

## Exploring Collaboration Across Institutional Affiliations for Sustainable Housing Development in Nigeria

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### Abstract

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Housing is a basic human need, yet its provision remains a major challenge in developing countries such as Nigeria, where the housing deficit continues to widen. This study examined research on housing provision in Nigeria using a bibliometric analysis of 1,045 publications indexed in the Scopus database. VOSviewer software was used to map research themes, leading authors, and emerging trends. Findings revealed five major thematic areas: physical development, environmental issues, socio-economic factors, living conditions, and locational contexts. Environmental sustainability accounted for most emerging keywords, highlighting its growing relevance. Established themes included sustainable development, urbanism, residential satisfaction, affordable housing, and informal settlements, while recent topics in the 2020s focused on COVID-19, gender issues, climate change, air pollution, energy efficiency, thermal comfort, lighting, and electricity utilities. The study recommends prioritizing these emerging areas to support evidence-based policies and sustainable solutions to Nigeria's housing challenges and those of similar developing nations.

**Keywords:** *Nigerian Housing provision, Sustainable development, Bibliometric review, VOSviewer, Emerging trends*

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### **Background to the Study**

Housing, one of the fundamental human necessities, is also used to determine a population's level of life. In its simplest form, shelter is ranked alongside food, water, and air as a basic physiological need (Aule et al., 2022a; Maslow, 2000). The eleventh objective of the Sustainable Development Goals (SDGs) focuses on global collaboration to provide safe, adequate, and better housing, particularly for the poorest and most vulnerable people (United Nations DESA, 2016). Despite the importance of housing to humans, its supply is not always guaranteed. Although the housing crisis is worldwide, it is particularly acute in emerging nations like Nigeria, where it has become a socio-economic issue that requires a coordinated response (Croese et al., 2016; Jaiyeoba & Aklanoglu, 2018). It is somewhat paradoxical that Nigeria, with a current human population of more than 200 million, is also experiencing a massive housing shortage of more than 20 million units, which, at an annual output rate of 200,000 (The World Bank, 2018), is estimated to take at least 20 years to address. Although the World Bank launched the Family Homes Fund (FHF) in 2018 to build 8,000 housing units, many scholars are examining alternative strategies to address the current housing shortage by examining the various indigenous construction styles, materials, and technologies for housing provision (Iwuagwu & Iwuagwu, 2015; Olotuah & Olotuah, 2016). While many stakeholders have often emphasized the need for mass housing, authorities have always used a lack of resources as an excuse for underperformance. In either the mass-housing or indigenous-solution scenarios, scholars call for the involvement of concerned end-users to avoid "uncomfortable prototype" housing deliveries that may result in non-occupation or unguarded transformations (Aule et al., 2019; Aule et al., 2022b; Isah & Khan, 2016; Maina, 2013).

In the ongoing research on the Nigerian built environment, Ilesanmi (2016) stressed the need for young academics to first understand the emerging trends, spread, and scope before deciding on new areas of specialization. Though Scholars have categorized researchable issues into five groups: things, people, records, dynamics/energy, and ideas/thoughts (Leedy & Ormrod, 2010; Ilesanmi, 2016), the contemporary challenges posed by Sustainable Development Goals (SDGs) often transcend these traditional categories. Addressing SDG research problems often requires an interdisciplinary approach beyond these established boundaries, reflecting the complex and interconnected nature of sustainable development issues.

In the housing domain, even seasoned researchers must be abreast of the "emerging trends" for tangible sustainable development. Furthermore, scholars should appreciate "top authors" in the Nigerian housing project for possible research collaborations. Nigeria should explore the network of other countries interested in providing concrete solutions to the lingering housing challenges. These are the objectives this bibliometric and scientometric review sets to explore, using objective scientometric methodologies to identify emerging trends for housing research in Nigeria. The bibliometric and scientometric analysis is therefore necessary as a scoping review, in which a broader pool of literature is methodically screened to identify relevant materials, authors, and journals for a more detailed Systematic Literature Review (Donthu et al., 2021).

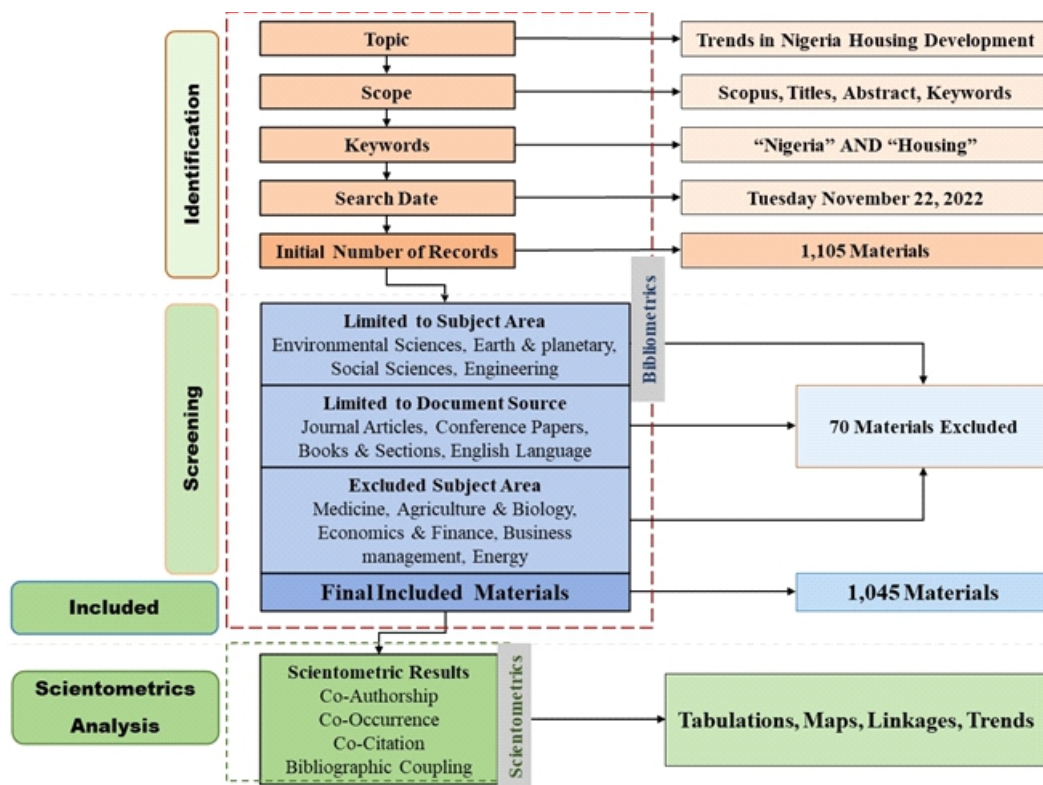
This study's methodology was first outlined, including justification of the choice of the Scopus database, data mining (excluded and included), and analysis tools. The bibliometric information from the selected database was also analyzed and presented in the Results and Discussion section, covering the distribution of data sources and the rising trend in publications across the different periods. Furthermore, the main themes that emerged over time were aligned with the existing literature. Consequently, prominent authors in the field were identified, along with their affiliating institutions. The high point and most important outcome of the bibliometric and scientometric study is the systematic elicitation of emerging keywords and trends for sustainable housing research and development. The emerging trends were generated and presented as keywords, journals, and countries.

### **Materials and Methods**

The study outlines its materials and methods, encompassing the selection of document sources, a rigorous data screening process to arrive at the final article count, and the rationale behind including or excluding specific sources. It also delineates the analytical tools employed and options for presenting the data. These meticulous methods are crucial for discerning prevailing patterns and developments in Nigeria's housing sector.

**Database:** The Scopus database was used to find relevant and high-quality publications for this study because it has a broader range of publications (Tanko & Mbugua, 2021). Since its beginning in 2004, the Scopus database has become a primary selection for journal searches. This popularity stems from its breadth, which includes research on a wide range of topics (Abbas et al., 2022; Sahi et al., 2022; Ghaleb et al., 2022). Unlike other databases, Scopus permits the export of 2,000 articles at once for scientometric data analysis using VOSviewer software, another justification for its usage in this study.

**Data Identification:** The study employed the Systematic Review method, adhering to the criteria of the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA), propagated by Page et al. (2021) to identify, screen, and incorporate data. However, this study's materials identification was limited to the Scopus database to check the difficulty of combining data from other sources with the current version of the VOSviewer tool. As shown in Figure 1, 1,045 documents were initially found when the Boolean operation "Nigeria" AND "Housing" was used as keywords for the data mining. Only materials involving 'Nigeria and housing' were produced with this query string for this general query.



**Figure 1:** Framework for Data Identification, Screening, and Inclusion

**Data Screening:** The search conducted on November 22, 2022, was refined by restricting the "Source" and "Document Type" to "English Language". To facilitate scientometric investigations with VOSviewer, developed by van Eck and Waltman (2022), data from the Scopus database, which allows simultaneous export of up to 2,000 items, required filtering to align with software requirements by simplifying materials and content. With the exclusions, restrictions, and limitations, the final results of 1,045 materials were realized from the succeeding query string:

*TITLE-ABS-KEY (Nigeria AND housing) AND (EXCLUDE (LANGUAGE, "German") OR EXCLUDE (LANGUAGE, "French") OR EXCLUDE (LANGUAGE, "Slovenian")) AND (EXCLUDE (EXACTSRCTITLE, "African Urban Quarterly")) AND (EXCLUDE (EXACTSRCTITLE, "International Journal For Housing Science And Its Applications")) AND (EXCLUDE (EXACTSRCTITLE, "Third World Planning Review")) AND (EXCLUDE (EXACTSRCTITLE, "Mediterranean Journal Of Social Sciences")) AND (EXCLUDE (EXACTSRCTITLE, "International Journal Of Scientific And Technology Research"))*

**Data Inclusion:** After successfully collecting materials, 1,045 documents were exported as CSV files to Microsoft Excel, preserving their bibliographical data and references. Key bibliometric details, such as author names, affiliations, journal types, and rankings, were predominantly sourced from the Scopus database. These compiled materials were then

consolidated into a single Microsoft Excel file and transferred to a computer system. Here, they underwent further scientometric analysis using VOSviewer. This methodical process enabled a comprehensive examination of the collected data, yielding in-depth insights and analysis in the field of study.

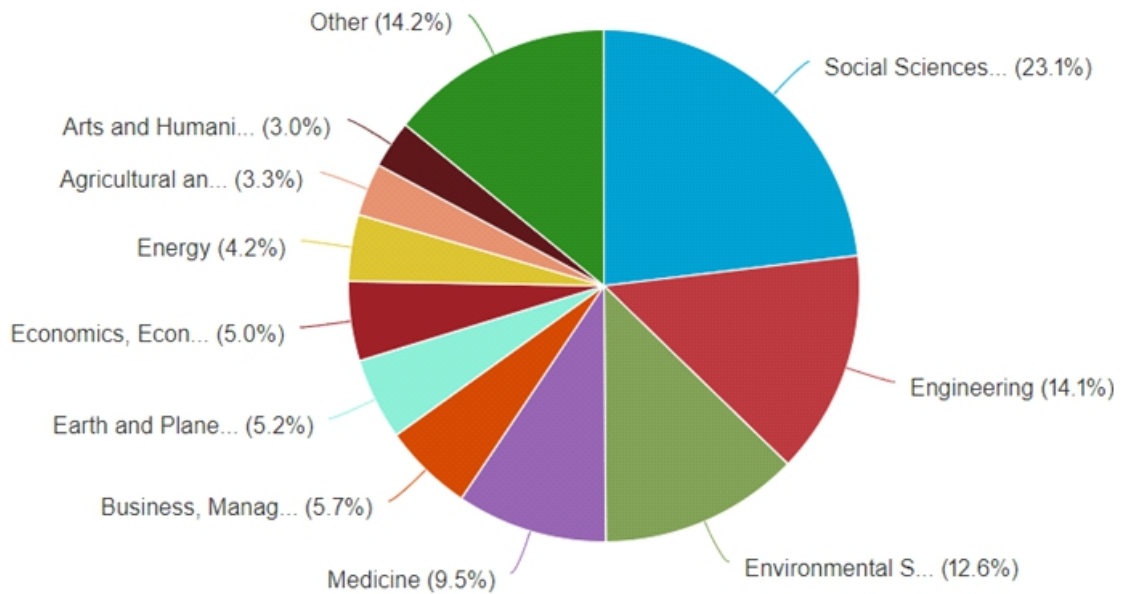
**Scientometrics Using VOSviewer:** Scientometrics is the systematic method of analyzing the effect of research publications, authors, journals, institutions, and nations in a particular knowledge domain, as well as their citation connections (Ghaleb et al., 2022). Although numerous bibliometric tools exist for Scientometrics, VOSviewer was used for this investigation. Bibliometric and scientometric methods are systematic and objective approaches used to streamline broader-scope studies with large datasets, running into the thousands (Donthu et al., 2021). Collectively, they are similar to a Scoping Review, which seeks to produce an overview of a potentially diverse and large body of literature on a broader topic.

The scientometrics analysis employed the "visualization of similarities viewer" (VOSviewer), a text-mining software tool developed by van Eck and Waltman in 2010. This tool facilitates the visualization of similarities among articles from databases, encompassing various dimensions such as journals, citations, authors, organizations, countries, keywords, and other bibliometric data. VOSviewer is instrumental in revealing patterns and connections within scholarly literature, helping researchers explore scientific knowledge landscapes (van Eck & Waltman, 2022). The software, freely available online, currently works with bibliographic records downloaded separately from Scopus, Web of Science, PubMed, Google Scholar, and Dimensions when exported as a Microsoft Excel file (Hosseini et al., 2018; Wong et al., 2020). After that, the program creates a distance-based network, overlay, and density map representations using a range of node sizes, line link strengths, and color-coded themes (Oraee et al., 2017; Wong et al., 2020). With several benefits over other bibliometric tools, Zakka et al. (2021) emphasize that VOSviewer's utility as a data mining tool is particularly advantageous for understandably displaying large maps. Therefore, the software was the principal instrument in this study.

## **Results and Discussions**

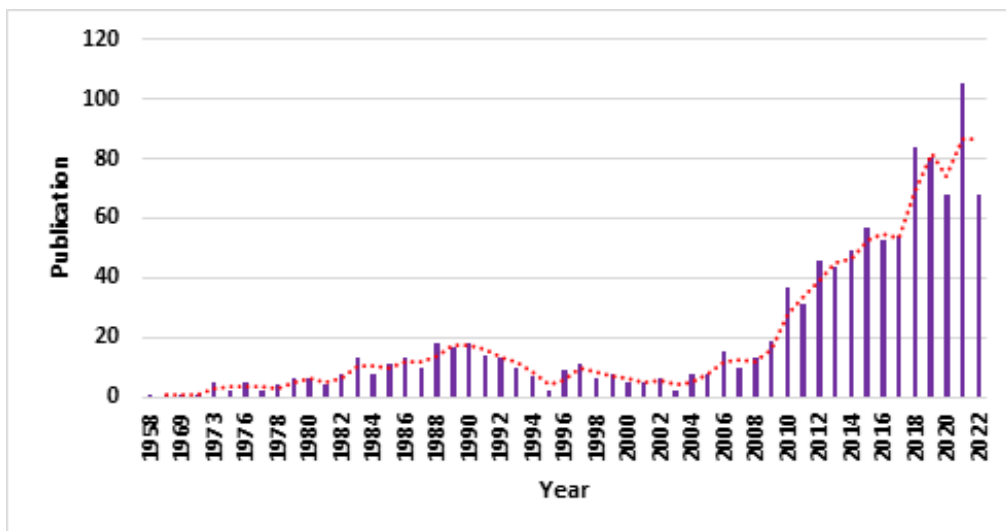
The results of this scientometric review were analyzed, in part, using bibliometric data from the Scopus database and network maps generated with VOSviewer. Therefore, the results were analyzed by document type, document year, source title, author and affiliation, and central themes, before highlighting emerging trends in housing provision in Nigeria.

**Analysis of Documents:** The 1,045 mined resources, comprising journal articles, reviews, and published conference proceedings, were exported into the computer as a Microsoft Excel CSV file. The bibliographic information for the screened materials from the Scopus database shows a distribution across Social Sciences (23.1%), Engineering (14.1%), Environmental Sciences (12.6%), and Medicine (9.5%), among other multidisciplinary disciplines, as presented in Figure 2. Most social science literature affirms the importance of housing as a fundamental human need (Aule et al., 2022a; Azouz & Sameh, 2020; Turkoglu, 2015).



**Figure 2:** Distribution of Materials Based on Subject Area

According to the search results, housing research in Nigeria began in the 1950s, but it was not until the 1970s that more than one publication appeared in a year. The astonishing pace of Nigeria's housing research was established in the 1980s, with over 10 publications annually. However, optimal potentials were realized at the turn of the twenty-first century, peaking at 105 research publications in 2021, as presented in Figure 3. Though 2022 has generated 68 journal publications by various writers so far, with 16 articles still in press, it remains to be seen whether the trend will continue.



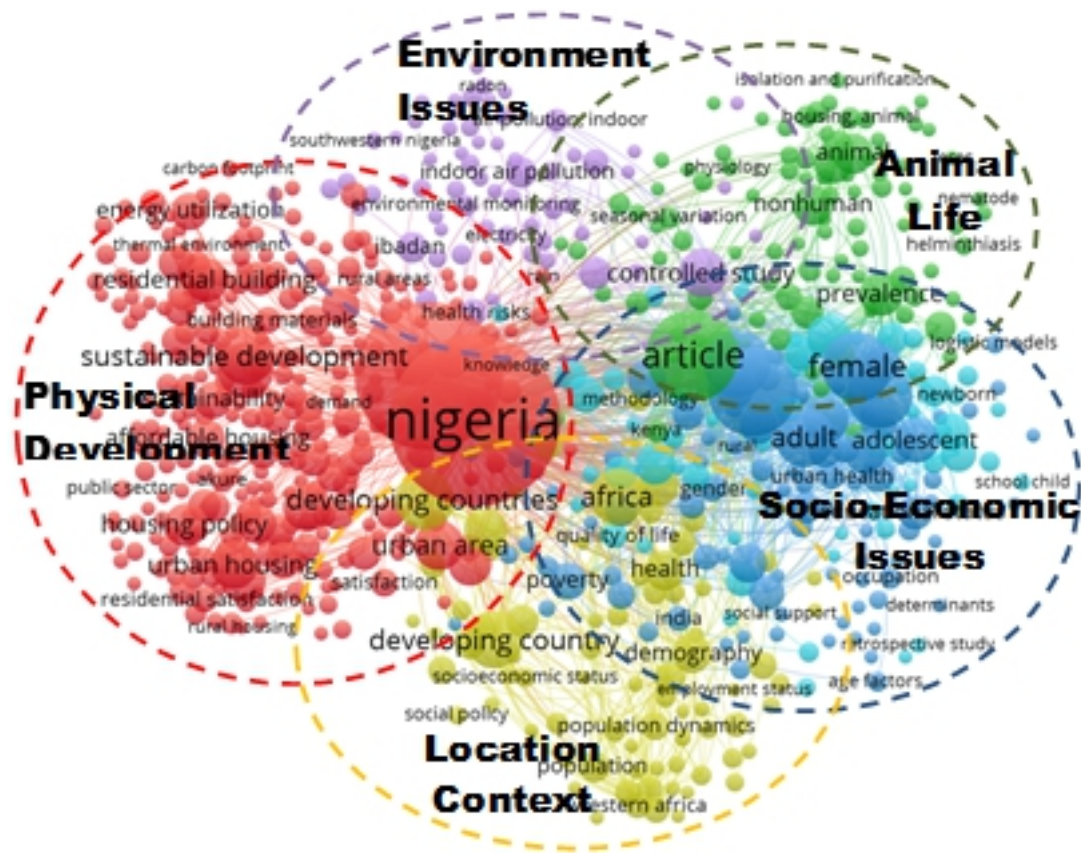
**Figure 3:** Historical Perspective on Nigeria Housing Research

### **Themes in Nigerian Housing Research**

Over time, researchers in Nigerian housing have identified five broad categories of phenomena—namely, physical objects, human aspects, data and records, dynamic processes and energy, and intellectual concepts—as sources of researchable topics. Nonetheless, Ilesanmi (2016) emphasizes that pursuing factual answers to research questions often transcends these conventional categories, particularly in the context of the Sustainable Development Goals (SDGs), which span economic, environmental, and social domains and defy neat specialization.

Themes in Nigerian housing research have evolved. Typically, scholars have categorized researchable issues into five groups: people, things, records, ideas/thoughts, and dynamics/energy (Leedy & Ormrod, 2010; Ilesanmi, 2016). However, as Ilesanmi (2016) notes, addressing research questions, particularly in light of contemporary challenges like the Sustainable Development Goals (SDGs), often transcends these predefined categories. The SDGs encompass economic, environmental, and social dimensions, making it challenging to confine research within traditional boundaries. This extensive posture underscores the need for interdisciplinary approaches to navigate the complexities of contemporary issues, recognizing the interconnectedness of economic, environmental, and social factors in pursuing sustainable development goals in Nigeria and beyond.

This scientometric study, using the Scopus database, identified five significant clusters in Nigeria's housing and built environments related to SDG issues. The themes are seen to relate to physical developments (red), socio-economic issues (blue), environmental concerns (purple), animal life (green), and locational context (yellow), as presented in Figure 4. These themes appear consistent with previous findings that social, economic, and environmental issues are among the sustainability concerns impacting global housing growth (Aule et al., 2022b; Jaiyeoba & Aklanoglu, 2018). While each central theme comprises various issues, there are elements of interdisciplinary collaboration between two or more to form a trend. The prominent items in the cluster of physical developments include housing construction, sustainable advancements, urbanization, climate change, and household livelihood, and the major socio-cultural issues include COVID-19, gender, educational status, maternal health, and child education, among others. The significant environmental challenges are air pollution, radioactivity, environmental monitoring, risk assessment, health hazards, child health, and waste disposal. Nonetheless, animal life concerns include human and non-human experimentation, with most contextual difficulties centered on Africa and Nigeria.



**Figure 4:** Scientometric Generation of Main Themes in Nigerian Housing Research

Most of these major themes were published by Nigerian authors residing in their native country or in the diaspora, across several institutions. New scholars in Nigeria's housing research should carefully note the themes to inform methodological decisions for their prospective contributions. Subsequently, mapping themes using Scientometrics requires a methodical combination of keyword co-occurrences and total linkages across the reviewed texts and sources.

**Analysis of Authors:** This section lists the top 10 prolific and most-cited Nigerian authors in the broad field of housing, as shown in Table 1. Knowledge about the leading writers in a study frequently stimulates research, encourages collaboration, and improves transdisciplinary productivity through efficient networking (Abbas et al., 2021; Czischke, 2018).

**Table 1:** Bibliometric Information of Top-Ten Authors in Nigeria Housing Research

S/N	Author	Discipline	Docs in Query	Total Pubs	Total Citatns	h-index	Sci-Link	Top Cited Material
1	Ibem, E.O.	Architecture	38	95	1,140	20 (1)	60	( <b>Ibem &amp; Aduwo</b> , 2013)
2	Olotuah, A. O.	Architecture	13	20	114	6 (6)	20	(Olotuah, 2002)
3	Opoko, A. P.	Architecture	11	22	117	5 (9)	27	(Ibem, <b>Opoko</b> , Adeboye, & Amole, 2013)
4	Oluwatayo A. A.	Architecture	10	35	102	6 (7)	23	( <b>Oluwatayo</b> , Aderonmu, & Aduwo, 2015)
5	Aduwo, E. B.	Architecture	9	28	320	9 (4)	11	( <b>Ibem &amp; Aduwo</b> , 2013)
6	Aigbavboa C. O.	Quantity Survey	9	520	1904	20 (2)	17	(Dogo, Afolabi, Nwulu, Twala, & <b>Aigbavboa</b> , 2018)
7	Ebekozien, A.	Quantity Surveying	9	53	334	9 (5)	12	( <b>Ebekozien &amp; Aigbavboa</b> , 2021)
8	Adedeji, Y. M. D.	Architecture	8	11	61	3 (10)	19	(Adegun & <b>Adedeji</b> , 2017)
9	Adegun, O. B.	Architecture	8	28	325	11 (3)	06	(Morakinyo, Dahanayake, <b>Adegun</b> , & Balogun, 2016)
10	Aliu, I. R.	Urban Planning	8	17	107	6 (8)	00	( <b>Aliu</b> , Adeyemi, & Adebayo, 2014)

Docs in Query (Documents in Query); Total Pubs (Total Publications); Total Citatns (Total Citations); Sci-Link (scientometric Links with other authors)

Furthermore, novice researchers in the field will benefit from explicit direction regarding influential authors to track, their respective contributions, and essential sources for bibliometric investigations. In addition to gathering authors' names, publication counts, and citation metrics, the analysis also documented their areas of expertise and identified their most frequently cited works. This comprehensive approach facilitates a more informed and holistic understanding of the scholarly landscape within the discipline. Authors were predominantly assessed based on the number of documents in the final query string. Additionally, their h-index, a measure reflecting the citation-per-document ratio, was calculated as part of the evaluation process. According to the search results, Ibem E.O. is the most prolific publisher in Nigeria for housing research, with 38 publications, followed by others with 13 articles and fewer. Outside the query region, the top-ten writers' bibliographic information shows that most wrote more than 10 papers, with Aigbavboa (502) and Ibem (95) standing out in the African and Nigerian contexts. The top-ten table also reveals that most of the top writers on Nigeria's housing research are in architecture (7), quantity surveying (2), and urban and regional planning (1). The distribution reaffirms the distinct significance of

Architecture as a pivotal discipline in shaping the development of the built environment (Chantzaras, 2019; Jutraz & Zupancic, 2014).

In addition, the VOSviewer examination of authors' co-citations in the exported materials produced scientometric linkages. Using the "create a map based on bibliometric data" feature, documents extracted from the Scopus database in MS Excel format were uploaded. The "co-authorship all authors" option was selected and loaded during the process. With at least one document in the search, the co-authorship analysis links show that Ibem has 60 links to other authors. Four of the ten authors have strong links of 20 or more, with the rest having an average of 10 co-authorship links, and one author has no links among the authors in the search query. The connections also show that most authors in similar disciplines have stronger links among themselves than with those outside their discipline. Therefore, it could be inferred that without any link in this search inquiry, the author may not be in the mainstream of Nigerian housing, likely with more connections outside this study area.

In addition to bibliometric data on publications, citations, and disciplines for the top 10 writers on Housing in Nigeria, the authors' affiliations were retrieved from the Scopus database. For collaboration and networking, it is crucial to be familiar with authors from other universities working on comparable research areas (Khudzari et al., 2018; Krauskopf, 2018). As expected, 90% of the affiliating institutions were in Nigeria, with one from Asia. In this context, the ranking of affiliating institutions was based on the number of documents retrieved by the final query. Table 2 shows that Covenant University - Nigeria ranked first among the institutions returned by the query search, with 101 journal articles, followed by the University of Ibadan with 94 publications.

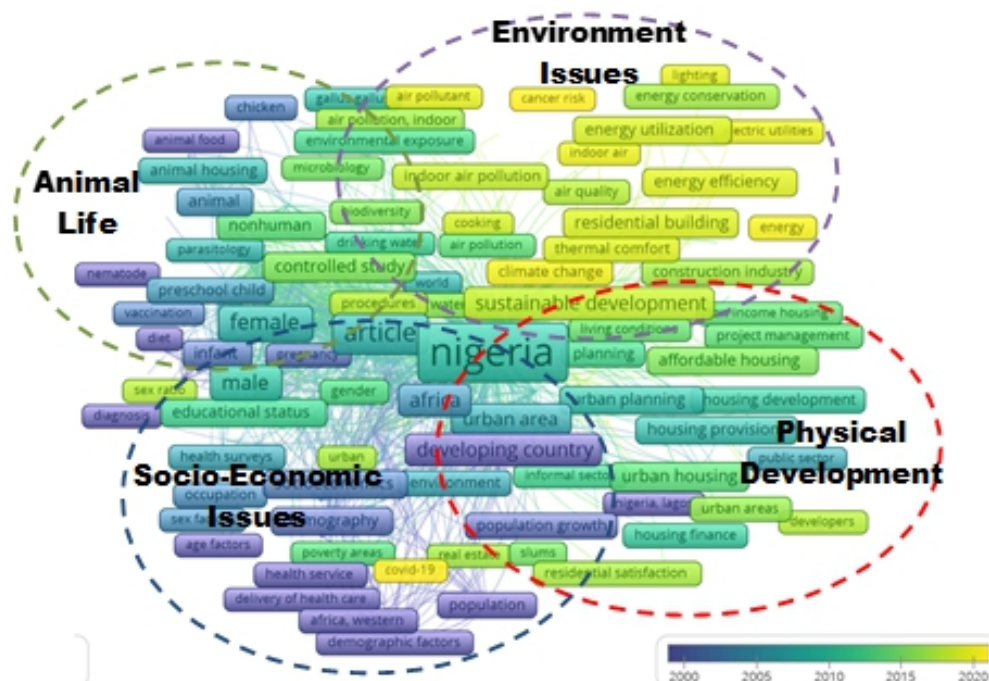
**Table 2:** Bibliometric Information of Top-Ten Institutions in Nigeria Housing Research

S/N	Name of Institution	Docs in Query	Total Docs	Total Authors	Docs/ Author	Impact Ranking
1	Covenant University	101	7,756	3,173	2.44	5
2	University of Ibadan	94	26,669	6,962	3.83	2
3	Obafemi Awolowo University	89	13,101	4,881	2.68	3
4	Federal University of Technology, Akure	61	5,913	2,458	2.41	6
5	University of Lagos	54	10,551	4,145	2.55	4
6	University of Nigeria	49	15,498	7,781	1.99	9
7	Universiti Teknologi Malaysia	40	50,067	12,618	3.97	1
8	University of Jos	26	3,130	1,603	1.95	10
9	Ahmadu Bello University	25	9,916	4,595	2.16	8
10	University of Benin	22	7,293	3,340	2.18	7

Docs in Query (Documents in Query); Total Docs (Total Documents); Docs / Author (Documents per Author)

According to the ranking, most of the top 10 universities have more than twenty articles that match the search query. The top 10 universities have thousands of documents in the Scopus database with thousands of citations; nevertheless, the tabulation was based on the number of articles returned by the search query. In addition to calculating the influence of universities on global research, the number of publications per author was also determined. Since housing and dwellings are essential elements of the built environment (Molinsky & Forsyth, 2018) and constitute the majority of architectural research in Nigeria (Ilesanmi, 2016), it is logical to use these research outputs to generalize and rank Nigerian institutions in the built environment.

**Emerging Keywords in Nigerian Housing:** The emerging Keywords were also elicited and grouped based on four main themes, in addition to the contextual issue of development in Nigeria. The four major themes include Physical Development, Socio-economic Issues, Environmental Concerns, and Animal Life, as presented in Figure 5. Emerging themes in Physical Development include sustainable development, residential satisfaction, urban development, low-income and affordable housing, and informal settlements, among others. The analysis identified most emerging themes related to environmental issues, including climate change, air pollution, energy efficiency, thermal comfort, lighting, and power utilities. On the other hand, emerging socio-economic themes include COVID-19, urban life, gender issues, educational attainment, and poverty reduction. The emerging themes in this study align with those of researchers who argue that most current housing and built environment research is concerned with humanity and environmental challenges that necessitate social improvements (Aule et al., 2022b, 2022c; Horgan & Dimitrijević, 2020).



**Figure 5:** Emerging Keywords for Productive Research in Nigerian Housing

In addition, climate change, social instability, and renewable energy, among others, are central to the mundane issue of sustainability (Doost et al., 2019; He et al., 2017). Furthermore, the theme identified in this study, "animal and life," involves the conservation of biodiversity and microbiology, among other non-human beings, which, according to Hirvilammi and Helne (2014), has an immense impact on global ecosystems.

In actuality, gaps in Nigeria's housing research are intertwined with emerging themes and can be examined by selecting keywords for further inquiry. As Trisos et al. (2022) noted, emerging trends represent themes that aim to address particular research gaps through innovative data and technology methods (p. 1330). Since the start of the twenty-first century, the Sustainable Development Goals (SDGs) have been a guiding framework with various objectives to address major global concerns (Aule et al., 2019). In addition to the long-term problem of the SDGs, important worldwide issues in the 2020s include "Climate" change, "Covid-19", and the myriad human "Crises" between people and states, sometimes known as the Three Cs (International Federation of Red Cross and Red Crescent Societies, 2021, 2022).

Scientometrics uses a systematic blending of co-occurrence and harmonization of all linkages in the document sources under examination to map the emerging keywords. In this scientometric analysis, new scholars may seek to examine and evaluate connections between emerging subjects such as SDGs and food security, climate change and COVID-19, food security and educational status, and climate change and public health, among others. The approach may involve human experimentation, cross-sectional research, risk assessment, and controlled study, among other methodologies, depending on the discipline. New academics in Nigeria's housing research should capitalize on emerging trends to identify existing challenges, difficulties, and gaps, thereby providing tangible research results.

### **Conclusion and Recommendations**

This study examined the evolution and structure of housing provision research in Nigeria, focusing on publication growth, thematic development, leading authors, institutional contributions, and emerging research directions. The findings show that housing research in Nigeria has progressed from its early stages in the 1950s, gained significant momentum in the 1990s, and reached peak scholarly output in the twenty-first century. This growth reflects increasing academic and policy concern over Nigeria's persistent housing deficit and the broader challenge of achieving sustainable urban development. The bibliometric and scientometric analysis confirms that housing research in Nigeria is highly multidisciplinary, spanning physical development, environmental sustainability, socio-economic issues, housing quality, and locational dynamics. The study highlights the importance of research collaboration networks in strengthening knowledge production, innovation, and institutional productivity, as evidenced by influential scholars and leading institutions in the field.

A key contribution of this study is the identification of emerging research themes shaping contemporary housing discourse, including affordable housing, informal settlements, climate change, renewable energy, thermal comfort, air pollution, gender inclusion, and post-COVID-19 housing realities. These shifts indicate a clear transition from a focus on housing

quantity toward broader concerns of sustainability, resilience, inclusiveness, and quality of life. Although the study is limited to Scopus-indexed and English-language publications, it provides a reliable overview of research trends and offers valuable insights for policy and academic direction. Overall, the study underscores the importance of evidence-based planning and institutional collaboration in addressing Nigeria's housing challenges. It concludes that sustainable housing development requires coordinated action among government, academia, industry, and communities to ensure affordable, inclusive, and resilient housing systems for present and future generations.

Based on the study's objectives and findings on housing research trends, thematic evolution, and emerging priorities in Nigeria, the following five recommendations are proposed:

- i. **Integrated Sustainable Housing Policy:** Government at all levels should adopt housing policies that integrate affordability, sustainability, climate resilience, infrastructure development, and livability. Emphasis should shift from numerical housing provision to quality and environmental performance.
- ii. **Strengthening Interdisciplinary Collaboration:** Academic institutions and professional bodies should promote stronger collaboration across architecture, engineering, urban planning, environmental sciences, and social sciences to develop holistic housing solutions.
- iii. **Focus on Emerging Research Priorities:** Policymakers and researchers should prioritize emerging themes such as informal settlements, climate change adaptation, renewable energy, thermal comfort, gender inclusion, air pollution, and post-pandemic housing needs, which represent key knowledge and policy gaps.
- iv. **Enhancement of Research Networks:** Identified leading scholars and institutions should be leveraged to strengthen national and international research collaborations, improving knowledge exchange, innovation, and evidence-based housing strategies.
- v. **Investment in Innovation and Evidence-Based Practice:** Government and private sector stakeholders should support housing innovation through low-cost technologies, local materials, and energy-efficient designs. Housing policies and programmes should be firmly grounded in empirical evidence from scientometric and bibliometric studies.

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