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A review of sustainable housing preferences and affordability

S Mushanga^{1,3}, O C Oloke¹ and D O Olukanni²

¹ Department of Estate Management, Covenant University, Ota, Ogun State, Nigeria

² Department of Civil Engineering, Covenant University, Ota, Ogun State, Nigeria

³ Department of Finance, Chongwe Municipal Council, Chongwe, Lusaka, Zambia

(Sipiwe.mushangaps@stu.cu.edu.ng; <https://orcid.org/0009-0006-2711-2514>); (yinka.oloke@covenantuniversity.edu.ng
<https://orcid.org/0000-0002-6658-7188>);
(David.olukanni@covenantuniversity.edu.ng; <https://orcid.org/0000-0001-8156-2619>)

Corresponding email: sipiwemucha@gmail.com

Abstract. The review examined the potential connections between sustainable housing, and sustainable affordability of such housing while meeting the housing preferences of various households. It is widely known that many lower-income countries are facing a housing crisis, and it is crucial to address this issue by providing affordable housing that meets individual needs while also promoting environmentally friendly living. This review paper is centered on the research question: How can sustainable housing be made more affordable and accessible to all households while meeting their housing preferences? A qualitative study of 66 publications from 2019 to September 2023 found that sustainable housing offers ecological and energy-efficient benefits, but there are barriers to scaling up these models, including economic, cultural, and legal challenges. Housing preferences are influenced by factors such as cost, location, and amenities, with affordability being a significant concern. While environmental and economic sustainability can positively impact housing prices in turn affect the affordability of such housing, the initial investment costs can be challenging for lower-middle-income households. The review further established that Sustainable housing, housing preference, and affordability are broad topics that have been explored by many researchers. However, there are still some research gaps that need to be addressed. There is a significant gap in how sustainable housing can be made affordable to all households while meeting their housing preference hence the need to explore the intersection between sustainable housing, housing preference, and affordability by carrying out empirical research to identify ways in which sustainable housing can be designed and built to meet the needs and preferences of low-income households while remaining affordable.

Keywords: Housing Preference, Sustainable Housing, Sustainable affordability



1. Introduction

Housing stands as an essential human need, offering refuge, comfort, security, and dignity to its occupants [1]. In the face of evolving urban dynamics, environmental concerns, and societal well-being, the pursuit of cost-effective and sustainable housing solutions has emerged as a critical global imperative. Many countries, including higher-income countries such as the United States, have a problem with the availability of affordable housing [2]. Housing affordability is a growing issue amid the growing apprehensions about environmental sustainability and the necessity to reduce the environmental impact of the housing sector giving rise to a worldwide movement toward sustainable construction practices. The COVID-19 epidemic has aggravated the problem by triggering a boom in homebuying, resulting in a scarcity of suitable dwellings [2]. In October 2021, about half of Americans (49%) indicated that the availability of affordable housing was a big issue where they live, a 10% increase from early 2018. Many people are finding it difficult to obtain affordable accommodation due to growing housing costs and stagnant salaries. The concept of sustainable housing has been adopted even in lower-income nations grappling with economic complexities, such as Nigeria in Africa, grappling with population growth, urbanization, and persistent housing shortages, this transition is becoming increasingly indispensable. [3] defines sustainable real estate development as the process of creating eco-friendly, cost-effective structures.

According to [4] an estimate, Nigeria is projected to become the third-most populous country globally by the year 2050, with a population exceeding 300 million individuals. A majority of Nigeria's estimated population, including 53%, resides in urban centers. The total population of Nigeria is estimated to be 216,883,577 inhabitants. A significant proportion of the urban populace resides in impoverished settlements, commonly referred to as slums. This demographic is burdened by a high unemployment rate, with approximately 33% of the overall population being jobless. Moreover, there exists a substantial deficit in housing availability, estimated at 28 million units, when compared to the stated count of 17 million units.[5]. As Nigeria's population continues to burgeon and urban migration swells, the quest for suitable housing intensifies. This population increase rate and the unemployment rate raise the need to address not only the housing shortage but also the affordability of housing. The outbreak of the COVID-19 pandemic in 2020 further exacerbated these challenges, imposing far-reaching implications on the economy, the workforce, and people's housing preferences [6]. The significance of one's living conditions for physical and mental well-being became evident during government-enforced lockdowns, remote work arrangements, and social distancing measures [7]. The pandemic underscored existing disparities in housing accessibility, especially for low-income households and underserved communities, the crisis has further exposed pre-existing inequalities in terms of individuals' ability to obtain inexpensive and secure housing. Certain populations that are more susceptible to negative effects, such as low-income households, minority groups, and marginalized communities, have had disproportionate effects as a result of living in overcrowded or substandard conditions [8]. Concepts such as home offices, outdoor spaces, and proximity to natural environments gained prominence due to the pandemic-induced shift in housing choices [9]. Simultaneously, economic hardships resulting from the pandemic, such as job losses and income reductions, intensified the need for affordable housing, particularly in densely populated urban areas [10]. A substantial portion of Nigeria's population struggles to secure decent housing, primarily due to economic constraints [11]. The government has made efforts to ameliorate issues related to slums to promote real estate development, which, in turn, has positive impacts on the economy, society, and the environment.

With the above-identified housing crisis issues and the trending debate on sustainable housing, this review paper's research question is; How can sustainable housing be made more affordable and accessible to all households while meeting their housing preferences? The review paper aims to explore the literature on sustainable housing, sustainable affordability, and housing preferences addressing the social-economic impact of sustainable housing provision to cater to the housing shortage.

2. Material and Methods

2.1 *Sample Collection and Preparation*

This paper is based on a systematic review of the literature on sustainable housing, housing preference, and affordability. The review includes peer-reviewed journal articles, conference papers, and reports published between 2019 and 2023. The search was conducted using online databases such as Google Scholar, Scopus, and Web of Science. The search terms used include "sustainable housing," "housing preference," and "affordability.". Our initial assessment included over 66 articles, utilizing search terms such as "housing preference," "sustainable housing," and "sustainable housing affordability." Ultimately, 30 papers and additional references were selected based on their relevance and robust contributions to our topics of interest.

3. Results and Discussion

3.1. *Sustainable Housing*

The concept of sustainable housing entails the creation of a residential dwelling that is environmentally, socially, and economically sustainable, encompassing all stages from initial design to completion and occupancy [12]. Sustainability housing criteria as given by [13] include;

1. The physical structure of a building encompasses various aspects such as the choice of materials, construction techniques, architectural design, adaptation to climatic change, incorporation of green spaces, and overall longevity.
2. The various aspects of energy, including building energy consumption, emissions, utilization of technology for new energy sources, and the maintenance required for sustaining these resources.
3. The management of waste, water, and wastewater involves the regulation and control of solid waste, the recycling and reuse of wastewater, and the utilization of rainwater resources.
4. The site and surrounding area should encompass several elements such as land utilization, geographical placement, ecological infrastructure, amenities, commercial establishments, healthcare provisions, recreational places for children, leisure facilities, accessible public areas, and educational institutions.
5. Human behaviour, specifically focusing on environmental protection, ecological behaviour, and pro-environmental conduct.
6. The quality of housing encompasses various factors such as the fulfillment of individual requirements, financial independence, effective management of the building, adherence to principles of circular economy, and the potential for work opportunities.
7. The application of culture and values to housing is vital.
8. The facets of communication and transportation encompass several elements such as the Internet, pedestrian infrastructure, dedicated bikeways, public transportation systems, environmentally friendly modes of transportation, and the integration of these components.
9. Safety and comfortable living encompass various factors such as residing in a healthy environment, sustainable communities, low crime rates, acoustic comfort, quality of lighting, noise levels, and other related considerations.
10. The topic of discussion pertains to the cost and accessibility of sustainable housing.

There has been a noticeable increase in interest in environmentally and energy-efficient housing solutions in recent years, and sustainable housing has emerged as a crucial component of housing preferences. [14] assesses public housing satisfaction in the UAE, focusing on physical characteristics, traditional social aspects, urban design, and social environment to evaluate sustainable housing development. Residents in two Abu Dhabi residential complexes reported high satisfaction with building functionality and public facilities, but lower satisfaction with the social environment. The study however did not explore affordability of sustainable housing. [15] explored sustainable building models (BMs) for affordable innovative zero-energy houses in North West Europe and discovered that these models create environmental, social, and economic sustainability values for low- and middle-income households.

Sustainable housing is a holistic approach that considers environmental, social, cultural, economic, and institutional factors [16]. All these studies highlighted the importance of sustainable housing but they all didn't explore the provision of affordable housing. Social sustainability involves empowering poor communities, involving all groups in planning, design, and governance, and creating training and employment opportunities. Economic sustainability involves connecting housing policies to micro- and macro-economic development, employment, and income generation. Cultural sustainability involves maintaining traditional housing forms and patterns and promoting culturally appropriate built environments. Institutional sustainability involves governments as key stakeholders in the housing sector, supporting sustainable housing development through robust and transparent institutions. Institutions should work to improve economic support for low-income households and groups, and reform policies that constrain sustainable housing provision. For instance, in the Netherlands, there has been a considerable uptick in the number of people interested in sustainable housing initiatives, even though environmentally friendly housing has a lot of benefits to offer, it is vital to be aware of the obstacles that prevent its broad implementation [16]. Affordable and sustainable housing has been more in demand as a result of the urban poor's need for housing, better outcomes are achieved in the environmental, economic, and social domains when sustainable materials made from locally available wastes are substituted for conventional materials [17].

Implementing sustainable affordable housing is complicated by market, government, and professional factors. Resistance can make market impact difficult for new products or methods [18]. For example, sustainable housing in China is hindered by high construction material costs and a lack of collaboration and knowledge exchange. Governments and professionals can set sustainable resource rules, yet affordable housing is neglected. Developers are wary of new methods since they could hurt their finances. Challenges include stakeholders' sustainability and material awareness. They need training in sustainable housing development since they get less exposure. However, long-term execution is necessary for government plans to succeed, and the lack of enforcement and monitoring measures might hurt them.

Social issues include government promotion of sustainable affordable housing. Enforcing laws, creating new standards, and offering incentives can encourage the building industry to study eco-friendly systems and learn about sustainability. Malaysia introduced the Green Building Index (GBI) to assess affordable homes and buildings sustainably [13]. Sustainable affordable housing has been hampered by the building industry's lengthy development plans and lack of local government consent. Lack of technical expertise, uncertainty about sustainable technology performance, and financial constraints make sustainable affordable housing implementation difficult. Sustainable technology implementation in affordable housing is delayed by building industry uncertainty about its performance. The Construction Industry Development Board (CIDB) should train on sustainable technology to prevent misconceptions. Financial issues also hinder sustainable affordable housing. Due to low competition and high sustainable construction material costs, sustainable home development is typically employed while operational expenses rise. Budget constraints and high start-up expenses also hinder sustained affordable housing.

To solve these issues, sustainable affordable housing programs should improve environmental protection, financial savings, and well-being. Malaysia should also be cognizant of the significance of building affordable, sustainable housing due to its inhabitants' home ownership. Malaysians struggle financially to construct sustainable affordable housing, so the government must solve these issues. However, barriers to upscaling such models, including cultural, legal, and technical challenges, were also highlighted (Nainggolan et al., 2020). Barriers that demonstrated notable variations [19] included: "high cost of building/construction materials and technologies"; "negative culture towards mortgage/loans for housing"; "lack of awareness creation and training on sustainable strategies/technologies for housing"; "lack of sustainable waste management in housing design and construction"; and "lack of regulatory support on guidelines for sustainable housing."

3.2. *Housing Preferences*

Several recent studies have illuminated the complex nature of housing preferences, revealing how multiple factors influence individuals' housing choices. [20] found that cost, location, and the availability of amenities were crucial considerations in housing decisions, especially among millennials. They stressed the importance of affordability, particularly for young individuals with limited financial resources. [21] categorized factors affecting housing preference decisions into demographic, financial, location, dwelling characteristics, property title, neighbourhood, environmental, and developer service quality factors. These factors play significant roles in shaping housing preferences among individuals [21]. During the COVID-19 pandemic, housing preferences have taken on an even greater level of significance. Individuals now place a premium on aspects such as home offices and outdoor areas as a result of the proliferation of remote work arrangements, which have become the new normal. One example that illustrates this shift in priorities is a scenario in which a family resides in a densely populated city and decides to purchase a home that features a designated workstation [9]. Remote work made it possible for employees in high-priced, high-productivity areas to relocate to less expensive cities like Boise, Idaho. This increased the cost of housing for current residents and created a chain reaction of affordability issues as displaced residents looked for nearby areas with lower costs.[22]. An interesting and thought-provoking case study can be found in the "Energies prong" initiative. It is the process of converting already-built structures into environmentally friendly and energy-free homes using cutting-edge construction techniques. This effort demonstrates how sustainable housing can be implemented in fact, showing that it is not only a theoretical concept but rather a goal that can be accomplished [15]. Apart from the pandemic [21] identifies nine housing purchase decision factors, including demographic background, finance, location, dwelling features, neighborhood, infrastructure facilities, environment, developer service quality, and superstitious belief, which may vary based on individual needs and affordability. All these studies explored the concept of housing preference and the aspect of housing affordability but not necessarily the aspect of sustainable housing nor its provision in line with meeting the housing preference.

3.3. *The Role of Sustainability in Affordability*

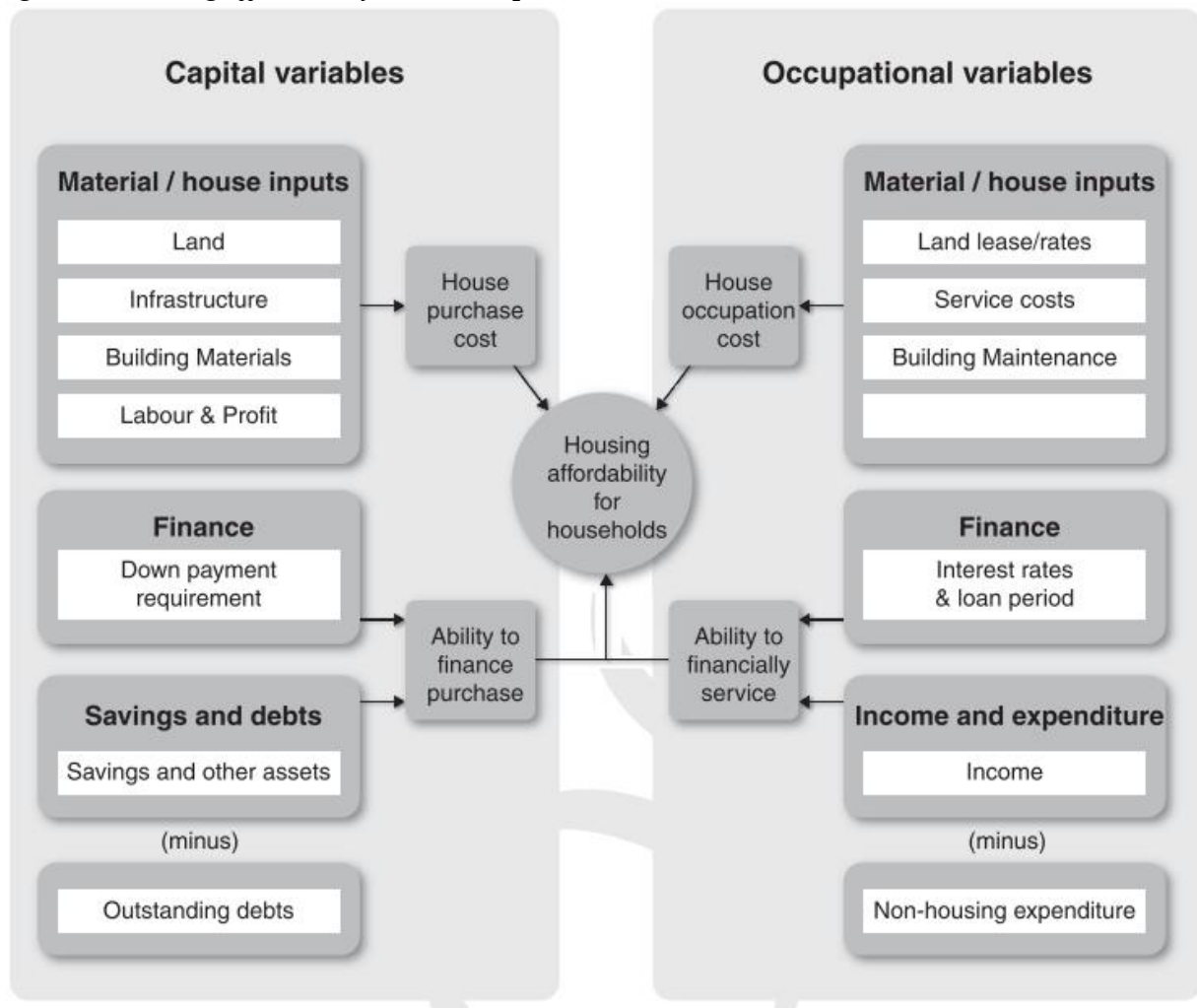
[23] revealed that there is a positive association between dwelling features and housing prices and that the initial investment cost of energy-efficient technologies can be high for lower-middle-income households. The concept of housing affordability has expanded to encompass not only initial purchase or rental prices but also long-term costs, including utilities and maintenance [24], [25]. They also reported that monthly incomes may not be sufficient to afford preferred housing, indicating a mismatch between buyer preferences and affordability in the market [23]. [26] argued that incorporating sustainable features in house design and construction can save residents money in the long run, making sustainable housing more economically viable and accessible. However, the study didn't provide in-depth insights into the affordability aspects of constructing sustainable housing [26]. According to [27] [28], The use of environmentally friendly building materials, such as locally or recycled-sourced materials, lowers construction costs without sacrificing structural integrity. For instance, the use of discarded plastic that would have been an environmental hazard has the potential to build stronger and more cheap bricks for affordable housing [29]. Furthermore, the implementation of water-saving techniques, such as rainwater harvesting systems, guarantees a sustainable water supply while also lowering the monthly water bills homeowners are to pay. The fact that a family that lives in a home that has been awarded the LEED certification, for instance, enjoys lower energy bills and a smaller environmental impact is illustrative of the practical benefits that may be gained from sustainable housing [30]. [31] revealed that the type of building material that was locally sourced in the private partnership housing construction scheme in Lagos reduced the construction of dwellings, reducing costs and promoting affordability in the PPP housing program, thereby promoting sustainable housing development. On the other hand, the cost of housing continues to be a substantial obstacle, particularly for households with lower and intermediate incomes. The idea of being able to afford anything has expanded to incorporate longer-term expenditures, such as those for utilities and upkeep. As an illustration of this scenario's applicability, consider the case

of a family with a middle income who has difficulty financing a house that has been designed sustainably due to the high initial expenses associated with energy-efficient equipment [23].

3.4. Housing Affordability

Affordable housing is now increasingly being defined as: “Housing that is priced at or below market rate, whilst considering the average household income of the area (Area Median Income) so that the net monthly expenditure on housing cost does not exceed 30% of the total monthly income of the household” [32]. Housing affordability encompasses a range of factors, including general housing affordability, purchase affordability, mortgage (repayment) affordability, income affordability, and rental affordability. Affordability is typically determined by examining the relationship between housing expenditure and household income, with a common threshold set between 25% and 30% of household income [32], [33]. Another approach, the residual income approach, considers whether a household's income, after deducting standard housing expenses, is sufficient to meet the minimum acceptable non-housing expenses [33]. Housing affordability has many components and some are presented in Figure 1 [34].

Figure 1. Housing affordability: Basic components.



Source: Adopted from [34]

As seen in Figure 1[34] identified affordability to have many components and measures by distinguishing the components into capital variables (house purchase costs) and occupational variables (costs associated

with keeping the house). Household affordability depends on purchase costs, financing, down payment, savings, and repayment instalments. Post-purchase, occupation costs include material and financial costs. The household income model goes beyond the house-purchase-price household income model. Lack of housing finance or unsupportive terms, such as high down payment requirements and short loan periods, directly limits housing affordability for lower- and middle-income groups.

Some of the need to tackle the issue of housing affordability includes the need for broad, responsive policy solutions to prevent the calcification of widespread housing affordability and ongoing housing inequity as [22] reported. Incentives and laws relating to finance play a critical part in the effort to promote the construction of housing that is both affordable and environmentally friendly. In addition, partnerships between the public and private sectors are encouraging the development of housing that is both affordable and environmentally friendly [28][31].[22][23], [28] justified the importance of government policies and laws to deal with housing affordability but the studies did not critically explore the provision of sustainable housing.

3.5. Linking Sustainable Housing and Sustainable Affordability while Meet Housing Preference

Affordable housing, housing preferences, and sustainable housing are related issues that need to be investigated further. [35] put up seventeen criteria for environmentally, economically, and socially responsible housing. One of the 17 criteria put forth by [35] is the affordability of sustainable housing. The study however doesn't give a thorough justification for this criterion. The study however concluded that it is crucial to prioritize enhancing the social sustainability of cheap housing, both new and old. and that home affordability should examine both economic factors quality of life and residential environment. Improving affordable housing sustainability can reduce indirect costs for households. For instance, energy-efficient housing near employment, public transit, education, and critical services can increase household income by reducing transportation and energy expenditures. We recognize that low-cost housing alone cannot sustainably meet affordability needs.

Studies have shown a significant gap between sustainable housing meeting household preferences and affordability. For instance, [23] indicated a disparity between the preference for landed houses and the actual affordability of such houses in Malaysia. This discrepancy suggests the need for policies that bridge the gap between sustainable housing preferences and affordability [23]. [36] identified several critical social components (CSC) needed for sustainable, affordable housing, with price and rental cost CSCs being highly ranked. Bridging the gap between sustainability and affordability in housing requires addressing factors such as household satisfaction, stakeholder satisfaction, housing operation costs, time measurement, location affordability costs, and quality-related CSC [24]. Additionally, the creation of a new Central Specificity (CSC) could influence affordable housing policies by focusing on household energy costs. By applying a standard in which no more than 10% of a household's income should be spent on energy-efficient housing, policymakers can minimize energy costs and reduce greenhouse gas emissions [37]. Housing preference is affected by affordability [38]; the affordability and sustainability gap can be addressed by incorporating innovative design strategies that optimize resource utilization and minimize energy consumption [28].

4. Conclusion

The dynamic relationship between housing sustainability and the housing market's affordability is a complex issue. Many demographics, cultural, and economic aspects affect this complex issue. Understanding that individual and demographic factors impact housing preferences emphasizes the need for specialized solutions that can meet a variety of preferences. Available resources, safety, security, location, comfort, and luxury of the house influence housing decisions. Indeed, cost and sustainability are not incompatible. Housing with green features can lower homeowners' long-term costs. However, low- to middle-income people may struggle to afford sustainable housing's initial investment. Improving affordable housing sustainability has a positive impact on the social and economic aspects of individuals as it can reduce indirect costs for households. For instance, energy-efficient housing near employment,

public transit, education, and critical services can increase household income by reducing transportation and energy expenditures.

A comprehensive plan is needed to bridge the gap between sustainable housing provisions and the ability to implement them. Innovative funding, government incentives, and sustainable building should be part of this strategy. This review paper provides a useful synthesis of the literature on housing preferences, sustainable housing, and affordability, but it emphasizes the need for more empirical research into the complex relationship between sustainable housing and sustainable affordability while addressing the housing preference of medium to low-income households. This literature gap requires further study to understand how these key aspects affect urban planning, environmental sustainability, and social equality. Future study in this area is crucial to solving future housing issues.

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The authors fully contributed and are responsible for the entire content of the document.

Conflict of interest

The authors declare no conflict of interest

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