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Sustainable Housing in Developing Countries: A Reality or a Mirage

Ibiwumi Saliu and Evangelisca Akiomon

Abstract

Efficient houses built in a way that respect resources and could last long in quality systems are said to be the way forward in achieving a low carbon footprint and a sustainable environment. These houses are constructed from high performance, energy saving materials with an energy maximizing building orientations. Findings have shown that as much as housing is a basic human need, in developing countries, around 40–75% of the population in fast growing cities is housed in squatter settlements without basic amenities and services. In sub-Saharan Africa, 59% of the populations in urban regions live in slums, about 30% in the Latin and Caribbean, 28% in Asia and Pacific region. Population migrate massively to big cities in search of green pastures, which has invariably turned green pastures into ‘brown’ if not ‘red’ pastures due to overcrowding and other social menace, turning houses to mere shelters. Energy efficiency or environmental friendly housing is far from the thoughts of dwellers which still crave to have or maintain a roof over their heads. Whereas government policies are majorly jeered towards constructing houses, if sustainable, would only be affordable for a few well to do population neglecting the homeless masses. Therefore, this chapter aims to expound on the situation of housing in developing countries as well as the possibility of achieving sustainable housing.

Keywords: carbon footprint, environmental sustainability, sub-Saharan Africa

1. Introduction

Worldwide, there has been large scale proliferation in construction of houses due to population growth, economic development, urbanization and migration, which has in turn had a ripple effect on sustainability [1]. According to the National strategy for ecologically sustainable development, sustainability is referred to as the development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends [2]. It is about meeting human needs and improving their quality of living by minimizing negative impact on the environment. According to Queensland Department of public works [3], sustainability could either be social, which include safety, security and universal design; or environmental, for example, water, waste, energy efficiency; or even economic, which entails cost efficiency, peace of mind and resale value [4].

Meanwhile, housing in itself is referred to as the central of sustainable development [5]. It is one of those social conditions that determine the quality of life and welfare of people and places; a social necessity of life recognized worldwide as one of the most important needs of man, after food [6]. It is a basic necessity that holds

Stage of house life cycle	Examples of environmental sustainability considerations
Planning stage	Impact of planned site on the local environment; relationship with the city; quality of the local built environment; mixed-use and density; poly-centricity; infrastructure; public transport; green areas; environmental hazards.
Building Design	Considering embodied energy and resource utilization; enabling energy and water efficiency by design; integrating district heating and micro-generation; sustainable waste management green roofs; robustness and resilience; future-proofing; possibility of upgrading; shaping of lifestyles.
Construction	Safe, environmentally-friendly, local affordable material; minimization of environmental impact from building activity.
Operation	Energy performance; air conditioning; air quality; pollution by residents and impact of the local pollution on residents, water use and water management; water recovery comfort and hygiene of home; quality and energy efficiency of the local infrastructure and transportation property maintenance and management, waste management and recycling; greening the area; natural hazards.
Refurbishment	Choice of refurbishment material; energy efficient design; disturbance of the environment; management of construction waste.
End of life	Demolishing or reusing; recycling of building components; management of construction of waste.

Source: www.UNHabitat.org.

Table 1.
Guiding matrix for assessing sustainable housing.

a place of singular importance in the general strategy of development [7]. The daily lives of people, their health, security and wellbeing are affected and influenced by locations of their homes, its construction and design and how well they are weaved into the environmental, social, cultural and economic fabric of communities [8].

Sustainable housing offers rare opportunities to promote not only environmental conservation and economic development but also quality of life and social equality while mitigating numerous precarious problems relating to population growth, urbanization, slums, poverty, climate change, lack of access to sustainable energy and economic uncertainty [9–11]. Its goal is to reduce the impact of consumption of natural systems by keeping it within natural limits while simultaneously enabling human system to be optimized without impairing the quality of life [8]. It is to integrate both green agenda, which involves maintaining the natural environment and brown agenda, i.e. ensuring a well built environment [6]. However, this has always being a dilemma for many countries, especially developing countries, which are still way behind in attaining their targets of the sustainable development goal 11 of making cities and human settlements inclusive, safe, resilient, and sustainable, and the 2030 target, which is to ensure access to adequate, safe, and affordable housing and basic services, upgrade slums and support least developed countries [4]. Sustainable housing development could be successfully achieved, if an optimal balance is ensured between sustainable housing and residents’ satisfaction [12]. It should be environmentally safe, socially inclusive and economically productive [12] according to **Table 1**. Below is the table that shows the guiding matrix for the assessment of sustainable housing, **Table 1**.

2. Situations in developing countries compared to other countries

Developed and developing world are facing sustainable housing and urbanization challenges in different ways but the developing countries are moving slowly or

even on a negative direction towards adopting feasible sustainable strategies [13]. Developing countries are those countries whose standard of living, income, economic and industrial development remains more or less below average. According to the IMF, there are 52 developing countries with current population of 6.53 billion, which is a considerable proportion (85.09%) of the world's population [14]. It includes the whole of Africa, central and South America, almost all of Asia countries and numerous other island states [14]. Due to low standard of living, income, among others, decent and safe housing remains a dream for a majority of the population in most developing countries, yet housing development in itself create amplified carbon footprint and negative impact on the environment if it's not sustainable [8]. The government even considers sustainable housing as merely social burden, while the so called pro-poor housing programs provide accommodation of poor standards in remote locations with little consideration to the residents' lifestyle and livelihood strategies [8]. Neglecting the fact that, it is through sustainable solutions that the tensions between the sporadic urban growth, climate change, access to clean energy and environmental conditions alongside other issues can be alleviated, while the potential of improved economic prosperity and social development can be further unlocked [8].

There is indeed no doubt in the magnitude of housing problems in developing countries compared to developed countries with good standard of living and industrial development [15]. Urbanization in developing countries is in sharp contrast to that of western industrial urbanization. According to the UN-Habitat 2008b, in developing countries, 1 out of 4 households live in poverty, 40% in African cities. 25–50% of people in developing cities live in informal settlement, while not further than 35% of cities in the developing countries have their waste water treated; 2.5 billion people have no sanitation and 1.2 billion do not have access to clean water [16, 17]. Half of the urban population in Africa, Asia, Latin America and the Caribbean suffer from one or more diseases associated with adequate water and sanitation [18]. Whereas between one third and one half of the solid waste generated within most cities are not collected, and less than half of the cities have urban environmental plan [16]. This has in turn made slum dwellers constitute 36.5% of the urban population in developing countries, with percentage being as high as 62% in Sub-Saharan and 43% in Southern Asia [17]. This has led to increasing urban poverty from rapid rural–urban rush, alongside inability to access sustainable and affordable housing. In developed countries there is high emission of CO₂, in terms of energy consumption, 60% of the world's electricity is consumed by residential and commercial building. Space heating accounts for 60% of residential energy consumption and water heating for 18%, but different strategies are relentlessly developed to alleviate these issues [13].

3. Lessons from world experiences

Balancing the equation between societal, economical and ecological issues could be quite difficult but it's not unachievable [19]. Different countries, more of developed countries, are adopting different approaches for sustainable construction and have set different priorities depending on their economic conditions. Nations with high economic growth are developing sustainable buildings making use of latest technologies and innovations [13].

In the order of countries with best sustainability measures to the poorest, Finland among many other countries was voted best in the quality of natural environment, with very innovative and eco-friendly built environment [20]. Finland was a pioneering country of energy efficiency, after the energy crisis over

three decades ago. Her goal of sustainable building was to build a house with as low energy use as possible and by utilizing the best available technology [21]. For building designs, solar heat from solar collector, geothermal heat from under building drilled borehole, solar electricity with high insulation level as well as low energy windows were adopted. Some houses adopted the use of locally available biomass to generate electricity and heat with a very low carbon footprint. Cutting edge LED application, developed through interdisciplinary research is very useful in energy saving as shown in **Figures 1** and **2**. Local waste is managed with interconnected conduits that carry them away for proper disposal and recycling [21].

India, a developing country, on the other hand, has 12.5% of all deaths caused environmental issues such as air pollution [20]. Most of research experts do not support government’s approach towards environmental protection policies,

Figure 1.
Ecofriendly house in Finland. Source: The culture trip.com.

Figure 2.
House built with energy efficient materials. Source: Skimbaco lifestyle.com.

meanwhile more than half of the experts are of the opinion that the total population is not interested in environmental issues [20] as shown in **Figures 3** and **4**. Energy resources used in India for manufacturing and transporting building materials has green high gas emission and related environmental issues. The sustainable use of these materials is also a call for concern as about 300metres depth of fertile top soil of the entire country have been said to be consumed for burnt brick clay bricks production in the next six decades if growth rate is assumed as 5% [22].

However there are improvements in some countries that were time past taking a down toll in sustainability. In United Arab Emirate, ABU-Dhabi as a case study, innovative technologies that are consistent with overall state expansion and growth over the years have been adopted in the creation of sustainable cities in Dubai and Abu-Dhabi [23]. A pearl rating system was established to achieve sustainability of housing throughout its life cycle from design to construction and operation. This

Figure 3.
House in Mumbai, India. Source: India ink, New York times.

Figure 4.
Aerial view of slums in India. Source: Hindustan.com.

has introduced green building norms and regulation, minimizing water and energy consumption; improving waste recycling and using local, environmentally friendly materials for construction [23].

Moreover, despite the housing crisis in the UK, environmental stewardship and long-term sustainability is the foremost in the minds of individuals, governments and businesses [13]. Environmental impact is factored in to safeguard the environment; therefore environmental sustainability is always embedded in every level of construction. Environmental stewardship is seen as not just creating great places and improving local environment, but having regard for the global climate as well by reducing energy and material consumption [13].

Since sustainability is all about meeting today's needs without compromising the needs of future generations, sustainable housing must target economic, social and environmental sustainability ensuring that houses are affordable, accessible and posing no harm to the environment [24].

4. Challenges and way forward to sustainable housing in developing countries

Challenges plaguing sustainable housing in developing countries are numerous and diverse and will be discussed based on four dimensions of sustainability.

4.1 Social challenges

4.1.1 Urbanization

One of the greatest problems facing sustainable housing is rapid urbanization which is common among developing countries. Urbanization takes a huge toll on the environmental resources which are mostly non-renewable resulting in shortage and limited access to basic amenities such as potable water, roads, waste disposal facilities, sanitation facilities and electricity [25–27].

4.1.2 Slum development

The movement of growth towards metro cities and mega cities poses a greater challenge to provide housing in the already saturated urban areas, transforming them into areas of crowded habitations without basic amenities, thus giving rise to urban slums [28].

4.1.3 Policy and legislations set back

A study by Ibem and Azuh supported the fact that weak sociopolitical structure and institutional frameworks are the banes of failed housing policies and its implementation mechanisms. As a result, growth in the quantity and quality of the housing stock in the country remains poor due to non-existent or non-functional standard and norm system for accreditation of green buildings [29].

4.2 Environmental challenges

4.2.1 Climate change

Some of the resulting effects of urbanization are an overwhelming increase in the number of high energy consumption buildings, increased vehicular density,

leading to more consumption and burning of fossil fuels and release of greenhouse gases. These activities are major culprits of climate change.

4.2.2 Land resource and vegetation degradation and destruction

Due to excessive pressure on land resource and vegetation arising from the need to construct more buildings, there is a huge loss of green covers leading to decrease in green belts, biodiversity loss, and loss of other green infrastructure [30].

4.2.3 Climatic conditions

Conventional sustainable housing methods may not be applicable in places with harsh climatic conditions and water scarcity.

4.2.4 Topography

The terrain of an environment can be challenging for sustainable housing. Landslides is a risk associated with mountainous and hilly areas, sudden occurrence can be very fatal for residents.

4.3 Economic challenges

Economic instability implies higher cost of living in developing countries like Nigeria, financing of housing development is a major challenge. One of the numerous reasons is that access to housing credit; mortgage or loans are associated with to high interest rates and collateral guarantees which are beyond the reach of majority of the citizens. Empirical data around the globe highlights Nigeria's homeownership rate in urban areas is around 10% compared to 97% for Romania; 74% for Brazil; and 62% for South Africa [31].

4.3.1 Affordability

The major housing challenge in developing countries is decent affordable houses this is due to rapid urbanization caused by increasing population and rural-urban migration [32]. A major consequence of this influx in population is an intense demand for affordable housing not necessarily sustainable ones [31].

Implementation of sustainable housing in developing countries will require a relatively high initial investment, which makes it quite difficult to take off [2].

4.4 Cultural challenges

Cultural sustainability takes into consideration cultural worldviews and values, norms and traditions, as well as lifestyles and behaviors of occupants, communities and society, thus supporting the dignity of communal life. Culturally appropriate and responsive built environments are an important dimension of sustainable housing. Communities may resist sustainable housing projects that interfere with their culture and traditions.

5. Benefits of sustainable housing in developing countries

Considering the benefits of sustainable housing over the challenges could help in charting a new course towards sustainability in most developing countries.

Asides the fact that sustainable housing is a means of achieving several global goals, there are multiple benefits of sustainable housing and they can be divided into three groups.

1. environmental benefits

2. Economic benefits

3. social benefits

5.1 Environmental benefits

Just as the housing sector plays a crucial role in the global environmental crisis, sustainable housing also provides great possibilities of mitigating global climate change through:

Reduced environmental footprints from housing, in terms of energy and associated GHG emissions, water, land and material use [33]. Entec in his study for Defra (2004) reported that with excellent standard sustainable houses about 200 million tonnes of CO₂ emissions per year could be avoided, eliminating external costs of the order of £2.9 billion. Also, with improved housing, the pressure on environmental components such as water, air and soil in slums are considerably reduced to minimal levels [33].

Water Efficiency: In regions where water availability is a limiting factor to development, the scale and pace of development could increase if less water is used. There is therefore a greater likelihood of more homes being constructed more quickly and easily if they are water efficient [18, 25]. Sustainable buildings manage water in a more effective and environmentally friendly manner. Such as systems that recycle water e.g. harvesting rainwater for toilet cleaning. Rain water harvesting associated with aspirational standards would have additional environmental benefits of controlling storm-water run-off and reducing flood risk.

Reduced waste going to landfill or being incinerated: The use of renewable sources and materials employed in the construction of sustainable housing minimizes waste generation. In a study for Defra, it was reported that £19 million can be saved from waste going to landfills, if standard sustainable homes are built. Products such as demolition debris, sand and burnt coal can be used with excellent environmental and esthetic results [25].

Mitigate environmental hazards and promote biodiversity by improving green spaces: If developments incorporate more green spaces, there will be minimal effect on biodiversity thus, promoting diversification. Green areas also help in carbon sequestration, mitigate heat waves through their cooling effect, prevent soil erosion and the need for piped drainages by acting as soil covers [34].

5.2 Economic benefits

Employment generation and improved standards: New employment can be created through the housing sector, which is especially important in the context of developing countries. Jobs can be created through new construction and retrofitting, production of energy efficient or recycled materials and though renewable energy and technologies related to it [35]. In 2014, Canada's green building industry generated \$23.45 billion in GDP and represented nearly 300,000 full-time jobs [36].

Through energy and water efficiency, household can save costs on utility bills. Energy efficient buildings are the most cost-effective way to battle fuel poverty in households [37].

5.3 Social benefits

Reduce medical bills: use of sustainable materials, safer building materials, design and components increases the quality of life of individuals and the community and reduction in cases arising from sick buildings [19].

Increase homeowners'/users' productivity: Qualities such as better indoor air quality, effective noise control mechanisms can improve performance and enhance productivity. Various studies have shown that sustainable buildings increase occupants' performance and wellbeing [38–40]. A recent study in Australia also showed that occupiers' cognitive scores were 61% higher for green buildings compared to standard buildings [38].

More sustainable and socially inclusive urban growth: sustainable environment promotes cultural and neighborhood integration. Communities create a sense of place, neglected or abandoned locations will result in neighborhood instability and a loss of economic activities [40].

6. Recommendation and conclusion

The best approach to achieve sustainable and affordable housing is to embark on a comprehensive approach spearheaded by appropriate standards and regulations and capacity building schemes which will oversee and ensure Strategic planning, cooperation and participation of stakeholders, supportive institutions, economic instruments and financial incentives.

6.1 Strategic planning

Strategic planning is important for ensuring efficiency and effectiveness in policy design and implementation. It enables the aspirations of different stakeholder groups to be included in a common vision that gets translated into objectives [1]. A comprehensive and clear cut plan would determine the success of a sustainability project. Goals, targets, key performance indicators and deadlines are indices that will help measure level of progress. Also, it is imperative that pilot studies are carried out which will be scaled up following their success.

6.2 Participation and cooperation of stakeholders

It is important to educate and thoroughly sensitize all stakeholders on the necessity of sustainable housing and involve them in every stage from the planning phase to scaling up. A city based approach which is a combination of “bottom up” approach which borders on self reliance and “top down” approach bordering on support will be ideal because it encourages learning and knowledge sharing platforms between stakeholders and communities, motivates communities to take “ownership” of finished products and reduce conflict between groups [1]. Sustainable housing implementation requires strong support from the government (leaders), communities and the housing industry.

6.2.1 Leadership

It is imperative that sustainable housing initiatives are backed by a clear and strong leadership and political will, as they are essential components to successful public interventions. Strong leadership is required to bring the various groups and

stakeholders together also to initiate a process for collaborative decision-making, Review and adapt existing planning legislation and regulatory planning controls.

6.2.2 Communities

It is very important to involve the communities from the planning phase to the implementation phase. Such approach will build learning and knowledge sharing platforms between stakeholders and communities, encourage communities to take “ownership” of finished products and ensure that the ideas, beliefs and traditions of the communities is taken into account. All these enhance occupants’ feelings of belonging. Other actors such as built environment professionals and manufactures are responsible for ensuring that housing design criteria, materials or product specifications are environmentally responsive [41].

6.3 Regulation and standards

Sustainable housing should be long term, requiring a healthy and clear institutional setting that allows all stakeholders to play their part without fail [35]. To achieve this, the government which is the key stake holder by virtue of the crucial position which they occupy in the country has to introduce a national housing strategy and a strong legislative framework. Policies and governance structures as it pertains to various developing countries has to be reformed, strategic investment, research and training programmes launched. All these will help full institutionalization of sustainable housing policy in both governmental and non-governmental structures that is not subject to changes in government [34].

6.4 Financial incentives and economic instruments

Mobilization of financial resources by advocacy with government institution, involving the private and public-private partnership for the implementation of sustainable housing projects.

Provide funding to support emerging businesses and innovative technologies.

Low-income households, especially in developing countries, often do not have the initial capital needed for building sustainable housing or can face problems of paying back loans [10], therefore it is important to make available financial support that provide cheap credit [42].

Creating jobs for locales through sustainable construction projects.

6.5 Capacity building

Building capacities of institutions and actors is crucial for scaling up sustainable housing practices. Capacity development refers to the development of the whole housing sector whereas capacity building is targeted at improving skills of stakeholders through education, skill acquisition programs, collecting and sharing data bank of best practices. This is important for recognizing crucial needs, develop capacities to implement housing that takes care of these needs and scale up sustainable practices [34, 35].

6.6 Pilot studies and scaling up

Embarking on pilot projects addressing sustainable housing is very important to test the viability of the project before executing it at full scale. It helps manage risk and reveal serious deficiencies or errors in the plan before committing major

resources to the project. However, it is crucial to scale up sustainable housing practices to meet the massive housing demand that exists, and that will be in demand over the coming decades as expected of developing countries. Scaling up requires three key ingredients; a supportive institutional and regulatory environment, timely monitoring and evaluation mechanisms, and appropriate capacity development of the housing sector and capacity building of housing sector actors [35, 43]. Achieving sustainable housing in developing countries could still remain a mirage if necessary measures such as the recommendations listed above still remain out of place.

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