



Harmonising Homes by Exploring and Developing a Sustainable Affordable Housing Model: A Structure Review

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ARTICLE INFO

Article history:

Received
Received in revised form
Accepted
Available online

Keywords:

Sustainable affordable house; affordable housing; housing affordability; sustainable development goals (SDG); energy efficiency

ABSTRACT

The global pursuit of sustainable development has brought into focus the pressing need for innovative solutions that address both environmental concerns and socio-economic challenges. In this context, the concept of sustainable affordable housing has emerged as a beacon of hope, offering a harmonious blend of ecological responsibility and equitable living spaces. This approach transcends the boundaries of conventional housing by intertwining affordability, energy efficiency and community well-being. However, a key issue impeding progress in tackling the global housing crisis is the lack of comprehensive studies on sustainable affordable housing. While many organisations strive to provide affordable housing alternatives, there is a lack of comprehensive study and analysis on the incorporation of sustainability concepts into these housing developments. The analysis, of a comprehensive selection, using the advanced search approach on Scopus and Mendeley database yielded (n=21) final primary data, which were also analysed. Accordingly, this article's aims are 1) to explore the sustainable affordable housing factors and 2) to propose a sustainable affordable housing model. The findings highlight three significant elements of sustainable affordable housing, namely, economic, non-economic and environmental factors. The study has also discovered that in discussions addressing sustainable affordable housing, the non-economic side garnered greater emphasis than the economic and environmental aspects. The review concludes with recommendations for policymakers, institutions and property stakeholders to improve the housing provision system by including three pillars such as social, economic and environmental aspects, as it is very important to ensure residential sustainability and harmony.

1. Introduction

In the dynamic interplay of urbanisation, economic realities and environmental imperatives, the pursuit of harmonious living environments gains paramount significance [1-4]. This article undertakes a comprehensive exploration of the intricate relationships and synergies that underpin the fusion of sustainability, affordability and structural design in housing. Affordable housing is frequently

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<https://doi.org/10.37934/araset.XX.X.137154>

determined by monetary factors, such as households' capacity to absorb the cost of housing and other expenditures [5,6] and is a fundamental human necessity, guaranteeing safe and secure shelter. Meanwhile, sustainable affordable housing takes it a step further by incorporating environmentally friendly design, energy efficiency and durability. For instance, utilising natural sources could result in significant energy savings from an environmental comfort standpoint, as well as aid in safeguarding the environment by producing fewer pollutants [7]. This not only addresses urgent housing requirements, but also helps to build a greener, more resilient future that benefits both the people and the world. Amid the global challenges of housing accessibility, resource limitations and climate change, the concept of sustainable affordable housing emerges as a pivotal axis around which urban development revolves [8-10].

By conducting a thorough review of existing literature, this article elucidates the multifaceted strategies that unite sustainability and affordability within the framework of housing structures. It delves into the symbiotic relationship between architectural design and environmental impact. Moreover, the article navigates through the intricate landscape of policy frameworks, regulations and technological advancements that shape the structural landscape of sustainable affordable housing. It offers a critical analysis of successful case studies and exemplars, unveiling the structural innovations that have proven instrumental in achieving a harmonious equilibrium between the economic constraints of affordability and the ecological imperatives of sustainability. In the ever-evolving tapestry of urban living, this article serves as a scholarly compass, guiding researchers, practitioners and policymakers in their quest to harmonise homes through sustainable affordable housing. By dissecting the intricate structural layers of this paradigm, the article not only enriches the academic discourse but also provides a model towards creating resilient, inclusive and environmentally conscious living spaces for diverse communities. The concept of sustainable affordable housing has gained prominence in recent years due to the increasing global focus on environmental sustainability, urbanisation and the need to address housing affordability challenges. This notion explains that the house has an affordable cost, a safe environment or community that promotes healthy living and other sustainable qualities [11]. The notion of sustainable affordable housing choice (SAHC) incorporates additional aspects inspired by the concepts of affordable housing, sustainable housing, social housing and sustainable communities (see Figure 1). However, in Malaysia, there has been little examination into the evolving paradigm of sustainable affordable housing solutions. As such, this study endeavours to bridge this void by formulating a pioneering sustainable affordable housing model that serves as a benchmark for optimal affordability and housing standards within the Malaysian context.

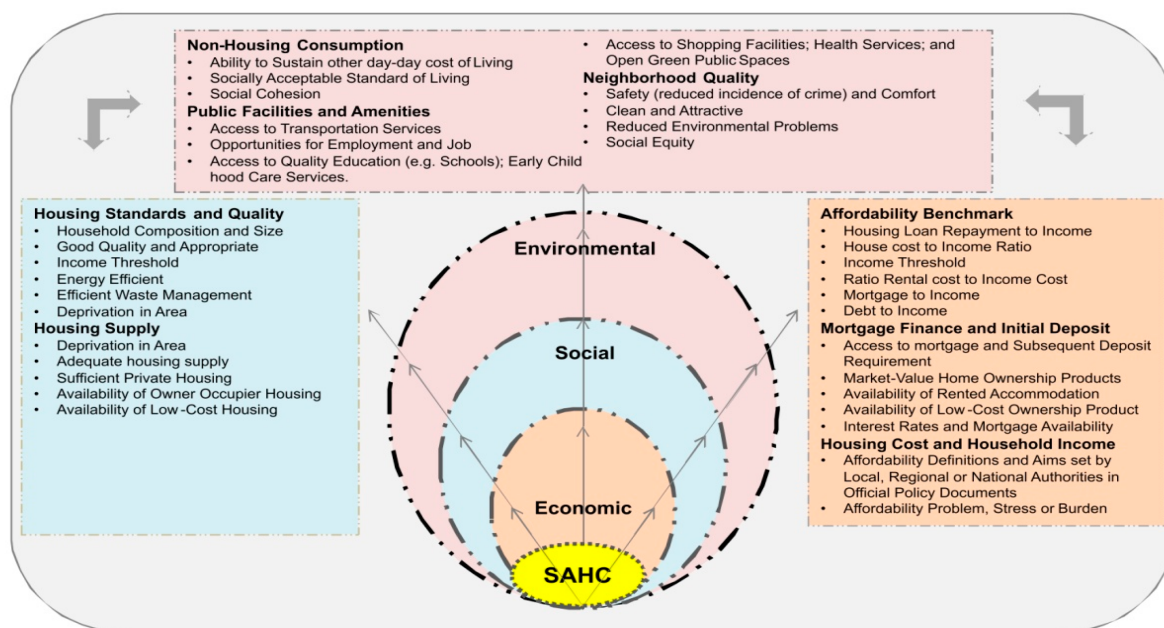


Fig. 1. Sustainable affordable housing choice (SAHC) concept [11]

2. Methodology

2.1 Material and Methods

A study of housing quality is essential, with an emphasis on housing that is not only affordable but also capable of giving the household a feeling of well-being. As a result, the combination of affordability and sustainability offers a comprehensive perspective that takes into account the social, economic and environmental pillars. Since measurements of SAH are a handful [12], contributions to emerging sustainability that are deemed to be a part of a unique study on housing affordability are incorporated into these three pillars [11,13]. Malaysian researchers rarely explore the interior of the evolving SAH model. As a result, the objectives of this study are to explore the factors that influence SAH and finally to propose the best SAH model. PRISMA also emphasises the randomised investigations assessments survey, which may be a major feature in systematic analysis reports for many forms of study [14]. Two databases were used to investigate the technique of this study because of their robustness: Scopus and Mendeley. However, no database, including Scopus and Mendeley, is exhaustive and complete. This part also discusses the four key sub-sections, namely, identification, screening, eligibility and data abstraction.

2.2 Identification

Numerous pertinent papers for this study were selected using the systematic review procedure, which involves three fundamental parts. Using the thesaurus, dictionaries, encyclopaedias and previous research, the initial part comprises identifying keywords and looking for associated, related terms. The Scopus and Mendeley databases' search terms have been created once all relevant keywords have been chosen (see Table 1). During the initial stage of the systematic review procedure, the current study project was successful in obtaining 1,379 papers from both databases.

Table 1

Search string using Scopus and Mendeley database

Scopus	TITLE-ABS-KEY ((factors OR attributes OR elements) AND (sustainable) OR (sustain) AND (affordable) AND (house)) AND PUBYEAR > 1999 AND PUBYEAR < 2024 AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (PUBSTAGE, i "final")) AND (LIMIT-TO (OA, "all"))
Mendeley	factors AND sustainable AND affordable AND housing

2.3 Screening

In the screening phase, the collection of potentially relevant research materials is examined for content that relates to the identified research question(s). One illustration of a content-related criterion that is regularly used during the screening phase is the selection of research items based on the factors of sustainable affordable housing. In this stage, the list of documents to be searched will be purged of any duplicate papers. Following the initial rejection of 1,307 articles, 72 papers were evaluated in the second round of screening based on various inclusion and exclusion criteria for this study (see Table 2). Literature (research articles), the primary source of helpful guidance, was the first criterion used. In addition, reviews, meta-synthesis, meta-analyses, books, book series, chapters and conference proceedings that were left out of the most recent study are included. Additionally, only articles in English were included in the review; bearing in mind that the strategy was only applicable to the years 1999 through 2023.

2.4 Eligibility

Sixty-three (63) articles have been prepared for the third level of eligibility. All article titles and significant content have been thoroughly scrutinised to ensure that they match the inclusion requirements and the goals of the current study. Accordingly, 42 articles were disqualified because they were irrelevant to the study's topic, their titles and abstracts were mismatched and they lacked full-text access based on empirical evidence. As of this writing, 21 articles are accessible for evaluation (see Table 2).

Table 2

The search criterion is used in the selection process

Criterion	Inclusion	Exclusion
Language	English	Non-English
Timeline	1999 – 2023	< 1999
Literature type	Journal (Article)	Conference, Book, Review
Publication Stage	Final	In Press

2.5 Data Abstraction and Analysis

An integrative analysis was used in this study as one of the evaluation procedures to review and synthesise a variety of research designs (quantitative, qualitative and mixed methods). The objective of the expert study was to pinpoint pertinent subjects and subtopics. The theme's conception began with the data collection phase. The authors carefully examined a collection of 21 publications, as shown in Figure 2, looking for claims or content pertinent to the subjects of the present study. Following the identification and establishment of major groupings in the second stage, the authors examine factors of sustainable affordable housing. The three main topics that resulted from the strategy are economic factors, non-economic factors and

environmental factors. Any themes, conceptions or ideas from this point on were continued by the authors for each established subject. As part of this research, the author collaborated with other co-authors to develop themes based on the evidence. A log was maintained throughout the study of the data to note any analyses, opinions, puzzles or other ideas that were relevant to the interpretation of the data. In order to identify any discrepancies in the theme design process, the authors compared the findings. Noting that the authors will discuss any differences in the concepts among themselves, it is important to note if there are any. After some time, the themes that had been created were adjusted to ensure that they were uniform. A study was conducted to determine the veracity of the issues by experts; one of whom specialised in built environment research and the other in housing studies. The expert review phase helps guarantee the clarity, significance and applicability of each sub-theme by determining domain validity. In correspondence, the authors modify their conclusions based on feedback and experts' opinions.

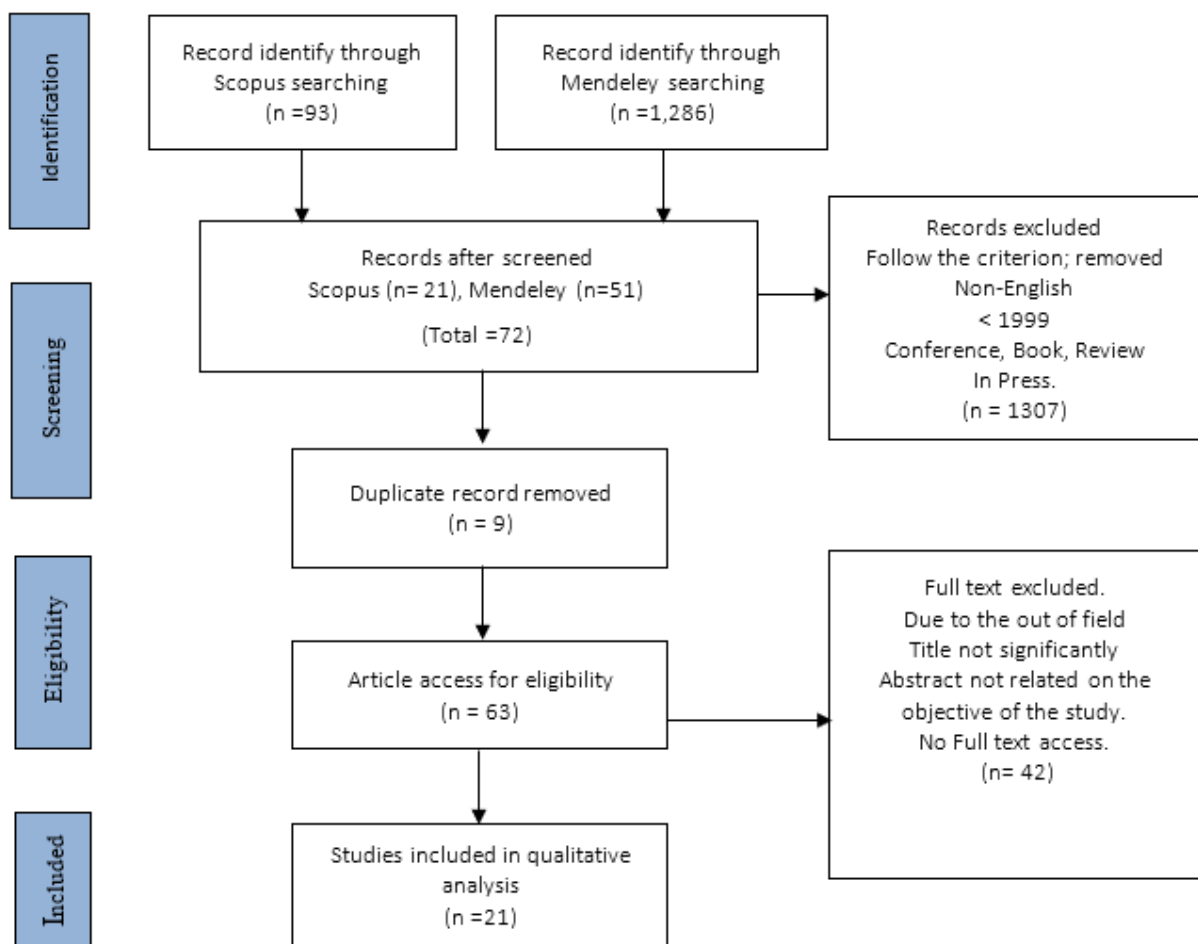


Fig. 2. Flow diagram of the proposed search study [14]

3. Results and Findings

Sustainable affordable housing is a multifaceted concept that combines environmental, social and economic factors to provide accessible, eco-friendly housing solutions. The search strategy was used to extract and examine twenty-one (21) articles. All articles were divided into three categories: economic factors, non-economic factors and environmental factors.

3.1 Theme 1: Economic Factors

Housing is pivotal for sustainable development and population well-being, yet various challenges persist. These encompass the disconnection between supply and demand for low-cost housing, escalating house prices, substandard housing quality and housing stress that transcends financial constraints, affecting both physical and mental well-being. In Johor Bahru, Malaysia, a study delves into housing affordability stress within the M40 income group, examining their capacity to rent or purchase homes based on affordability, loan repayment abilities and income sufficiency. Concurrently, a study in New Zealand investigates the influence of financial factors on property purchase decisions among housing buyers in Auckland. House prices, income levels and financing accessibility wield substantial influence on these decisions, particularly for higher-priced properties with promising returns. Likewise, Ho Chi Minh City's housing sector is witnessing robust growth, with a focus on affordable apartments. Utilising a hedonic regression model, researchers scrutinise the determinants of affordable and unaffordable flat prices. While common factors include vertical access and proximity to downtown, the affordable segment exhibits unique characteristics such as high-rise towers, foreign investment and proximity to shopping centres. Cross River State, Nigeria, is a notable case in addressing factors that are crucial for mitigating the affordable housing deficit and promoting sustainability. The state grapples with a shortage of affordable housing, primarily affecting the urban poor, where the root causes encompass rural-urban migration, inadequate planning, maintenance and management, as well as challenges that are linked to government policies, land acquisition, building material costs and limited access to finance.

Table 3
Summary of economic factor of SAH

Authors	Title	Year	Journal	Methods	Result/Advantages
[15]	Housing Affordability Stress Among the Middle-Income (M40) Group in Johor Bahru	2023	Planning Malaysia	Cross-tabulation analysis was used to examine the association between income and housing affordability. Pearson's Chi-Square analysis & correlation analysis were used to identify significant correlations between factors and family incomes.	Economic factors, including the increasing cost of homes, the amount required for a down payment, spending habits, interest rates and the duration of mortgage payments, have all played a role in adding to the housing affordability stress.
[16]	The Prominence of Financial Considerations on Housing Investors' Purchase Decisions	2020	Journal of Asian Finance, Economics and Business	Structural Equation Modelling was the principal analytical technique used.	House prices, income and credit availability all have an advantageous effect on investors' purchasing decisions.

[17]	Price determinants of affordable apartments in Vietnam: Toward the public-private partnerships for sustainable housing development	2018	Sustainability (Switzerland)	Data set included 714-unit prototypes from 211 apartment developments in HCMC that were marketed since 2000. The ratio of housing prices to the disposable income of a household was used to determine housing affordability. The hedonic regression model was utilised.	The hedonic regression model reveals strong shared pricing factors for both affordable and high-end housing segments.
[18]	Factors Affecting the Shortage and or Provision of Sustainable Affordable Housing in Developing Countries - A Case-Study of Cross River State, Nigeria	2018	Journal of Sustainable Architecture and Civil Engineering	Fifty housing units have been selected at random for the interviews, with around 10% of total units across each housing estate being sampled. A semi-structured face-to-face interview was used to gather data for this study.	The high population density in Cross River State's main areas poses a problem to the availability of affordable housing. Another prominent aspect highlighted was high rental fees, with several interviewers remarking that people who are living in government low-cost housing estates are usually middle-income earners.

3.2 Theme 2: Non-Economic Factors

Sustainable affordable housing encompasses a broad spectrum of non-economic factors that play a pivotal role in creating liveable, environmentally responsible and socially inclusive housing options. Non-economic factors can be broken down into a number of sub-themes consisting of:

- i. house type and design
- ii. housing location
- iii. security
- iv. housing delivery system
- v. technology in construction
- vi. collaborative governance
- vii. housing facilities.

These factors are instrumental in shaping liveable, environmentally responsible and socially inclusive housing solutions. The choice of house type and design significantly influences sustainable affordable housing. Compact and well-designed housing units optimise space utilisation, reduce construction materials and promote energy efficiency. Considerations for universal design principles also ensure accessibility for all, regardless of physical abilities. The location of housing developments is pivotal for sustainability; proximity to public transportation, job opportunities and essential amenities, reduces transportation costs and enhances the overall quality of life. Moreover, sustainable housing should be integrated into the existing urban fabric to minimise environmental impact. Undoubtedly, safety and security are paramount for residents. Sustainable affordable housing incorporates security features such as well-lit common areas, secure access control and community policing efforts to create safe living environments. The efficiency of the housing delivery

system plays a critical role in affordability. Streamlined and transparent processes, reduced bureaucratic hurdles and efficient construction techniques can lower overall costs and accelerate project timelines. Technology such as modular construction methods, often utilising prefabricated components, can significantly reduce construction time and costs. This approach minimises waste, enhances energy efficiency and allows for flexibility in design and expansion. Collaborative governance involves stakeholders from government, communities and the private sector working together to plan, design and implement sustainable affordable housing projects. This approach ensures that diverse perspectives are considered and that housing solutions meet the needs of the community. Sustainable affordable housing includes the provision of essential facilities and services, such as clean water, sanitation, waste management and green spaces. These amenities improve the residents' quality of life and contribute to the overall sustainability of the community. By integrating these non-economic factors into sustainable affordable housing initiatives, communities can create housing options that are not only financially accessible but also socially and environmentally sustainable.

Table 4
 Summary of non-economic factor of SAH

Authors	Title	Year	Source Title	Methods	Result/Advantages
[19]	Determinants of homeownership in Malaysia	2008	Habitat International	The Principal Component Extraction Method is used to measure constructs with numerous indicators of homeownership using factor analysis.	Homeownership is a complex issue that is the result of many determinants, including housing characteristics (house types and property types), employment and income trends and socio-cultural and demographic descriptors.
[20]	Sustainability through Resilient Collaborative Housing Networks: A Case Study of an Australian Pop-Up Shelter	2022	Sustainability (Switzerland)	A qualitative case study of one of Australia's first pop-up shelters. Data was acquired through interviews, review of papers, analysis of Build Well's corporate social responsibility videos, & site visits to the pop-up shelter.	Distributed leadership, the ability to deliberately examine ingrained routines, & the ability to mobilise various levels of convergence are characteristics of resilient networks. These resilient networks are critical to the development of economically and socially sustainable housing options. While these networks are frequently ad hoc, they could be made systematic by the selective use of technological innovations that do not jeopardise the more contingent, adaptable characteristics of networks that are crucial to resilience.

[21]	Building Regulations Assessment in Terms of Affordability Values. Towards Sustainable Housing Supplying in Palestine	2023	International Journal of Sustainable Development and Planning	The research data were collected through a survey of the opinions of 30 experts in the field of designing and building affordable housing in three main Palestinian cities: Nablus, Ramallah and Jenin.	The results showed that the need for values of affordability increases at the urban level compared to the single-building level. The paper's main finding is to establish an approach for a sustainable supply of affordable housing based on collectively, sharing and diversity.
[22]	Criteria and Factors Affecting Sustainable Housing Design in Iran	2017	Journal of Sustainable Development	Descriptive approaches and field investigations, as well as a comparison approach, were used.	Sustainable housing standards include more than just shelter and protection from severe weather and animal abuse, which can also harm humans, as well as being low cost and acceptable. One of the most significant and crucial requirements is that the housing provides a place and ambience of peace, comfort and residence.
[23]	Strategies to promote the acceptance of sandbag building technology for sustainable and affordable housing delivery: the South African case	2022	Journal of Engineering, Design and Technology	This study employed a quantitative research technique that includes a literature analysis and a structured survey via a questionnaire of 228 ABT experts and players within the South African housing market. The study statistically examined 13 options for social acceptance of SBT.	The top three strategies are the establishment of sandbag demonstration installations in all the provinces, the enactment of a sandbag building code, & the accessibility of standard design methodologies for earthbags.
[24]	Urbanization, environment and homelessness in the developing world: The sustainable housing development	2014	Mediterranean Journal of Social Sciences	The 'survey method' was utilised for quantitative data collection. The 'Structured questionnaire' on the homeless research tool was created to cover pertinent data on the respondents' socioeconomic and housing factors.	The result of the study justified the need for urgent attention from the government and other stakeholders towards addressing the problems of homelessness and inadequate housing among the urban poor and those who are deprived of access to decent shelters in the developing world.

[25]	Sustainable City Development: A Brazilian Goal Plan in Practice	2021	Journal on Innovation and Sustainability RISUS	The study has a descriptive exploratory character, the use of a case study of the municipality of Antônio Prado, located in southern Brazil, was chosen as a technical procedure testing and describes how a small municipality could develop and apply the Municipal Goals Plan, based on the objectives of sustainable development (SDG).	The results demonstrated in 42 months of Management (2017-2020) proved quite excellent, with 90% of the 97 actions envisaged by the work teams being completed, owing mostly to three factors: <ul style="list-style-type: none"> • the involvement of individuals in charge with Administrative Management • the relevance of planning at both the operational and strategic levels • the teams' commitment to action execution.
[26]	Sustainable Rural Housing and the Challenge of Climate Change: Experiences from Ethiopia	2013	Journal Of Architecture & Environment	A continuous experimental sustainable rural housing endeavour that is working with local people to improve traditional vernacular homes through a variety of innovative technologies and practices.	The aforementioned innovative projects are examined in the framework of climate change solutions and paradigms for sustainable development.
[27]	Sustainable Housing Affordability in Sabah	2016	Planning Malaysia	The surveys were sent to inhabitants in six of Sabah's most desired residential districts. The questionnaires contain 26 categories (F1-F26) that respondents must select. Respondents rank each item in terms of its importance to sustainable housing affordability.	The ideal place that adheres to the sustainable housing affordability characteristics is one with a high utility degree.

[11]	Exploring the severity of factors influencing sustainable affordable housing choice: Evidence from Abuja, Nigeria	2019	Sustainability (Switzerland)	A survey of 83 affordable housing applicants, 102 and 69 residents of affordable housing estates and shantytowns respectively, was performed. The test confidence level was 95%, which implies a 0.05 level of significance. Using principal component analysis (PCA), the 43 different factors were narrowed down to seven.	Results reveal that the factors affecting SAHC cuts across economic, social and environmental dimensions. "Housing price in relation to income" and "rental price in relation to income" are the most severe factors with relatively high overall scores, which is consistent with similar studies in this domain. However, it was uncovered that respondents placed high priorities on other non-economic factors such as security (safety), housing location and building type.
[28]	In-migration and housing choice in Ho Chi Minh City: Towards sustainable housing development in Vietnam	2017	Sustainability (Switzerland)	A citizen questionnaire survey was conducted in HCMC and an in-depth analysis was carried out.	The results indicate that the row house type for single-family housing is strongly preferred, but a preference for apartments is also observed for future planning. The factors influencing housing choice and movement are family income, housing ownership, housing typology and commuting environment.
[29]	Drivers towards Adopting Modular Integrated Construction for Affordable Sustainable Housing: A Total Interpretive Structural Modelling (TISM) Method	2022	Buildings	Semi-structured interviews with experts Total Interpretive Structural Modelling (TISM) Method	Following the TISM and Reachability Matrix (RM) and Matrice d' Impacts Croises-Multiplication Appliqué a Classement (MICMAC) analytical procedures, social drivers were discovered to have the highest driving and lowest dependent power, followed by productivity and policy drivers. This highlights the significance of social variables in increasing MiC adoption for ASH.

3.3 Theme 3: Environmental Factors

Environmental factors are instrumental in shaping the rise of sustainable affordable housing. Firstly, the local climate and environmental conditions wield significant influence over the design and construction of affordable housing projects. In regions that are prone to extreme weather events such as hurricanes or wildfires, sustainable affordable housing integrates resilient building materials and construction techniques to bolster durability and safety. Conversely, in sun-drenched areas, these projects incorporate solar energy solutions to harness renewable sources, effectively lowering long-term energy expenses for residents. Additionally, attention to local environmental factors, such

as water availability and conservation, leads to the adoption of rainwater harvesting systems and low-flow fixtures, resulting in reduced water consumption and utility costs. These considerations not only enhance the sustainability of affordable housing but also fortify its resilience against climate-related challenges. Secondly, environmental regulations and policies exert a pivotal role in propelling the adoption of sustainable practices within affordable housing development. Government initiatives and building codes that champion energy efficiency, green building standards and sustainable construction materials wield substantial influence over the emergence of sustainable affordable housing. Developers frequently pursue incentives and subsidies that are offered by local governments to offset the initial costs that are associated with integrating green technologies and practices into their projects. Furthermore, more stringent environmental regulations, such as mandates for emissions reduction and energy efficiency, stimulate the incorporation of renewable energy systems and energy-efficient building designs, resulting in decreased operational costs and increased affordability for residents in the long term. This regulatory framework effectively acts as a catalyst for sustainable affordable housing, fostering a built environment that is both more sustainable and energy-efficient while simultaneously addressing affordability challenges.

Affordable housing holds a pivotal role, both for well-being and in sustainable development, with energy-efficient and sustainable housing designs significantly reducing operational costs and energy consumption while enhancing environmental sustainability. Enhanced energy efficiency is particularly vital in combating fuel poverty within affordable housing. To exemplify the focus on sustainability, the potential of integrating Building Information Modelling (BIM) with energy simulation software throughout the housing lifecycle is highlighted, showcasing its capacity to achieve superior sustainability outcomes. Another noteworthy example pertains to the adoption of modular integrated construction (MiC) methods for affordable sustainable housing (ASH), where key drivers encompass cost, time, productivity, quality, environmental, social, policy and demand factors. Among these, social factors emerge as pivotal in enhancing MiC adoption. When applied to contexts like Mogadishu and Somalia, the tool aims to steer decision-making beyond mere economic considerations, emphasising the integration of economic, environmental and social sustainability principles. Consequently, this study underscores the importance of holistic approaches and the incorporation of greener, sustainable measures, recognising the intricate interplay between housing, lifestyles and health.

Table 5
 Summary of environmental factors of SAH

Authors	Title	Year	Source Title	Methods	Result/Advantages
[30]	Household energy use pattern in rural India: A path towards sustainable development	2022	Environmental Challenges	Primary data gathered via the Access to Clean Cooking Energy & Electricity-State Survey (ACCESS) 2014-15. The data was analysed using the multinomial logit model (MNL) & descriptive statistics.	Government policies, such as the Pradhan Mantri Ujjawala Yojana (PMUY), are vital but insufficient. According to locational data, people are more likely to use traditional fuels in places with substantial forest cover.

[31]	BIM Dimensions & Application Areas for Enhancing Sustainability and Affordability of Affordable Housing: As a Key for Effective Housing Policies	2021	Periodica Polytechnica Architecture	Based on an extensive literature analysis that took into account the complete life cycle of affordable housing,	The political economics of affordable housing guidelines and suggestions for affordable housing policies call for the use of BIM across the whole life cycle of affordable houses.
[32]	Construction technologies for sustainable affordable housing within fragile contexts: Proposal of a decision support tool	2021	Sustainability (Switzerland)	The indicators were chosen using extensive reviews of the literature, business white papers and NGO reports.	The tool is built around a set of essential metrics that are organised into three key elements of sustainability. The proposed technique, which is designed to be scalable and reproducible, is ultimately executed in the particular setting of Mogadishu (Somalia), as it is emblematic of the precarious social, economic and political nature of fragile situations.
[33]	Household energy efficiency and health: Area-level analysis of hospital admissions in England	2019	Environment International	The correlations between small-area household energy efficiency parameters & hospital admissions were described using descriptive statistics & regression models.	In the nationwide analysis, residential energy consumption certificate values ranged from 37 to 83 (mean 61.98; standard deviation 5.24). The kind of housing tenure status (e.g., homeowner versus renter), residing in a rural region, & minimum winter temperature all had an impact on admission rates.
[34]	An assessment of urban park- access using house-level data in urban China: Through the lens of social equity	2020	International Journal of Environmental Research and Public Health	Autonavi electronic navigation map (AMAP) is used to extract parks with the latest information and precise resolution. Spatial modelling technologies, such as GIS and remote sensing technology, were utilised to identify 79 city parks with a total area of 250 km ² . Network Analysis Method.	Greening urban redevelopment initiatives and large-scale affordable home construction have driven out the urban poor & rural immigrants who migrate from the downtown areas to the urban outskirts. This would decrease access to urban green spaces as well as public service facilities for lower-income families while exacerbating the disparity in quality of life between the rich and the poor.

3.4 Proposed Sustainable Affordable Housing Model

Within the economic context, the most influential factor affecting housing affordability is household income. This economic dimension comprises three crucial elements: household income, household expenditure, housing costs and financing accessibility. Sustainable affordable housing initiatives must be designed to align with the financial capabilities of the targeted demographic.

Consequently, housing costs should be proportionate to the income of residents to ensure affordability. Beyond housing expenses, households bear additional financial responsibilities. Sustainable housing endeavours to reduce the overall financial burden on residents, thereby enabling them to allocate resources to other vital needs such as education, healthcare and sustenance. The cost associated with the construction and maintenance of sustainable affordable housing is a pivotal consideration. Innovations in construction materials, methodologies and financing models can play a pivotal role in diminishing these expenses, rendering sustainable housing financially viable.

Secondly, non-economic factors encompass a range of components including house type and design, housing location, security measures, housing delivery systems, housing facilities, technology implementation in construction and collaborative governance. Sustainable affordable housing must be tailored to accommodate the diverse requirements of its inhabitants. Efficiently designed spaces optimise utility and comfort, accommodating families of varying sizes and preferences. The geographical location of housing developments plays a crucial role in terms of accessibility, with proximity to job opportunities, public transportation and essential services, all of which significantly influence the residents' quality of life and reduce commuting costs. Ensuring the safety of residents is of paramount importance. Sustainable affordable housing projects should incorporate security measures that not only protect individuals but also foster a sense of community and well-being. Streamlining housing delivery processes can expedite the availability of sustainable affordable housing units, ultimately reducing administrative costs and delays. Access to amenities such as parks, schools, healthcare facilities and recreational spaces can enhance the overall liveability of affordable housing communities, thereby improving the quality of life for the residents. The integration of advanced construction technologies can expedite building processes, minimise waste and decrease costs, contributing to the affordability of sustainable housing. Lastly, involving residents in decision-making processes and fostering collaboration between the public and private sectors can lead to more effective, community-driven solutions in sustainable affordable housing. Significantly, environmental concerns such as energy efficiency, green spaces and technological innovation must be taken into account. Prioritising energy-efficient designs and appliances saves utility costs for the occupants while also reducing the environmental effect of housing complexes, thus contributing to sustainability goals. Green spaces, rooftop gardens and sustainable landscaping not only improve the environmental quality of housing developments but also encourage people's physical and mental well-being. Innovative technologies such as solar panels, rainwater harvesting systems and smart building technology can help reduce the environmental effects of affordable housing while also promoting sustainability goals [35].

The development of sustainable affordable housing requires a complex approach that carefully balances economic, non-economic and environmental considerations. Addressing household income, expenditure and housing expenses while taking into account factors such as house form, location, security, delivery systems, facilities, technology and collaborative governance enables the development of affordable and ecologically responsible housing solutions. Achieving sustainable affordable housing goes beyond economic concerns, incorporating a broad commitment to improving the quality of life for individuals and families while protecting our planet for future generations. As such, it takes a careful balancing act to bring these interrelated forces into harmony for the benefit of society as a whole.

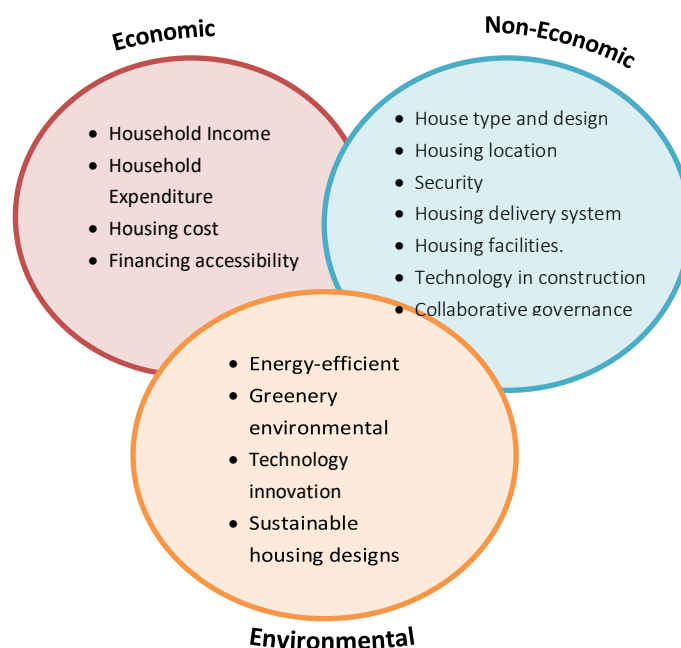


Fig. 3. Proposed sustainable affordable housing model in this study

4. Discussion and Conclusion

In conclusion, housing discourse is undeniably important in terms of sustainable development and the general population's well-being. Specifically, numerous challenges remain in this domain, including the persistent supply-demand gap for affordable housing, rising house prices, substandard housing quality and the broader concept of housing stress, which includes not only financial constraints but also physical and mental well-being. These challenges are inextricably linked to home prices, income levels and finance availability, especially for higher-priced houses with potential returns. These studies underscore the varied nature of housing difficulties and the importance of comprehensive, interdisciplinary approaches to effectively address them, ensuring that housing remains a cornerstone of human and social well-being while improving sustainability. Furthermore, sustainable affordable housing encompasses important facilities and services such as clean water, sanitation, waste management and green spaces in addition to the physical structure itself. These factors not only improve the quality of life for the residents, but they also contribute considerably to the overall sustainability of communities. The debate over sustainable affordable housing emphasises the multifaceted nature of the endeavour, emphasising the importance of non-economic variables in developing liveable, environmentally responsible and socially inclusive housing options. These non-economic characteristics include several sub-themes that, when combined, improve the overall sustainability and inclusion of housing complexes. Communities may establish housing solutions that are financially accessible as well as socially and environmentally sustainable by including these non-economic components in long-term affordable housing projects.

Finally, with an emphasis on energy-efficient and sustainable design, affordable housing plays a critical role in fostering well-being and sustainable development by lowering operational costs and energy consumption. Improving energy efficiency is critical, especially when it comes to alleviating fuel poverty in affordable housing. As a result, past research emphasises the importance of embracing a holistic approach and incorporating eco-friendly and sustainable practices. Sustainable affordable housing acknowledges the complex interplay between housing, lifestyle and health in the

context of affordable housing and sustainable development, emphasising the need for holistic solutions that address economic and environmental concerns while improving social well-being.

Acknowledgement

This research was supported by Ministry of Higher Education (MoHE) of Malaysia through the Fundamental Research Grant Scheme (FRGS/1/2022/SS10/UUM/02/5).

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