

A MULTI-DIMENSIONAL SYSTEMATIC REVIEW ANALYSIS OF BARRIERS TO SUSTAINABLE AFFORDABLE HOUSING (SAH)

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Abstract. The growing demand for affordable housing and rising environmental concerns, particularly in most developing countries, have resulted in the insistence on having Sustainable Affordable Housing (SAH) regulations. This scenario is also applicable in the Malaysian context. Since the Eleventh Malaysia Plan, the development of affordable housing has gradually improved. To accomplish appropriate urban growth, housing affordability must also be sustainable. This research aims to examine the challenges associated with the adoption of SAH from the viewpoints of the key participants, who are the government, developers, and homeowners (householders). This research also applies the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) model to analyse 29 related publications, highlighting the challenges of incorporating sustainable practices into affordable housing across different demographics, contexts and legislative operations. Therefore, this paper identified six (6) major barriers and thirty-nine (39) challenges that need to be considered. These barriers include lack of funds, insufficient knowledge and technology, lack of education and awareness, limited accessibility and land use planning, lack of enforcement and efforts, as well as land cost and assessment. This had impeded the development of SAH. Therefore, future research will focus on the integrated strategies to motivate the implementation of SAH development.

Keywords: *stakeholders, affordability, sustainability, economics, environmental*

Introduction

Housing is an essential resource that is vital to the well-being of the population as it offers safety, security and a stable environment in which individuals and families can prosper. The issues of affordable housing have drawn significant attention worldwide, both in advanced and emerging economies. According to Anthony (2023), various factors contribute to the affordable housing crisis. Among the factors are that housing prices and rents have persistently increased at a faster rate than income and wage growth over the past three decades. The research also added that approximately 42 million households, which comprise 17.5 million homeowners and 24.5 million renters, were burdened by housing costs in 2018. Malaysia is facing a similar housing affordability issue, as the aspiration of low to middle-income individuals to own a home continues to grow (Musaddad et al., 2025). The main reasons for the growing concern about affordable housing are income growth and susceptibility to better career prospects, particularly in metropolitan regions (Almeida et al., 2017). The crucial prerequisites for affordable housing are to be acceptable in terms of location, decent quality of housing, and "not so pricey." In order to guarantee that the cost of housing would not burden house buyers, the housing quality must be at a satisfactory level. It should be at a convenient location close to all basic amenities and facilities that are required. This is to ensure that the financial commitment to housing will not burden the

house buyers, the quality of houses was satisfying, and having good access to necessary facilities and amenities.

Based on research undertaken by the McKinsey Global Institute in 2014, it was predicted that 330 million urban dwellers worldwide were under financial stress due to housing mortgage eligibility and living in inadequate housing conditions. Bank Negara Malaysia's (BNM) Housing Market Report 2017 identified several factors that have caused housing in Malaysia to become extremely unaffordable since 2016. In Malaysia today, the primary direction for affordable housing initiatives is divided into social housing, housing financing schemes, and subsidised housing. The subsidised housing scheme like Perumahan Rakyat 1 Malaysia (PR1MA), also known as 1 Malaysia People's Housing Program, acts as a direct provision of social housing where the government builds and/or owns most housing units and allocates the units to the target groups. Furthermore, helpful regulatory provisions support affordable housing development, such as inclusionary zoning, which sets aside the construction for this kind of development scheme (Alias et al., 2021). Bank Negara Fund is one of the initiatives that hold up affordable housing, allowing eligible home buyers to finance their houses at a concessionary rate with participating commercial banks. This financing scheme effort is available to assist in lowering financing costs, including down-payment support. In the 11th Malaysian Plan, the federal government of Malaysia shifted its attention to the country's middle-class income group. Even though they belong to a higher income class, households in the M40 class frequently struggle to find housing that meets their aspirations and income levels. Compared to the (Below 40% of the economic group) B40 group, the (Middle 40% of the economic group) M40 group offers a greater selection of financial capability-based initiatives and affordable housing programmes. Generally, affordable housing is considered affordable if the housing costs do not exceed 30% of the household's income. Though developments in Malaysia's affordable housing market have been gradually improving, sustainable housing development growth still requires more than just affordability.

The concept of sustainable housing development emerged by growing environmental consciousness and conservation efforts. This is attributable to the fact that the primary source of greenhouse gas emissions is both residential and building construction. This is in line with UN-Habitat (2021), which stated that most cities worldwide use more than half of their land for housing constructions and development, hence dictating the structure and level of urbanisation. As a result, an apparent connection exists between human civilisation and the environment, with housing activities impacting the environment at large. As reported by Golubchikov and Badyina (2012), building and maintaining a home consumes a lot of natural resources and pollutes the air, water, and the environment overall. This highlights the need for suitable regulations and policies aimed at improving the sustainability of building operations. Therefore, sustainable housing strategies can enhance people's quality of life and create a healthy environment while simultaneously alleviating social, economic, and environmental issues.

Thus, affordable and sustainable housing aims to strike equilibrium between the environment and civilisation. In the global battle against urbanisation and climate change, a specific approach, such as sustainable, affordable housing development or SAH, is now an urgent call. In addition to being essential to human rights, affordable housing accessibility is a key component of a sustainable urban environment. Unfortunately, implementing sustainable and affordable housing development in Malaysia is still in its infancy, as stated by Abidin (2010) and fewer implementations in

the industry, leading to insufficient guidelines and regulations (Goh et al., 2013). Similarly to SAH, current efforts are to align with National Housing Policy (NHP) is the Green Affordable Housing (GAH) which had focus on specific aspects such as sustainable site management, material efficiency, water efficiency and innovation (Zulkepli and Abdul Rahman, 2025). Consequently, SAH aims to create socially inclusive, resource-conscious, and energy-efficient affordable housing solutions. Nevertheless, despite its obvious advantages, barriers and challenges prevent SAH adaptation from developing beyond.

Literature review

Sustainable Affordable Housing Development (SAH)

According to the three pillars of sustainable development foundation by Barbier (1987), sustainable development can be discussed in three dominant elements, which are economic, social and environmental. In addition, the core fundamentals of SAH development incorporate a harmonious mixture of economic viability and preservation of the environment without compromising social equity. It is a perfect blend of sustainable and affordable offers to urban dwellers. According to Isalou et al. (2014) and Fuhry and Wells (2013), integrating economic sustainability and affordable housing requires consideration of initial upfront costs, future transportation costs, and energy consumption costs. However, the recent evidence has indicated that many affordable housing developments in Malaysia experience “spatial isolation,” as they are often situated far from urban centres to minimise land costs (Zaharin et al., 2026). Consequently, the benefit of lower housing prices is offset by substantially higher monthly commuting expenses, creating a significant trade-off for residents (Tareke and Baraki, 2024). It is important for the household to have balance of rental or mortgage payment of housing as well as the transport costs. It is important for households to maintain a balance between housing expenses, such as rent or mortgage payments, and transportation costs. This is due to the decreasing spending on transportation and energy will leave some space for the lower-middle-income householders to spend more on non-housing spending due to their limited income (Golubchikov and Badyina, 2012). In addition, translating economic sustainability also refers to the viability of economics, which aims to foster economic growth and development that is financially feasible and supports long-term prosperity.

On the other hand, social sustainability is also one of the pillars in SAH development. It stresses the quality and equity in sustainable development to ensure all individuals and communities have fair access to resources, opportunities and the decision-making process. According to Saliu and Akiomon (2022) sustainable housing presents valuable opportunities to advance environmental conservation, economic growth, and social equity, while also enhancing quality of life and addressing critical challenges such as population growth, urbanisation, slums, poverty, climate change, limited access to sustainable energy, and economic instability. However, the increasing interest in sustainable housing also must be supported by appropriate policies (Reid, 2023). The housing quality and neighbourhood consideration is something really to ponder. The implementation of SAH development is quite challenging due to certain barriers arising from a complex interplay between main participants within such development. However, the SAH development still has a wide potential to be implemented through certain strategies to overcome the barriers to its implementation.

Environmental bearability in sustainable development involves maintaining the integrity of ecosystems and biodiversity while minimising human impact on the environment. Furthermore, the environmental sustainability indicators in affordable housing encompass energy and water efficiency, effective resource utilisation, reliability and durability of housing, intelligent waste management, a comfortable and healthy environment and reduction of carbon footprint (Gan et al., 2017). Globally, the primary sources of greenhouse gas and carbon emission are 73.2 % from the energy emitted by electricity, heat, and land use of 18.4% in the year 2016 as reported by Oxford Martin School. The residential and building activities also contributed to carbon emissions which can affect the environment. Environmental sustainability also extended to optimal and efficient land use (Fuhry and Wells, 2013). The selection of the site also needs to avoid places that are at risk of flooding, natural disasters and other threats. The mixed-use of land also needs to be taken into account to minimise the transportation costs and maximise the accessibility of the location to the necessary amenities and facilities (*Figure 1*).

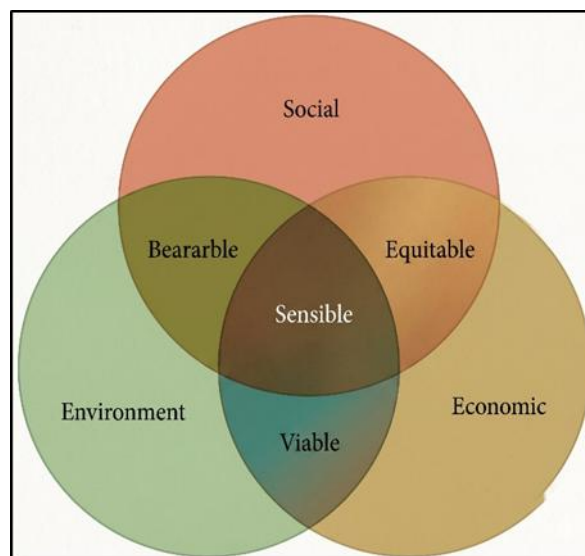


Figure 1. Sustainability in Built Environment Theory.

The barriers in developing Sustainable Affordable Housing (SAH)

This research paper discusses the barriers and challenges in integrating sustainability into SAH development. According to Oluleye, Oyetunji, Ogunleye, et al. (2021), SAH development has many benefits. However, it faces many barriers and challenges, particularly in developing nations. Chan and Adabre (2019) defined barriers as specific obstacles that prevent or hinder the progress of integrating sustainability in SAH development. On the other hand, challenges in SAH are defined as the broader and systemic issues that arise when attempting to meet sustainability goals (Reid, 2023). The execution of SAH development has multiple barriers based on the environmental, economic, and social spectrum.

Economics barriers

One of the challenges to SAH development implementation is economic obstacles. This is owing to the high upfront price of sustainable materials and technology.

Although these investments usually result in long-term benefits, developers and end users (householders) may find the initial expense prohibitive (Kothari and Pathak, 2021). In addition, Leonavičienė et al. (2022) stated that the situation is exacerbated by a lack of funding and financial incentives for sustainable development initiatives. Inadequate financing from financial institutions to fund such a project, caused by reluctance and hesitation, impedes the SAH development project. Economic viability is still a significant consideration. A delicate balance must be established to prevent sustainable features from driving up housing costs to the point where housing becomes unaffordable. Thus, preserving housing affordability for low-income households may be difficult due to the increased expenses associated with sustainable measures (Adabre et al., 2021).

Social barriers

The primary social challenges to SAH implementation are community opposition and public perception. Residents in the neighbourhood may be concerned about losing the neighbourhood's character and property values, leading to apathy and lack of confidence in the concept of SAH development (Wijesooriya and Brambilla, 2021). Furthermore, developers and homeowners are typically unfamiliar with sustainable materials and approaches. Mushanga et al. (2024) stated that these knowledge gaps can lead to suboptimal maintenance and operation of sustainable features, resulting in greater long-term expenditures.

Environmental barriers

The most challenging task in incorporating sustainability into affordable housing is integrating sustainable features or technology into the typical standard existing infrastructure. This integration may result in greater building costs and project delays since sustainable elements are not always compatible with conventional building techniques and practices. Furthermore, to upkeep and operate the environmentally friendly attributes, experts with expertise and abilities must possess specialised skills. The inefficiency and exorbitant running costs of operation will arise from the lack of availability of professionals (Mushanga et al., 2024).

Materials and Methods

This research employed a Systematic Literature Review (SLR) methodology to arrive at the research aims. SLR is a rigorous and methodological approach for collecting, critically interpreting and synthesising research data findings from the existing studies. It is often used to provide a comprehensive overview of the literature on a particular topic, identify gaps and generate new insights. The methodological process includes the following steps: (i) Defining the research questions, (ii) Developing a review protocol, (iii) Conducting research searching strategies, (iv) Screening and selecting the studies according to research assessment criteria, (v) Analysing data using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Guidelines.

Research questions

Due to some limitations of the author's knowledge of Sustainable Affordable Housing (SAH) Development, this article focuses on developing the body of knowledge on the fundamental issues on this topic. Most of the previous research papers only focus on single and dual perspectives of the key players of SAH development. Thus, this SLR paper aims to produce a comprehensive perspective of the main key players identified as householders, developers, and the government regarding the limitations of SAH implementation. Therefore, this paper addressed the research questions:

RQ 1: What are the challenges of integrating sustainability into affordable housing development from the perspectives of key participants identified as householders, developers and the government?

RQ 2: What are the research methodologies that have been applied to similar research?

Research database and search string strategy

According to Ferlito et al. (2022), search strings were employed to retrieve the most relevant and up-to-date publications related to SAH development topics. This SLR focused on searching scientific databases, as they yield more substantial research results compared to relying on books and reports only (Kitchenham and Charters, 2007). These search strings were carefully crafted to include various combinations of keywords and Boolean operators, ensuring a comprehensive search of relevant topics. Boolean operators are based on mathematical models and database semantics. Boswell (2009) classified the basic boolean operators into three, which are AND, OR and NOT. The benefits of using Boolean operators in a search strategy include the following: (i) Narrowing down the search, especially if the topic has several search terms; (ii) Connecting together disparate pieces of information to locate exactly what is required. For this research, the search strategy used three primary databases: the Web of Science, Scopus, and ScienceDirect, and the ancillary database source, Google Scholar. A detailed explanation of the search strings and keywords derived from the specified database is presented in *Table 1*.

Table 1. Database and search strings.

Sources/database	Serch string/keywords
Primary database sources	
Web of Science	TS = (("Challenges*" OR "Barriers*" AND "Sustainable*" AND "Affordable*" AND "Housing*"))
Scopus	TITLE-ABS-KEY = (("Challenges*"OR "Barriers*" AND "Sustainable*" AND "Affordable*" AND "Housing*"))
Science direct	Barriers to Sustainable and Affordable Housing Development
Ancillary database source	
Google Scholar	Barriers to Sustainable and Affordable Housing Development

Research assessment criteria

Screening is a process where the researcher must set the inclusion and exclusion criteria that will strictly filter the related research topics. The inclusion and exclusion criteria are essential to ensure that the selected studies are relevant and of high quality. These criteria help systematically filtering the search results to include only those studies that meet the predefined requirements, thus ensuring the rigour and validity of the SLR (Kitchenham and Charters, 2007). The rigorous process ensured the selected

studies were highly relevant and comprehensively covered the research topic. Thus, the inclusion and exclusion criteria for the assessment are presented in *Table 2*.

Table 2. *Inclusion and exclusion criteria.*

Criteria	Assessment criteria
Inclusion	Research articles relating to barriers and challenges in adopting Sustainable and Affordable Housing Development (SAH) The publications made between 2010 and 2023 Publication must be written fully in English Publications are conference papers, proceedings or journal articles that are related to the subject areas of Built Environment, Social Sciences, and Engineering Open access publications
Exclusion	Papers from newspapers, blogs and articles that are not being reviewed and are not vetted. Articles or research papers are not within the selected subject areas. Articles or research papers published before 2010.

Data analysis

Data analysis involves data extraction to collect relevant information from each included study. In this study, the information about the study design, outcomes, and key findings are extracted from the previous study, which applied the review protocol. Data synthesising involves summarising and integrating the findings from included studies. In this research, the collected data were synthesised using the meta/descriptive analysis (quantitative) and thematic analysis (qualitative). The goal is to identify the patterns, relationships and overall trends in literature. Therefore, the data analysis process involves the identification, screening, and inclusion steps. There are 70 articles or registers from four sources of database. Accordingly, 33 articles were excluded from the research as it is not open access, and only 37 were screened. These 37 articles were eligible for the inclusion assessment criteria. Then, several 29 articles were included in the research after 8 were excluded based on the exclusion assessment criteria. The data analysis process is presented in *Figure 2*.

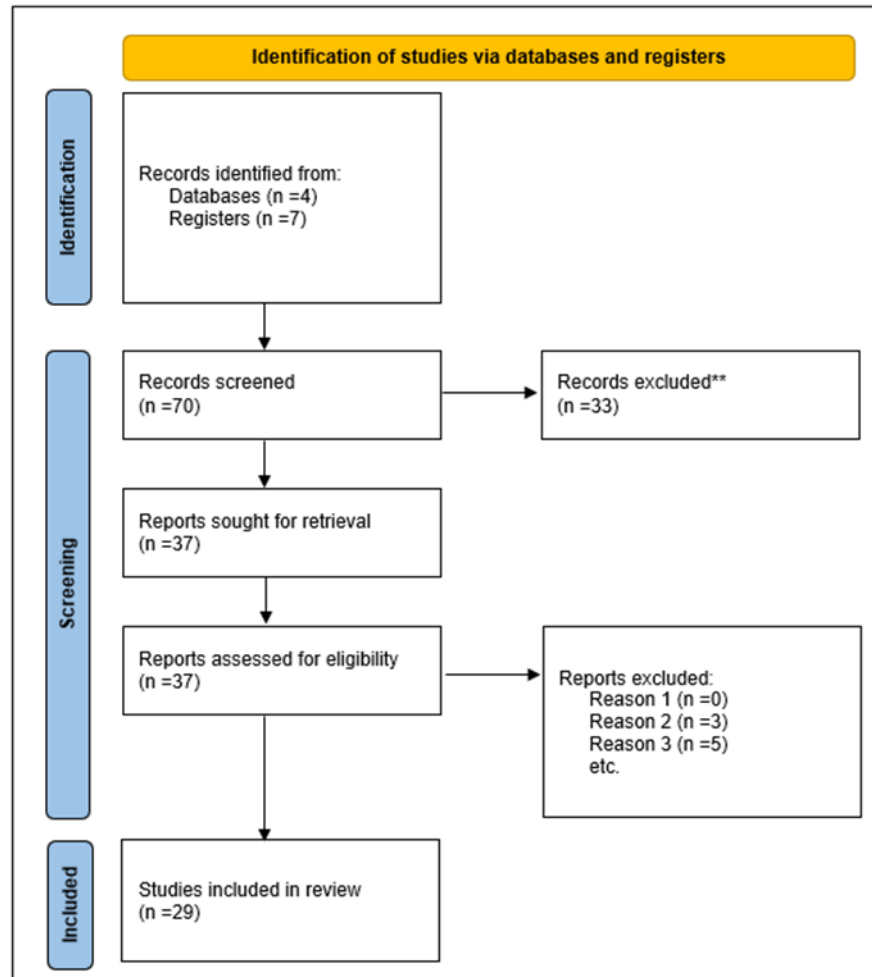


Figure 2. PRISMA model.

Results and Discussion

Descriptive analysis

This section presents the outcomes of the research, divided into two primary parts: the descriptive analysis and the thematic analysis. In the descriptive analysis, this research provides an overview of the data, including the statistical summaries and visual presentations. In addition, the thematic analysis delves deeper into qualitative aspects of the data, identifying and exploring key themes and patterns. This part highlights understanding the fundamental patterns and trends observed within the dataset. Figure 3 summarises the number of publications on barriers and challenges in integrating sustainability into affordable housing development. The data were collected from research articles and papers published from 2010 until 2025 (accumulative of 15 years). Most publications were in 2021 and 2023, with five research articles. It is relatively challenging to find the research papers that highlight this topic. However, no research papers have been on this topic in 2010, 2011, 2014, and 2016. Figure 4 depicts the research design that was applied in the previous research. Most research employed quantitative research by ten articles, eight using qualitative methodological design, and the rest a combination of both qualitative and quantitative research.

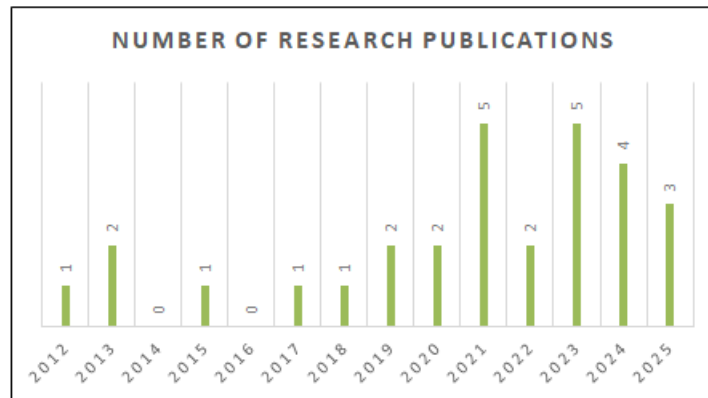


Figure 3. Number of research publications.

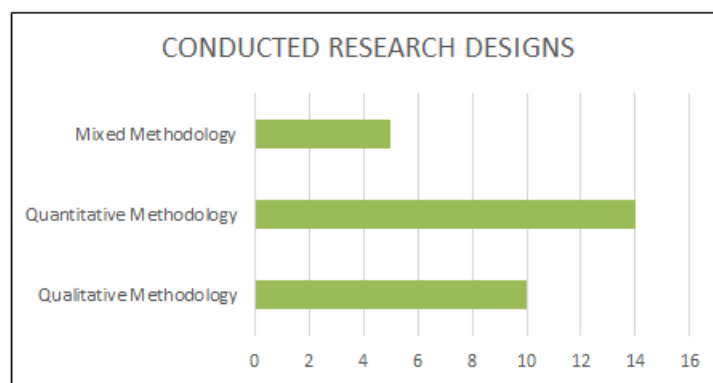


Figure 4. The conducted research designs.

Thematic analysis

The thematic analysis seeks to reveal underlying meanings and insights that will aid in a deeper comprehension of the research issues. *Table 3* presents the findings on the barriers to SAH development based on various literature reviews by multiple authors and contexts. According to the findings, six (6) barriers to SAH were identified and tabulated according to sustainability dimensions. The major barriers highlighted are lack of funds, insufficient knowledge and technology, lack of education and awareness, limited accessibility and land use planning, lack of enforcement, efforts, land cost and assessment. All had impeded the development of SAH. Thus, future research will focus on integrated strategies to motivate the implementation of SAH development.

Table 3. The barriers to integrating sustainability into affordable housing (SAH) development.

Sustainability dimension/barriers	Perspective	Perspective views	Authors	Nation
Economics sustainability dimension				
Financial	Developers	High expenses for environmentally friendly buildings (components and green commodities).	(Oluleye, Oyetunji, et al., 2021; Adabre and Chan, 2020; Syed Jamaludin et al., 2020; Syed Jamaludin et al., 2018; Goh et al., 2013)	Malaysia and Nigeria
		Green construction materials are more	(Oluleye, Oyetunji, et al.,	Nigeria

		expensive due to the difficulty of procuring them. The developers were hesitant to foot the "additional construction costs."	(2021) (Cahyani and Rarasati, 2021)	Indonesia
	Householders	Household income and household unaffordability for obtaining sustainable dwellings at high prices. Buyers have difficulties in buying sustainable dwellings due to rising prices.	(Goh et al., 2013)	Malaysia
	Government	Insufficient public financing for sustainable and affordable housing. Inadequate funds and underdeveloped financial markets	(Adabre and Chan, 2019) (Bashir et al., 2023)	Australia Worldwide Pakistan and Bangladesh
Enforcement and Incentives	Developers	Sustainable housing schemes are not mandated development	(Syed Jamaludin et al., 2020)	Malaysia
	Householders	There are fewer incentives for developers. Insufficient financial programs or incentives to acquire such a housing scheme. Mortgage eligibility under such a program	(Zaharin et al., 2026; Trudeau, 2018) (Oluleye, Ogunleye, and Oyetunji, 2021; Wallbaum et al., 2012) (Sunday et al., 2021)	Malaysia, Spain, United States Nigeria Nigeria
	Government	Lack of surveillance and regulation.	(Oluleye, Ogunleye, and Oyetunji, 2021; Syed Jamaludin et al., 2020)	Malaysia and Nigeria
		Inaccessible rules and procedures for long-term affordable housing delivery.	(Ezennia, 2022; Oluleye, Oyetunji, et al., 2021; Goh et al., 2013)	Malaysia and Nigeria
Land Assessment and Land Cost	Developers	High price of land	(Sunday et al., 2021)	Nigeria
	Householders	Households are unable to afford sustainable houses.	(Sunday et al., 2021)	Nigeria
	Government	No environmental and geological assessment funds/incentives have been provided. Unavailability of Public-Private Partnerships engagements in housing developments	(Sunday et al., 2021) (Sunday et al., 2021)	Nigeria Nigeria
Social Sustainability Dimension Education, Knowledge and Awareness	Developers	Misunderstanding of sustainable, affordable housing. Fail to comprehend	(Yang and Yang, 2015) (Adabre and	Australia Malaysia and Nigeria

	Householders	the core concept/foundation of sustainable housing construction. Lack of clients' interest and inability to meet the demand for sustainable and affordable housing. Lack of social acceptability.	Chan, 2020; Chan and Adabre, 2019; Goh et al., 2013) (Reid, 2023; Oluleye, Oyetunji, et al., 2021; Li et al., 2019) (Adetooto et al., 2022; Cahyani and Rarasati, 2021)	Nigeria, Switzerland and the Asian Region
	Government	Lack of public awareness. Inadequate exposure to sustainable development is a core subject in higher education institutions that provide related courses. Lack of encouragement for sustainability education at universities.	(Hafez et al., 2023) (Mushanga et al., 2024; Oluleye, Ogunleye, and Oyetunji, 2021; Oluleye, Oyetunji, et al., 2021) (Oluleye, Ogunleye, and Oyetunji, 2021)	Worldwide views Nigeria Nigeria
Accessibility and Land Use Planning	Developers	There is no mixed land use planning. Unsuitable location for such a program.	(Cahyani and Rarasati, 2021) (Sunday et al., 2021)	Indonesia Nigeria
	Householders	Limited accessibility to public facilities and amenities.	(Cahyani and Rarasati, 2021; Wallbaum et al., 2012)	Indonesia, Switzerland
	Government	Lack of a systematic physical development plan. Bureaucracy.	(Ezennia, 2022; Sunday et al., 2021) (Sunday et al., 2021)	Nigeria Nigeria
		Ineffective land use planning.	(Sunday et al., 2021)	Nigeria
Environmental Sustainability Dimension				
Expertise and Technology	Developers	A lack of current knowledge of green technologies and materials.	(Syed Jamaludin et al., 2020)	Malaysia
		No or less competency in sustainable design.	(Ng et al., 2017; Goh et al., 2013)	Malaysia
		Uncertainty about future technological developments	(Oluleye, Oyetunji, et al., 2021; Sunday et al., 2021)	Nigeria
	Householders	Fear and hazards associated with adopting and adapting new technologies.	(Mushanga et al., 2024; Oluleye, Oyetunji, et al., 2021; Goh et al., 2013)	Malaysia and Nigeria
		Lack of technical knowledge and skill sets.	(Reid, 2023)	Asian Region
	Government	Importing green technologies and supplies from overseas countries is necessary.	(Oluleye, Oyetunji, et al., 2021; Goh et al., 2013)	Malaysia and Nigeria
		Technology transfer.	(Oluleye, Oyetunji, et al., 2021)	Malaysia and Nigeria

Economic sustainability dimension

Financial barrier

The development of sustainable and affordable housing (SAH) faces significant financial challenges from multiple stakeholders. Developers are discouraged by the high cost of sustainable materials, many of which are expensive due to limited local availability and the need for importation, leading to construction costs that can be up to 40% higher than conventional housing (Syed Jamaludin et al., 2020; Goh et al., 2013). This cost barrier particularly affects small-scale developers who lack the financial capacity to absorb such expenses. On the demand side, householders also struggle with affordability, as sustainable housing prices reflect both high land and construction costs, making it difficult for middle- and low-income groups to access such (Ng et al., 2017). Meanwhile, governments often provide insufficient funding for SAH projects, as fiscal priorities tend to favour infrastructure over housing, resulting in an underdeveloped market for Sustainable Affordable Housing (SAH) (Bashir et al., 2023; Adabre and Chan, 2020).

Enforcement and incentives barrier

Regulatory and policy frameworks are mandatory to the successful implementation of sustainable and affordable housing (SAH), yet several institutional barriers hinder progress. Inconsistencies in legislation, outdated regulations, and inadequate zoning and policy support make it difficult to integrate sustainable practices into affordable housing initiatives. According to Syed Jamaludin et al. (2018) and Trudeau (2018), developers are not mandated to pursue SAH projects, and the lack of incentives further discourages their involvement. As for householders, the limited access to the designated financing programs from financial institutions restricts their ability to secure loans for affordable, sustainable housing (Oluleye, Oyetunji, et al., 2021; Sunday et al., 2021; Wallbaum et al., 2012). Meanwhile, weak government enforcement, complex procedures, and a lack of streamlined compliance mechanisms delay SAH implementation (Ezennia, 2022; Syed Jamaludin et al., 2020; Goh et al., 2013). Therefore, there is an urgent need for a coherent and supportive regulatory framework to facilitate and accelerate SAH development (Azman et al., 2023).

Land assessment and land cost barrier

The selection and cost of land play a significant role in the challenges faced by Sustainable and Affordable Housing (SAH) development. In some cases, SAH projects are located in vulnerable areas prone to natural disasters. This highlights the need for thorough environmental and geological assessments before construction begins. High land prices, combined with rising construction costs, limit developers' ability to profit from SAH projects, often deterring their participation (Sunday et al., 2021). On the other hand, the SAH are less in demand by householders due to their limitations of housing loans and high costs associated with this kind of development, making it impossible for the households to opt for sustainable houses. From the government's perspective, there is a pressing need to provide subsidies or assessment funds to ensure safer site selection and accelerate development (Sunday et al., 2021). Moreover, the lack

of strong public-private partnerships further constrains SAH progress, underscoring the importance of collaborative efforts to reduce financial burdens and promote sustainable development (Bashir et al., 2023).

Social sustainability dimension

Education, knowledge and awareness barrier

The lack of awareness, expertise, and education surrounding Sustainable and Affordable Housing (SAH) poses a major barrier to its successful implementation. Rapidly evolving sustainable building technologies are not well understood by many developers, architects, and contractors, leading to misconceptions and a shortage of skilled professionals in green construction (Hafez et al., 2023; Yang and Yang, 2015; Goh et al., 2013). Whilst among householders, public knowledge and interest in SAH remain low, particularly in countries where such developments are still emerging. Poor social acceptance and the location of SAH projects in remote areas further reduce demand and satisfaction (Reid, 2023; Adetooto et al., 2022; Cahyani and Rarasati, 2021; Oluleye, Oyetunji, et al., 2021). Besides, on the government and institutional level, there is limited emphasis on sustainability in higher education curricula, restricting students' exposure to sustainable development principles. As such, curriculum reforms are necessary to ensure that future professionals are adequately prepared to support SAH advancement (Oluleye, Ogunleye, and Oyetunji, 2021).

Accessibility and land use planning barrier

Site selection and land use planning present significant challenges to the success of sustainable and affordable housing (SAH) projects. These developments are often located in remote areas, far from city centers, business districts, and public transportation, making access to essential services difficult for residents. While Malaysia faces fewer accessibility and land planning issues compared to some countries, challenges remain. Developers tend to avoid mixed-land developments, favouring exclusive schemes that are typically situated in less desirable locations and that limit tenant access to basic amenities (Cahyani and Rarasati, 2021; Sunday et al., 2021). For householders, inconvenient site locations increase daily commuting time and transportation costs, making SAH less attractive (Wallbaum et al., 2012). Furthermore, the government's lack of comprehensive physical planning and inefficient land use strategies, compounded by bureaucratic delays, further obstruct the effective implementation of SAH projects (Sunday et al., 2021).

Environmental sustainability dimension

Expertise and technological barrier

Sustainable housing strategies and the technologies that support them are constantly evolving, yet many countries remain in the early stages of adopting these practices, resulting in significant technical and technological barriers across all stakeholder levels. Developers often lack up-to-date knowledge of green materials and sustainable design, and many are hesitant to invest in unfamiliar or rapidly changing technologies due to uncertainty and limited expertise (Oluleye, Ogunleye, and Oyetunji, 2021; Oluleye, Oyetunji, et al., 2021; Sunday et al., 2021; Syed Jamaludin et al., 2018; Goh et al., 2013). Meanwhile, the adoption of new technologies brings concerns over risks,

maintenance, and repairs, especially given the lack of technical skills and familiarity with sustainable housing systems among householders (Reid, 2023; Oluleye, Oyetunji, et al., 2021). The governments, on the other hand, face challenges in acquiring the necessary technical expertise and resources locally. These had led to relying too much on imported green technologies due to the suffering of weak internal mechanisms for effective technology transfer (Oluleye, Oyetunji, et al., 2021; Goh et al., 2013). These limitations hinder the widespread adoption and implementation of sustainable and affordable housing solutions. For the purpose of constructing a conceptual framework, the barriers that were analysed in this study were tabulated into indicators as in *Table 4*.

Table 4. *The barrier's indicators in adopting sustainable affordable housing development.*

Main barriers	Perspective	Barriers indicators
Economic sustainability dimension Financial	Developer	Construction Costs The costly purchase of sustainable materials The reluctance to face increased costs
	Householders	Inability to afford sustainable houses Less purchasing power
	Government	Unavailability of public funds
Enforcement and incentive	Developer	SAH development is not obligatory Less provision of incentives and subsidies
	Householders	Lack of financing/tenure options for the buyers Less promotion on the mortgage for such development
	Government	Lack of surveillance and regulations Distant guidelines and procedures for SAH Housing Delivery Less related policies
Land assessment and land cost	Developer	High cost of land Geological land assessment costs that need to be borne by the housing price
	Householder	Incapacity to foot the land expenses
	Government	Inability to fund the environmental and geological costs Absence of cooperation between private and public parties
Social sustainability dimension Education, knowledge and awareness	Developer	Misunderstanding of SAH development concepts Complexity of SAH practices
	Householders	Lack of motivation Less demanded Deficiency in demand for SAH development
	Government	Less exposure to a sustainable syllabus at higher education institutions Less promotion of sustainable education
Accessibility and land use planning	Developer	Neglected mixed land-use planning Selection of a site to an unfavourable location
	Householders	Limited accessibility to public facilities and amenities
	Government	Lack of inclusive physical development strategies Bureaucracy and red-tape issues Ineffective land use planning
Environmental sustainability dimension Expertise and technology	Developer	Lack of up-to-date knowledge of green technologies and sustainability Less expertise in sustainable design Uncertainty about the future technological development Less skilled labour
	Householders	Fear and risks with the adoption and adaptation of new technology Fewer skill sets of maintaining, repairing, replacing and restoring green materials
	Government	Shortage of technological experts Less commitment to technology transfer

Conclusion

SAH has robust new development barriers spanning low to middle-income levels in terms of economic, social and environmental dimensions. By addressing these barriers,

the requirement of an inclusive approach concerning the strategic partnerships between developers, policymakers, financial institutions, and communities is now an urgent call. Economically, developers struggle with the high costs of building sustainably, and builders do not want to absorb extra costs. One such problem is that owners have concerns about the purchasing power and construction cost, which hinder sustainability, while governments underfund SAH schemes due to budget constraints. Furthermore, there are no mandated SAH developments or enforceable incentives, such as a lack of government regulation and guidelines and financing issues for the householders being unable to get loans. In addition to this are land assessment and costs that also pose an economic challenge, with high costs of the land a detriment both to developers as well as householders; from another standpoint, there has been no significant financial support for environmental or geological funding allocated on behalf of the government.

On the other hand, regarding societal awareness, there is likely a lack of exposure among developers, homeowners, and even municipal authorities regarding SAH. Consequently, there has been a dearth of comprehension, apathy, and inadequate advocacy for advancing sustainable education. There are issues regarding accessibility and inadequate land use planning, sometimes neglecting mixed land use and selecting unsuitable locations. Households lack efficient access to public services, and government planning is characterised by inefficiency and bureaucracy. Regarding the environmental sustainability dimension, knowledge and technology are deficient. Developers are not receiving sufficient information or motivation to create innovative solutions, unlike government institutions. Adopting new technologies poses hazards and instils concern due to the lack of skills among householders to maintain or repair their equipment. In order to develop SAH, it is envisaged that this study would contribute by providing a framework of SAH development guidelines for developers, householders, and the government. The attributes from this study will help the development of unnecessary SAH designed for developers, households and the government. The framework will focus on identified attributes, thus removing the financial, societal, and environmental challenges and providing more realistic solutions. The developed framework could guide developers, particularly in the direction of cost-effective construction methods and sustainable material choices. Furthermore, it encourages cost-effective financing solutions and awareness-raising measures for homeowners. Regulations and incentives will be drafted by the government to promote SAH, aiming for a unified and coordinated approach to sustainable and economically stable housing development.

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Conflict of interest

The authors confirm that there are no known conflicts of interest associated with this publication.

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