood in the paths of mass and qualitative housing development in these countries. Of the many problems facing sustainable housing provision in developing economies, five are quite outstanding, and these are:
• Huge population and unplanned urbanization

• Costly building materials and high professional fees
• Profound social polarization and poverty
• Unorganized and dishevelled housing policy
• Undependable housing finance and non-inclusive financial system

The most critical challenge to sustainable housing production in developing economies is the proportion and rate of population growth. With rare exceptions, most Global South countries are heavily populated. They are also characterized by rapid and population-induced urbanization. Although the rate of urbanization could signal high rates of development, where urbanization is not planned (as in the Global South) the relationship between urbanization and development is at variance. The jumbo population could present numerous opportunities and could be a source of challenge. It is only in the developing economies that urbanization is merely described by the sheer weight of huge urban residents agglomerating on a specific location. In most African cities, the growing rate of urban population is worrisomely indeterminate (Ajala et al., 2010; UNHABITAT, 2008). Unfortunately, this rapid urban growth is not commensurate with *per capita* infrastructure and income. The negative implications of rapid growth in the Global South have been partly alluded to by the UNHABITAT (2008 p. 10) report that said:

> *The rapid growth rates of urban agglomerations and the lagging response by governments have been associated with significantly increasing urban poverty, problematic urban environments and ever more complex urban management issues, including uncontrolled growth of urban informal settlements, prevalence of substandard and overcrowded urban housing, inadequate basic urban services and infrastructure provision, declining urban livelihood options, frequent civil unrest, and infectious diseases and crime.*

The size of a population and, particularly, the number of households, determines the demand for housing (Mulder, 2006). At any rate, the population must be sheltered in a safe location at all times. This requires huge resources of both materials and money.

Housing is a massive user of diverse environmental resources ranging from liquid to solid and renewable to non-renewable resources, including land (Kadiri, 2005; Towry-Coker, 2012). The lack of affordable and sustainable housing in developing economies is closely related with the high and multiple costs of building materials and professional charges. Put simply, housing construction requires three components:
- Construction material deployment
- Professional material deployment
- Maintenance material deployment

The construction of dwellings makes use of many resources such as granite, sand, iron or steel, limestone cement, zinc roofing, woods, ceramic, polyvinyl products and synthetic materials. While most of these products are obtainable within the immediate local environment, many of them are also imported from other countries. These materials are not ubiquitous and therefore are competitive and expensive. The international monetary system also affects the imported building materials very unfairly. The combined effect of these escalates the total budget for housing construction. Much more worrisome for housing development is the increasing trend in professional fees charged by planners, builders, artisans and other players in housing construction. The total money required to cover construction materials, professional charges and maintenance costs is often huge, making the housing produced very unaffordable.

Social polarization or social inequality is widespread in developing countries (Aliu & Ajala, 2014). Social polarization is engendered by inequality in social, economic and political opportunities. Access to resources in the society is skewed towards certain groups of people and away from others. The lack of equity in resource distribution leads to acute polarization of society. Socio-economic polarization affects sustainable housing development directly by severely hampering access to adequate housing by the less privileged. Extreme poverty, which reflects in multiple deprivations in terms of access to basic human needs like food, clothing and shelter, can lead to the advertent marginalization of the poor in society, as recently observed in Maseru Lesotho (Motsoene, 2014). Poverty and marginalization are social traits that can further impede equitable access to resources and the realization of the right to an adequate standard of living and healthy built environment and that can predispose individuals or groups to feelings of alienation or non-inclusion.

Another factor that undermines sustainable housing development in developing economies is the uncoordinated housing policy that predominates in the region (Aliu et al., 2018). Housing policy in developing economies, like all public policies, is often bedevilled by lack of organization, clarity and reality. The policy tools through which housing development can be achieved in the Global South are not only limited but ineffective. Ordinarily, policy tools such as mortgage finance, land subsidies, soft bank loans, stock exchange market and multi-lateral organizations should be meticulously fashioned to capture in holistic ways the target problems and populations. But alas, in developing countries, policies are made without recourse to proper base data and without due consideration for other factors that could aid or compromise the realization of the policy objective (Huang, 2012; Towry-Coker, 2012). What results thereafter is a situation in which all parts of the policy work at cross purposes to one another. Strong and effective housing policy is central to the realization of sustainable housing development.

The housing debacle pervasively recorded in developing economies is due mostly to poor access by the individual, private and public sectors to funds (Agbola, 2005; Aliu et al., 2014; Bah et al., 2018). In well-organized economies, ordinarily, the housing finance system is often organized around the primary and secondary mortgage system (Megbolugbe & Cho, 1993; Buist, Megbolugbe & Trent, 1994). Beyond the mortgage system, housing finance is also augmented by the banks, insurance organizations and government financial subsidies in terms of budgetary allocation to housing construction, CBOs and NGOs. The truth about the housing finance system in developing countries is that sources through which housing is financed are very limited, weak and grossly inadequate in terms of amount of money committed and risks faced by lenders (Bah et al., 2018). Housing finance in developing countries is faced with credit risks arising from the failure of borrowers to pay back, liquidity risk arising from maturity mismatch, cash-flow risk arising from interest rates, prepayment, inflation exchange rate, then agency risk, systemic

risk and political risk stemming from uncertainty about adverse government actions that can trigger other risks. Whether the housing is individual or private or public, access to copious and sustainable finance is limited. In most developing countries the mortgage system is organized to take care of the workers alone, leading to the exclusion of the majority of people in the informal sector.

5. Conclusions and policy implications

From the detailed discussion rendered above, it is apparent that housing and sustainability have a strong relationship, and achieving sustainable development is rather improbable without realizing sustainable housing. The difficulties in attaining sustainable housing in African countries can be ascribed to a number of reasons that include rapid urbanization, high cost of building materials, social polarization, poor financial system for housing, poor mortgage system and uncoordinated housing policy. The implications of the revelations about the underlining relationship between housing and sustainable development calls for policy options that will support and facilitate the achievement of sustainable housing provision in developing countries including Nigeria within the context of available natural environmental resources and socio-economic realities. These alternative sustainable housing options include:

- The design and implementation of smart growth cities that make proper use of spaces
- The adoption and operationalization of green energy housing
- Adoption of land rights and entitlement process that will make more land available for housing
- The strengthening of public and private sector participation (PPP) frameworks in housing provision
- Constant maintenance of old building and apartments
- The restructuring of housing policy and mortgage finance system to include the workers in the private sectors
- The development of building materials that are derivable from the immediate local environment and less reliance on imported materials

- The control of levels of urbanization and social polarization within urban centres

It is quite possible that, if these highlighted policy suggestions are adopted and implemented, the course of sustainable housing delivery will be forced to change positively in all developing economies.

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