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Systematic Literature Review on Sustainable Construction Strategies for the Development of Affordable Housing

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Abstract

The building industry plays a critical role in attaining sustainable development. Despite its substantial contribution to nation-building, the construction industry has a significant environmental impact in both industrialized and developing countries. Even though sustainability is a global issue, developing countries must approach it differently than developed countries, and alternative strategies must be embraced and implemented. In this research, SLR was performed to understand sustainable construction strategies for the development of affordable housing. Using the PRISMA model, we selected and analyzed 22 papers published between 2011 and 2021. The publications were sourced from ScienceDirect, Scopus, Emerald Insight, Sage Journals and Engineering Village through conferences and journals. The systematic review indicates using affordable, locally sourced building material as a sustainable, affordable housing development strategy.

Keywords

Construction, Housing, Systematic Literature Review, Sustainable, Sustainability.

1. Introduction

Due to reasons such as human population increase, natural catastrophes, and conflict, global housing demand has reached unprecedented levels. This is especially true in developing nations, which have been subjected to disproportionately high demand due to their inherent fragility. Many existing approaches to housing delivery in poor nations continue to rely on inefficient and unsustainable building technologies and execution procedures. As a result, affordability and sustainability have become critical issues in the international development debate over housing the poor in developing nations in order to satisfy long-term sustainable development goals and housing demands (Bruen et al,2013).

The building industry plays a critical role in attaining sustainable development. Despite its substantial contribution to nation-building, the construction industry has a significant environmental impact in both industrialized and developing countries. Land degradation increased energy consumption, which has resulted in pollution in recent years (Du Plessis, 2007). The rate of urbanisation is increasing exponentially. Slums and informal settlements are among the challenges facing urban housing policymakers globally. The number of informal housing inhabitants increased from 689 million to over 880 million in the space of 24 years. This drives the need for infrastructural growth (Cheah et al, 2020). Furthermore, implementation is critical in South Africa, where sustainable construction principles are little known (Marsh, 2020). When well-planned and managed, cities produce value, which is defined as the total of all economic, social, environmental, and intangible circumstances that can improve citizens' quality of life in meaningful and tangible ways (Un Habitat; 2020).

Sustainable development creates a one-of-a-kind social, psychological, and physical environment in which people's behavior is harmoniously adjusted to improve the present and provide for the future. Many countries are unaware of the need of environmentally friendly building. Some writers blame a lack of sustainable building design training and education, a clear conceptualization of sustainability, a clear argument for sustainability advantages, and

a lack of long-term sustainability perspective on a lack of sustainable building design training and education (Ganiyu, 2016:). The lack of a precise evaluation instrument to analyze building design, as well as the unwillingness of construction industry practitioners, have all been identified as hurdles to the adoption of sustainability in construction.

Sustainable houses remain at a high rate of need among the citizens. Affordable housing is a basic requirement for human well-being and a fundamental human right. The construction of affordable housing is promoted as a tool to alleviate concentrated poverty, enhance access to opportunity, and improve affordability for many populations viewed as necessary or desirable to a community (Muazu et al, 2011). This becomes a challenge for the government and the built environment to provide the public with other infrastructure such as energy and water in a healthy and adaptive climate (Li et al., 2019). The housing sector is a major consumer of global energy and a contributor to CO2 emissions. Heating and hot water provision among private households account for 40% of the total energy consumption and 25% of greenhouse gas emissions, while 54% of electricity is used to run homes (Adabre et al, 2019).

It is crucial for the construction industry's future and its environmental impact. In Africa, green architecture is viewed differently. It looks at traditional construction methods, energy-saving, and promoting material reuse in a variety of ways. Due to expense, governance, and a lack of technology, it is environmentally cautious and mindful of waste management. Despite these obstacles, numerous institutions are attempting and making success.

Research on sustainable construction strategies for affordable housing development is relatively low in the South African context. Most research has focused solely on sustainable construction (Aigbavboa et al, 2017; Oke et al, 2017; Mashwama et al, 2020) and affordable housing (Butcher, 2020; Othman et al,2011; van Niekerk, 2018) separately. The study of (Massyn et al, 2015) looked at the economics of providing well-located housing in the inner city of Cape Town, South Africa. Moreover, (Ndlangamandla et al, 2019) looked at sustainable construction practices used in developing self-help housing and upgrading informal settlements that are believed to affect the natural environment negatively. An investigation and interrogation are required to implement sustainable practices in South Africa properly.

A complete investigation of the link between innovative and sustainable cities is needed, according to studies, with an emphasis on practical applications that might lead to a deeper knowledge of the domains, typologies, and design principles involved (Angelidou, M et al., 2018). The goal is to discover and connect all three pillars of sustainability: social, economic, and environmental sustainability. In terms of research, sustainability in house development is still in its infancy in South Africa. South African research on this area appears to be underexplored in their efforts. Many articles discuss sustainability in terms of its environmental, social, or economic implications, but few examine it in terms of all three and how they interact and are implemented. Articles like (Masia et al, 2020) focus on energy, water, and resource efficiency, even though there are numerous new technologies and approaches to quantify sustainability. The most notable difference in this study and others is that it will use a mixed-method approach.

2. Review Method

To understand the state-of-the-art strategies on sustainable construction for the development of affordable housing prioritization, a Systematic Literature Review (SLR) was adopted from (Rouhani et al, 2015) and (Lenarduzzi et al, 2021). The SLR method allows researchers to probe into existing scholarly articles. The advantage of an SLR is that it provides transparent and explicit protocols by which researchers search for and assess the field of studies relevant to a specific research topic. It has been widely used in business and management (Tian et al, 2018). For this study, the review protocol was developed jointly by the authors of this paper. In contrast, the corresponding author identified and selected the primary studies following the specified protocol. All the steps of the protocol are described below in this section. The review protocol for the study was designed collaboratively by the authors of this work. This is to help systemically to identify and select the primary papers according to the protocol. The section below describes all the steps of the SLR.

2.1 Research question

Defining and describing sustainability implementation is not a new problem. Over the years, different approaches, methods, and methodologies have been proposed to describe sustainable construction implementation practices. However, little research explains how the strategies enable sustainable construction in the development of affordable housing. As a result, aligned with this paper's overall purpose and research questions, the systematic literature review set out to synthesise existing knowledge of SSCI and answer the research questions. The SLR research questions that we intend to answer in this research are as follows:

RQ1: What are effective strategies for the implementation of S.C. in the South African Construction Industry?

2.2 Search String and process

Mathematical sets and database logic are built on the foundation of Boolean operators. They link your search terms together to narrow or extend your results set. AND, OR, and NOT are the three basic Boolean operators.
The benefits of using Boolean operators are:

- To narrow down a search, especially if your topic has several search terms.
- To link together disparate pieces of data to locate exactly what you're looking for.

Search strings were applied to ensure the availability of relevant publications to grab the most relevant and updated information related to the topic. This SLR concentrated on searching in scientific databases because that is the major research result compared to just in books and reports. Databases allow researchers to see how many times an article was cited. Keyword and search strings were conducted on Emerald Insight Engineering Village, Sage Journals, ScienceDirect and Scopus to retrieve relevant articles for the SLR. The following sources and search strings have been selected to perform the SLR search process:

Table 11: Search databases and strings

Database	Website	Search String
Emerald Insight	https://www.emerald.com/insight/	sustainable construction strategies for the development of affordable housing
Engineering Village	https://www.engineeringvillage.com	Sustainable Construction Strategies for the Development of Affordable Housing
Sage Journals	https://journals.sagepub.com/	sustainable construction strategies for the development of affordable housing
ScienceDirect-Elsevier	https://www.sciencedirect.com	sustainable construction strategies for the development of affordable housing
Scopus	https://www.scopus.com	TITLE-ABS-KEY (sustainable AND construction AND strategies AND for AND the AND development AND of AND affordable AND housing)

2.3 Inclusion and exclusion criteria

The inclusion and exclusion criteria were devised and strictly followed by authors to select primary studies. This is to be used to exclude studies that are not relevant to the research questions. This inclusion criteria were meticulously curated to obtain the most up-to-date, influential, topic-relevant, and correct data in order to provide the best contribution and dissemination of information in the field of sustainable construction. The table below shows the defined inclusion and exclusion criteria.

Table 12: Inclusion and Exclusion Criteria

Criteria	Assessment Criteria
Inclusion	research articles relating to the sustainable construction of affordable housing
	The publications made between 2011 and 2021
	Publications that are written in English
	Peer-reviewed publications
	Publications which are conference papers or journal articles
	subject areas of Social Sciences, Environmental Sciences and Engineering
	Open Access publications
	Papers that are not entirely written in English

Exclusion	Papers from newspapers, blogs and technical reports
	Publications where the full paper cannot be Located
	Papers not within a selected discipline
	Papers not within the 10-year range

2.4 Data analysis

Atlas.ti is a qualitative research tool that allows you to code and analyze transcripts and field notes, as well as write literature reviews, create network diagrams, and visualize data. We may use Atlas.ti software to query data and analyze qualitative data in a systematic and transparent manner. Questions can be asked and answered rapidly with data that would otherwise be buried. There will be no educated guesses. Another advantage is that the results can be double-checked by a third party, ensuring that they are completely accurate. As a result, the information added to scientific and human knowledge will be of higher quality (Friese, 2019).

Following the results of each section above, the initial hits were exported to Atlas.ti. After removing the duplicates, all titles and abstracts were screened to select the relevant studies based on the inclusion and exclusion criteria. The selection of the papers was made to check the comparability of studies by reviewing the abstract. After removing studies that met the exclusion criteria during the initial screening, the full text of the remaining studies was assessed against the inclusion criteria, and any differences were discussed, and a consensus was reached. A flow chart of the study selection procedure is presented in Figure 1.

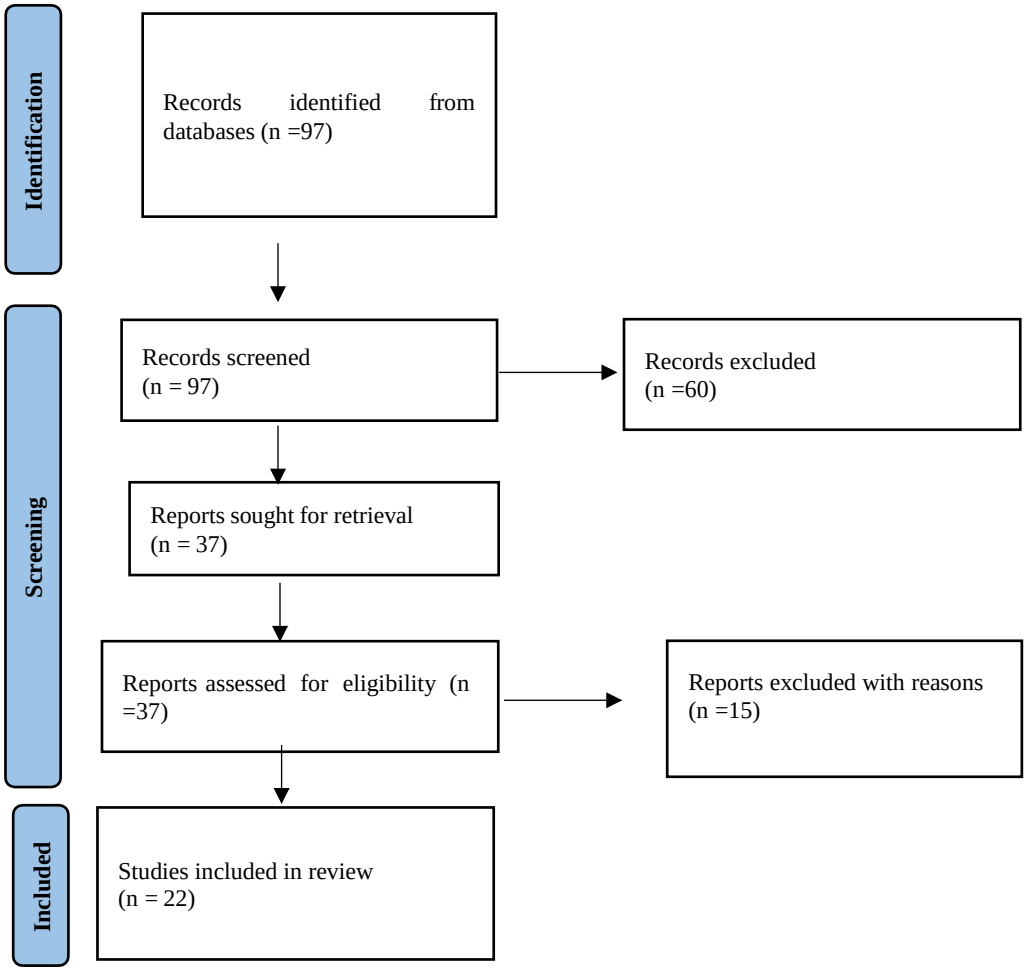

Fig. 8: PRISMA Model

Source; (Page, 2021)

3. Results

3.1 Descriptive Classification

Figure 2 up to figure 5 show the descriptive information of the 22 publications. Figure two shows the annual publications made. The highest number of papers were published in 2020, with five publications. Figure three shows the publications made per country. Australia and Nigeria have four publications each. Ghana with two publications. Seven countries have one publication each. Figure four shows the publication type. Of the 22 publications, 16 publications were journal articles, while six were conference papers. Figure 5 shows the research method. Most publications were Qualitative in 10 publications. Quantitative was used in 5 publications, literature review in 5 and mixed methods in 2 publications.

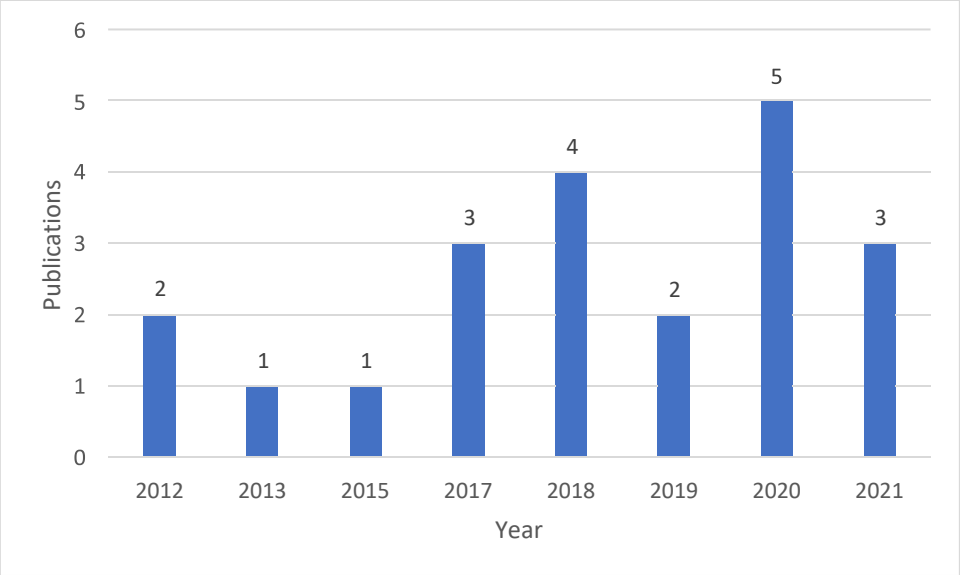

Fig. 9: Number of publications made per year

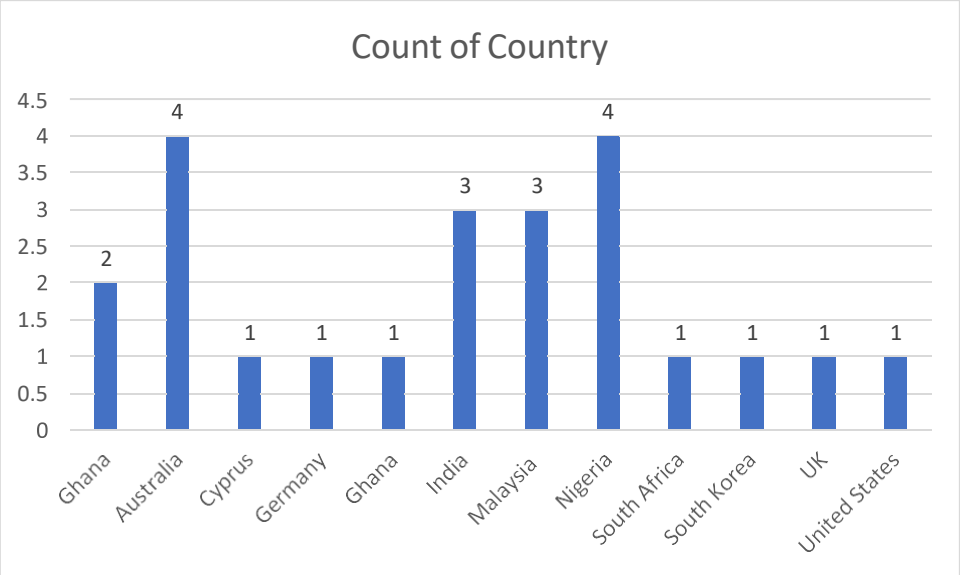

Fig. 10: Publications made per country

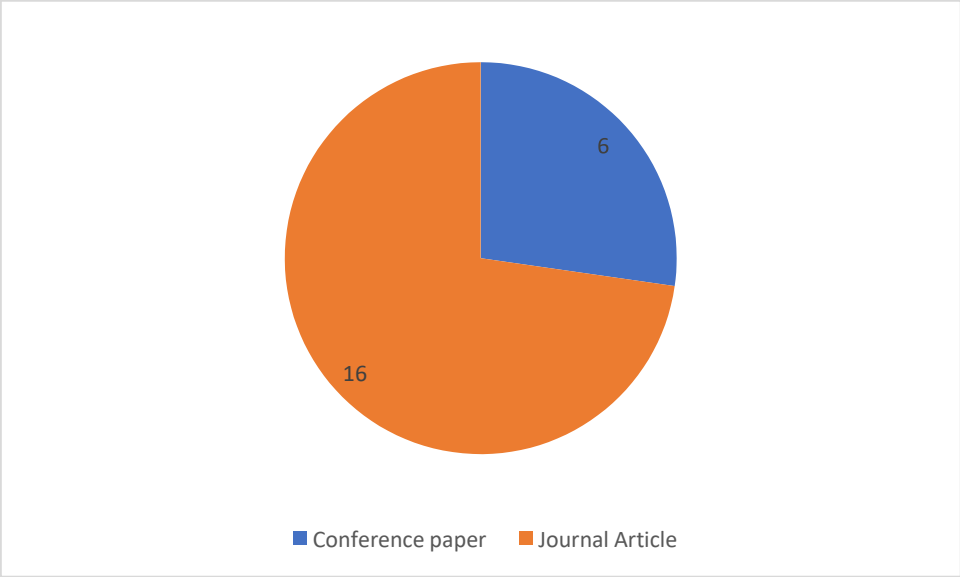

Fig. 11: Selected publication type

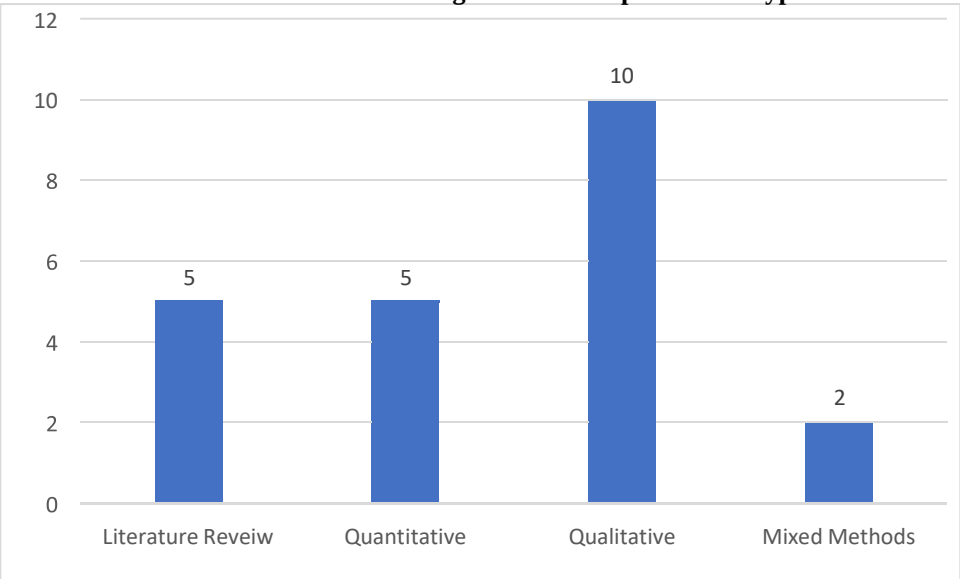

Fig. 12: Research Method

3.2 Thematic Analysis

From the thematic analysis of the publications, it was found that four papers suggested using affordable locally sourced material as a strategy. Moreover, most publications cited partial government finance and the policy response to social housing needs as the second most cited strategy of sustainable construction development of affordable housing.

Table 13: Thematic Analysis

Main Finding	Reference
Using affordable, locally sourced building material	(Ugochukwu et al, 2015), (MacAskill et al, 2021),(Abdul et al, 2018),(Hashim et al, 2012),(Kulshreshtha

	et al, 2020),(Georgiadou, 2012),(Mohammed et al, 2017),(Oluleye et al, 2020)
Offsite construction	(MacAskill et al, 2021), (Nanyam et al, 2017)
Self-build co-housing	(Scheller et al, 2018)
Usage of energy-efficient resources	(Scheller et al, 2018), (Michael et al, 2020), (Georgiadou, 2012)
Increasing public knowledge and awareness	(Scheller et al, 2018), (Dave et al, 2017), (Musonda et al, 2020)
Setting up an appropriate maintenance management plan	(Hashim et al, 2012), (Bilal, 2019)
Government partial finance	(Ortiz et al,2018), (Cronin, 2013), (Morris et al, 2019), (Bilal, 2019), (Mohammed et al, 2017),(Oluleye et al, 2020)
The policy response to social housing needs	(Michael et al, 2020), (Gilbert, 2020), (Georgiadou, 2012),(Feather, 2019),(Mohammed et al, 2017),(Oluleye et al, 2020)
Functional designs for housing and urban infrastructure	(Obianyo et al, 2021), (Morris et al, 2019)
A better understanding of population dynamics	(Obianyo et al, 2021)
Evolution of integrated approach to sustainable housing development	(Obianyo et al, 2021)
Polices of finance with private institutions	(Dave et al, 2017), (Bilal, 2019), (Mohammed et al, 2017)
Investment in research and development	(Dave et al, 2017), (Gilbert, 2020), (Georgiadou, 2012)
Making land urban affordable	(Butcher, 2020), (Georgiadou, 2012), (Feather, 2019), (Mohammed et al, 2017)
Controlling land development and construction through vertical integration	(Butcher, 2020), (Gilbert, 2020)
Directing investors and users into sustainable housing developments	(Butcher, 2020)
The government leading role in shoring up the monopoly of property investors in affordable housing	(Butcher, 2020), (Morris et al, 2019)
Appropriate building design and building services supply	(Cronin, 2013), (Georgiadou, 2012), (Bilal, 2019)
Increasing stakeholder and user participation and communication	(Cronin, 2013), (Musonda et al, 2020), (Oluleye et al, 2020), (Adabre et al, 2020)
Use decision-making techniques and tools	(Georgiadou, 2012), (Adabre et al, 2020)
Development of a housing development model	(Bilal, 2019)
Development of smart technology sustainable housing units	(Musonda et al, 2020)

Discussion

From the figures above we can deduce the following:

- Figure 2 demonstrates that the bulk of sustainability-related publications were released in 2020, indicating that sustainability is becoming more important and on people's minds than ever before.

- The countries with the most publications in the field of sustainability are depicted in Figure 3. The countries with the most publications were Australia and Nigeria, each with four. With two publications, Ghana ranks in second, followed by the rest of the countries with one apiece. This indicates that Australia and Nigeria are countries that are placing a high importance on sustainability and its implementation with the other countries slowly following suite.

- Figure 4 depicts the various types of publications. According to the publications reviewed, journal papers are the most widely published. Sixteen of the twenty-two pieces are journal articles, while just six are conference papers. Journal articles include more material about a subject or discipline than conference papers, which are limited in length. Journals enable for additional research and knowledge to be gathered.

- Figure 5 shows the 22 articles most utilized research methods. Ten were qualitative, five were quantitative, five were literature reviews, and two were mixed approaches. The qualitative method was the most popular since it is simple to comprehend and discover themes and patterns. The data collection procedure is also adaptable, useful, and thorough.

Four papers advised using economical locally obtained material as an approach, according to the publications utilised. Furthermore, most media mentioned partial government financing and policy responses to social housing requirements as the second most cited option for long-term affordable housing creation.

Conclusion

Sustainability is no longer a choice but a necessity. Even though sustainability is a global issue, developing countries must approach it differently than developed countries, and alternative strategies must be embraced and implemented. In this research, SLR was performed to understand sustainable construction strategies for the development of affordable housing. To do this, 22 publications from between 2011 and 2021 were collected and thematically analysed. From the SLR descriptive analysis were able to see that 2020 had the highest number of publications with three papers. The study also found Australia and Nigeria to have the highest number of publications. This suggests that these countries are taking sustainability in construction into consideration. Sixteen of the 22 papers were journal articles, while five papers were literature reviews. Eight papers cited the thematic analysis using affordable, locally sourced building material as a sustainable, affordable housing development strategy. Future research should combine the knowledge gained from the literature review with primary data collected. Future studies should address the limitation on the number of databases used to screen publications

Acknowledgement

This research is funded and part of collaborative research at the Centre of Applied Research and Innovation in the Built Environment (CARINBE) University of Johannesburg

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