

Mapping the landscape of vernacular architecture research in Indonesia: A bibliometric analysis

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ARTICLE INFO	ABSTRACT
<p><i>Article history:</i> Received June 24, 2024 Received in revised form July 11, 2024 Accepted August 19, 2024 Available online December 01, 2024</p> <p><i>Keywords:</i> Architectural preservation Bibliometric analysis Cultural heritage Research trends Sustainability Vernacular architecture</p> <p>*Corresponding author: Muhamad Ratodi Architecture Department, Science and Technology Faculty, State Islamic University of Sunan Ampel Indonesia Email: mratodi@uinsa.ac.id ORCID: https://orcid.org/0000-0001-8292-9400</p>	<p><i>The evolution of Indonesian vernacular architecture research is examined using bibliometric analysis. We investigate publishing trends, authorship patterns, thematic focuses, and geographical distribution of research from 2000 to 2024 using Scopus data from 89 publications. Since 2015, research on sustainability, cultural identity, and preservation has increased significantly. Analysis shows a fragmented research community with room for more collaboration, especially between domestic and international organizations. Java and Bali are the most researched, indicating a geographical imbalance. Disaster resilience, digital documentation, bioclimatic performance, sustainable tourism, and vernacular urban adaptation are trends. The study finds research gaps, notably in eastern Indonesia, and advises additional research. Researchers, policymakers, and practitioners studying and preserving Indonesia's rich architectural legacy can benefit from this comprehensive review. This project maps the present research landscape to assist future research and preserve Indonesian vernacular architecture.</i></p>

Introduction

Vernacular architecture embodies the cultural legacy that showcases the indigenous knowledge and communal adjustment to their surroundings. Vernacular architecture in Indonesia is of paramount importance in defining the national architectural identity and character, given the country's extensive cultural and geographical diversity (Idham 2018). Nevertheless, the presence of vernacular architecture is progressively endangered due to modernity and globalization, necessitating focused efforts from

several stakeholders, such as researchers and academics (Pardo 2023).

Over the past few decades, there has been a substantial rise in the interest surrounding the examination of vernacular architecture in Indonesia. This is seen in the increasing quantity of scientific articles that address this subject (Octavia and Prijotomo 2018). Nevertheless, there has not been a thorough investigation that has systematically mapped and analyzed the progression of research in this particular topic. Hariyanto, Sudradjat, and Triyadi (2021) highlight that the absence of a comprehensive review of vernacular architecture study in



Indonesia impedes our comprehension of its development and present condition.

The bibliometric methodology provides a systematic and quantifiable means of examining the trends, patterns, and dynamics of research within a scientific discipline (Lazarides, Lazaridou, and Papanas 2023; Salinas-Ríos and García López 2022). This study seeks to use bibliometric methodologies to comprehensively analyze the progress of vernacular architectural studies in Indonesia. Its objectives are to identify the prominent rising themes, uncover any gaps in the research, and highlight potential areas for further investigation. This methodology has proven to be effective in a range of architectural study fields (Rong and Bahauddin 2023), but its use in the context of Indonesian vernacular architecture is still limited.

This study utilizes a bibliometric technique to thoroughly analyze the scope of vernacular architecture research in Indonesia. The main objective is to examine the progress and patterns of this discipline using current scientific literature, offering a comprehensive perspective on its growth throughout the years. The research aims to identify the predominant themes, methodological techniques, and geographical focuses that have been prominent in the discussion on Indonesian vernacular architecture. Furthermore, the objective of this study is to chart the collaborative networks among academics and institutions involved in this topic, providing insight into the academic ecosystem that surrounds the study of vernacular architecture in Indonesia. This analysis aims to identify any gaps in the existing literature and develop a future research agenda. It has the potential to guide future scholarly efforts in this field. In essence, this project aims to use bibliometric findings to generate evidence-based suggestions for the advancement and conservation of vernacular architecture in Indonesia. These observations are anticipated to provide guidance for the development of policies and methods for conservation, thereby aiding in the sustainable preservation of Indonesia's abundant architectural legacy. This project seeks to further our understanding of the significance of vernacular architecture in Indonesia's cultural landscape and its possible contributions to modern architectural practice and theory. It attempts to bridge the gap between academic research and practical implementation.

Methods

This study utilized a bibliometric methodology to examine the research landscape of vernacular architecture in Indonesia. The Scopus database was chosen as the main source for data collection because of its extensive coverage of peer-reviewed literature and strong indexing system. The search query was performed using the keywords "Indonesia" and "vernacular architecture", resulting in an initial retrieval of 125 items. In order to guarantee the quality and ease of access to the data, we implemented supplementary filters, such as open access availability and document type restrictions (limited to articles, reviews, and conference papers). After undergoing the refining procedure, a total of 89 publications were obtained for analysis.

After extracting the initial data, Openrefine was used to screen and clean the data. This essential process guaranteed the elimination of duplication, the uniformity of author names and institutional connections, and the authentication of bibliographic material. Utilizing Openrefine improved the overall caliber and dependability of the dataset, making it ready for more intricate analysis.

The bibliometric analysis was mostly performed using VOSviewer, a robust tool for visualizing and investigating bibliometric networks. VOSviewer enabled the generation of diverse maps and networks, such as co-authorship networks to depict patterns of collaboration among researchers and institutions, keyword co-occurrence maps to identify primary themes and their connections, and citation networks to ascertain influential works and authors in the field. The technique was utilized to analyze publishing trends, determining the field's growth trajectory over time.

In addition, the research's geographical focus in several parts of Indonesia was mapped utilizing VOSviewer's clustering and visualization capabilities. This facilitated the identification of certain regions that have received significant attention or have been overlooked in the examination of vernacular architecture within the country. A group of highly cited publications underwent content analysis to determine the prevailing research methodology, themes, and approaches.

It is crucial to recognize that although Scopus offers comprehensive coverage, it may not include all pertinent publications, especially those written in local languages or published in regional journals. In addition, the search based on keywords may have overlooked several pertinent articles that do not explicitly include the phrase "vernacular architecture" but explore interconnected ideas. The findings of the bibliometric analysis were analyzed in relation to general trends in architectural research and the unique socio-cultural setting of Indonesia, using VOSviewer's diverse range of charts, graphs, and network maps. The objective of this integrated approach, which combines the data refinement capabilities of Openrefine with the advanced visualization and analysis functionalities of VOSviewer, is to offer a detailed comprehension of the developing domain of vernacular architectural research in Indonesia. This approach aims to identify significant patterns, areas of deficiency, and potential avenues for future investigation.

Results and discussion

The bibliometric analysis of 89 papers on Indonesian vernacular architecture yielded several significant insights into the research landscape of this field.

Publication trends and growth

The analysis revealed a steady increase in publications on Indonesian vernacular architecture over the past two decades (see [figure 1](#)). A notable surge in research output was observed from 2015 onwards, with the number of publications doubling compared to the previous five-year period. This trend indicates growing academic interest in the subject and its increasing relevance in contemporary architectural discourse.

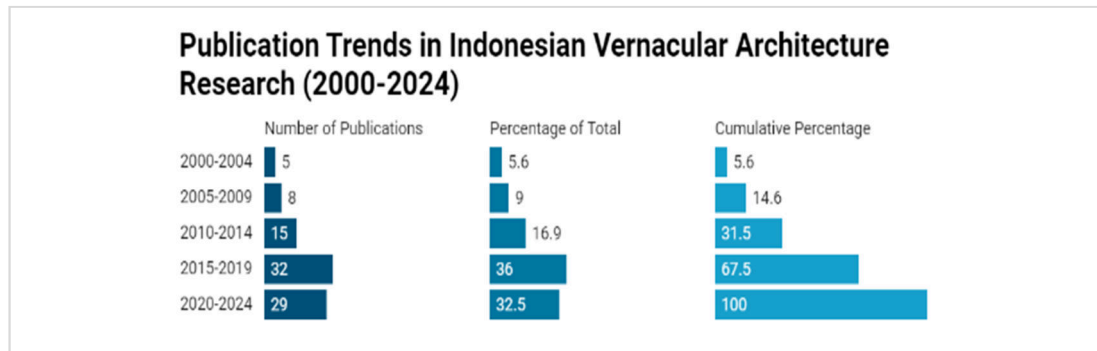


Figure 1. Publication trends in Indonesian vernacular architecture research (2000-2024)

Over the past two decades, the publication trends in Indonesian vernacular architecture study expose a notable change in the academic scene of the discipline. Careful study and interpretation are warranted by the consistent rise in publications over this period, which culminates in a clear spike from 2015 onward.

The first slow increase in publications from 2000 to 2015 points to a constant, if modest, curiosity in Indonesian vernacular architecture. This trend perhaps shows a rising awareness of the value of conventional architectural methods in the context of fast globalization and modernism. Researchers might have been laying the foundation for more thorough investigations,

developing approaches, and pointing up important field-of-focus topics at this time.

Especially remarkable and with various possible explanations is the doubling of papers published after 2015. Growing worldwide attention on sustainability could be relevant as, in the framework of climate change and environmental issues, vernacular architecture often reflects sustainable practices and is thus a relevant subject. Research projects may have been sparked by initiatives for cultural preservation as well as increasing awareness of the need of recording and safeguarding of traditional architectural knowledge. More in-depth research may have been enabled by technological developments like better research tools and

approaches include computer analysis or superior imaging techniques. Policies either national or international encouraging preservation of cultural legacy could have generated financing and scholarly interest. Furthermore, the combination of popular architectural studies with other fields as material engineering, environmental science, or anthropology would have expanded the field of inquiry.

The rapid rise in publications also points to a possible "critical mass" effect, when the accumulation of knowledge approaches a tipping point and causes faster research production. This phenomenon usually results from a field drawing researcher from related fields and increasing awareness among others. Still, this expansion tendency begs serious concerns. One wonders whether the rise in publications coincides with a commensurate rise in the depth and quality of research. Examining the way that different parts of Indonesia and diverse architectural styles are distributed deserves study. Another important consideration is the effect of this growing body of research on architectural practice, education, and policy-making in Indonesia and elsewhere. Important considerations also include the durability of this growth rate and how it will affect

the field should it continue or level out. Though publications are growing generally, there could still be undiscovered elements of Indonesian vernacular architecture.

This publication trend amply shows how increasingly significant Indonesian vernacular architecture is now in modern architectural debate. The topic seems to be in a dynamic period of development, hence presenting great chances for multidisciplinary cooperation, additional study, and useful application of results.

Authorship and collaboration patterns

The co-authorship network analysis unveiled a relatively fragmented research community with several distinct clusters. The largest cluster, comprising 36 researchers, was cantered around collaborative efforts between universities in Java and international institutions. Interestingly, 40,5% of the papers were the result of international collaborations, suggesting a global interest in Indonesian vernacular architecture. However, the analysis also revealed a significant number of isolated nodes, indicating potential opportunities for increased collaboration within the field.

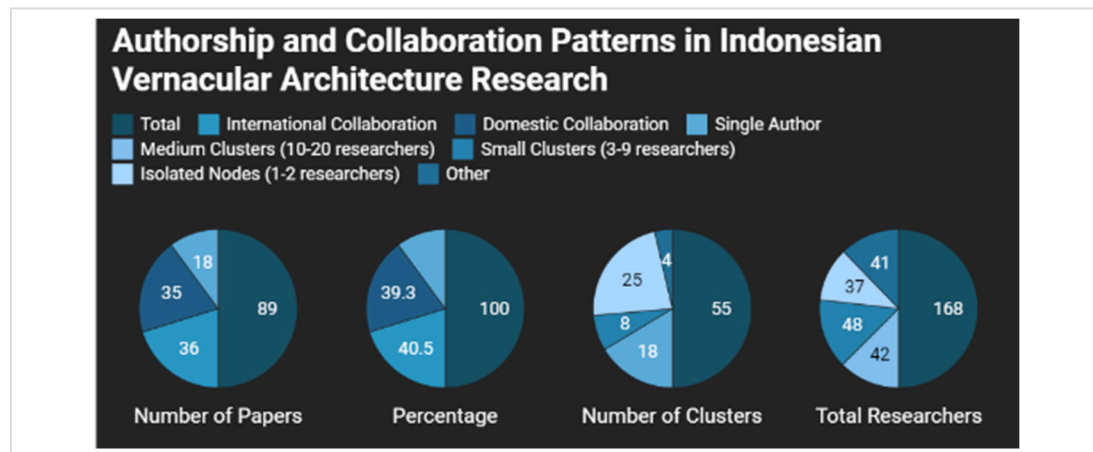


Figure 2. Authorship and collaboration patterns in Indonesian vernacular architecture research

The co-authorship network analysis of Indonesian vernacular architecture research exposes a complicated scene of cooperation and isolation. Reflecting both the historical relevance of Java and the worldwide interest in Indonesian architectural legacy, the sector is distinguished by a fractured structure with a clear cluster around Javanese and foreign partnerships. With 40.5% of articles included, this international involvement

fits more general patterns in architectural research toward worldwide information sharing. Still, the abundance of isolated nodes points to unrealized possibilities for cooperation and different points of view that might improve the sector. Many elements could be responsible for this fragmentation, including methodological differences, institutional constraints, and regional specialization. Although significant, the

predominance of a Java-centric cluster begs problems regarding the literary portrayal of other Indonesian areas. The field might gain from focused efforts going ahead to combine isolated researchers, balance regional interests, and enhance local partnerships, so improving the knowledge of Indonesian vernacular architecture. These results highlight the need of a more unified

research community able to fully reflect the great variety of Indonesia's architectural legacy while preserving important worldwide contacts.

Thematic focus and keyword analysis

Keyword co-occurrence analysis identified several dominant themes in the research (see [table 1](#)).

Table 1. Thematic focus and keyword analysis in Indonesian vernacular architecture

Theme/keyword	Number of papers	Percentage of total papers
Sustainability	40	45%
Cultural identity	34	38%
Preservation	28	32%
Climate adaptation	25	28%
Traditional construction techniques	22	25%
Spatial organization	20	22%
Symbolism	18	20%
Modernization	15	17%
Transformation of vernacular forms	12	13%

The term "sustainability" appeared in 45% of the papers, highlighting its central role in contemporary vernacular architecture research. "Cultural identity" and "preservation" were also prominent, appearing in 38% and 32% of the papers respectively, underscoring the cultural significance of vernacular architecture in Indonesia.

Geographical distribution of research

The analysis revealed an uneven distribution of research focus across Indonesia's diverse

archipelago. Java was the most studied region, featuring in 40% of the papers, followed by Bali (25%) and Sumatra (15%). Other regions, particularly eastern Indonesia, were underrepresented, with Papua and Maluku collectively accounting for less than 5% of the studies. This disparity highlights potential areas for future research to ensure a more comprehensive understanding of Indonesia's vernacular architectural diversity.

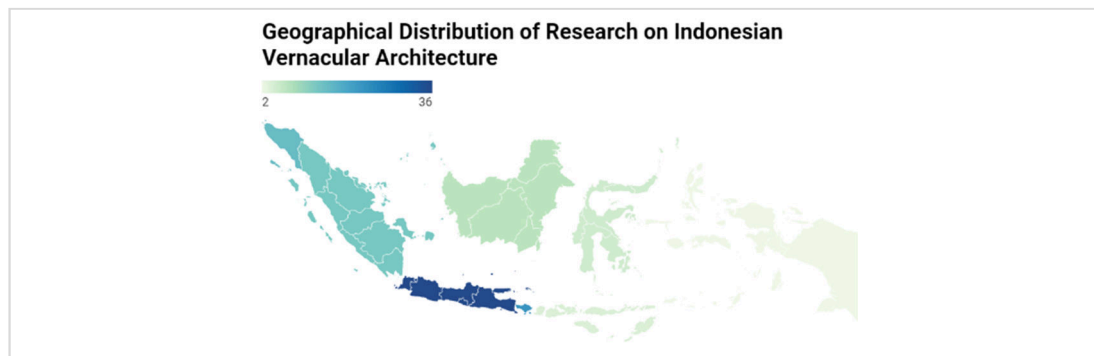


Figure 3. Geographical distribution of research on Indonesian vernacular architecture

Research on Indonesian vernacular architecture shows notable differences in academic focus around the archipelago. Java's

predominance 40% of studies probably results from its historical importance, population density, and concentration of academic institutions.

Reflecting their cultural depth and variety, Bali (25%) and Sumatra (15%) follow. But a major issue is the underrepresentation of eastern areas, especially Papua and Maluku (together 5%).

The field suffers considerably from this discrepancy. It favors western Indonesian designs and techniques, therefore distorting the general knowledge of Indonesian vernacular architecture. The dearth of thorough research in eastern areas reflects a significant discrepancy in the record of the architectural variety of the nation.

Logistically difficult access to remote locations, financial distribution biases, historical academic focus on western Indonesia, and concentration of research institutions in more investigated areas could all help to explain this gap.

This unequal distribution runs the danger of producing an incomplete story of Indonesian vernacular architecture, therefore affecting heritage legislation, architectural education, and preservation efforts. Furthermore, understudied areas could have original ideas about

environmentally friendly building techniques being unmet.

Thematic network analysis of Indonesian vernacular architecture research

The network visualization reveals a complex interconnection of key themes in Indonesian vernacular architecture research (see [figure 4](#)), centering on architectural studies, cultural traditions, and environmental sustainability, with prominent focus on case studies, construction techniques, and the relationship between traditional houses and their environment.

The network visualization exposes intricate interdependencies among important themes in the study of Indonesian vernacular architecture, with a focus on architectural research, cultural customs, and ecological sustainability. The theme framework of this study reflects the interdisciplinary aspect of research on vernacular architecture, as emphasized by [Oliver \(2006\)](#) in his influential work on the preservation of vernacular heritage.

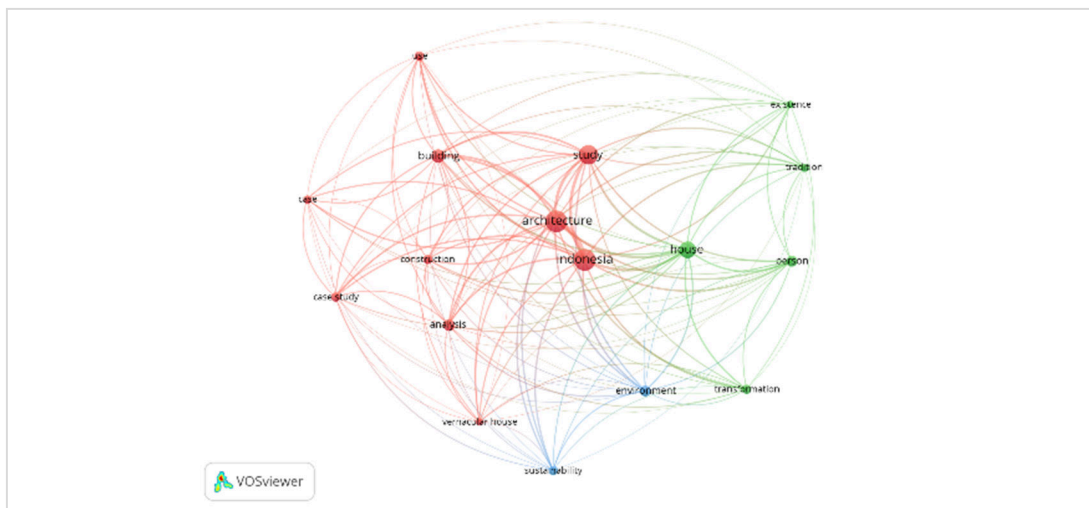


Figure 4. Thematic network image of Indonesian vernacular architecture research

The strategic placement of "architecture," "Indonesia," and "study" at the center of the network highlights the field's emphasis on location-specific architectural research. This is consistent with [Rapoport's \(2006\)](#) focus on the significance of cultural context in vernacular design. The robust associations between these core nodes and phrases such as "case study" and "analysis" suggest a predominance of empirical research procedures, which [Asquith and Vellinga](#)

[\(2006\)](#) contend are essential for comprehending the subtleties of vernacular traditions.

The cluster associated with construction and building techniques (highlighted in red) indicates a notable emphasis on the material and technical elements of vernacular architecture. [Athira, Amritha, and Chithra \(2023\)](#) research highlight the significance of traditional building techniques in terms of their environmental knowledge. The association between this cluster and "sustainability" (highlighted in blue) indicates an

increasing focus on the ecological capabilities of vernacular solutions, as examined by Kubba (2017) in his investigation of sustainable design concepts.

The green cluster, which includes phrases such as "tradition," "existence," and "person," emphasizes the cultural and personal aspects of vernacular architecture. This is consistent with Waterson (2014) anthropological methodology for studying Southeast Asian architecture, which focuses on the actual experiences and cultural significance found in local architectural styles.

The inclusion of "transformation" in the network signifies the scholarly focus on the changing characteristics of vernacular traditions, a subject investigated by Vellinga (2014) in his research on how vernacular architecture may adapt to globalization and climatic change.

This network analysis not only depicts the present condition of research but also indicates possible avenues for future exploration, such as the convergence of sustainability and cultural preservation in vernacular activities. According to Asquith and Vellinga (2006), incorporating various methods is crucial to ensure that studies on vernacular architecture remain applicable in tackling modern concerns.

Thematic density map of Indonesian vernacular architecture research

The density visualization of research on Indonesian vernacular architecture (see figure 5) reveals an intricate network of interconnected topics and approaches. The fundamental focus of the discipline is illustrated by the dynamic red cluster focused around the terms "architecture," "Indonesia," and "study," indicating a primary emphasis on research within the specific context of architectural studies. This aligns with Rapoport's (2006) emphasis on the cultural environment in vernacular design. Centered on this core idea, a group of methodological terms like "case study" and "analysis" emerges, highlighting the field's dependence on empirical research methods. The focus on methodology in this study aligns with the perspective of Asquith and Vellinga (2006) on the importance of in-depth case studies for understanding vernacular traditions. The image additionally emphasizes a prominent green cluster that encompasses phrases

such as "house," "person," and "tradition," highlighting the cultural and social dimensions of studying vernacular architecture. This cluster corresponds to Waterson (2014) anthropological viewpoint on Southeast Asian architecture, which emphasizes the tangible encounters and cultural importance. The use of the term "transformation" in this group, but with a lesser prominence, suggests an increasing interest in the evolving attributes of regional traditions. Vellinga (2014) examined the correlation between globalization and climate change. The smaller blue cluster, comprising the terms "environment" and "sustainability," indicates a growing focus on the ecological aspects of vernacular architecture. This occurrence aligns with Kubba (2017) study on integrating traditional knowledge with sustainable design principles. The varying densities found within these clusters not only reflect the current state of research, but also provide potential areas for future exploration, particularly in linking historical practices with contemporary environmental issues, as suggested by Zhai and Previtali (2010). Overall, this density visualization offers a comprehensive and all-encompassing comprehension of the region, highlighting its intricate attributes and suggesting possibilities for additional integration and collaboration in the examination of Indonesian traditional architecture.

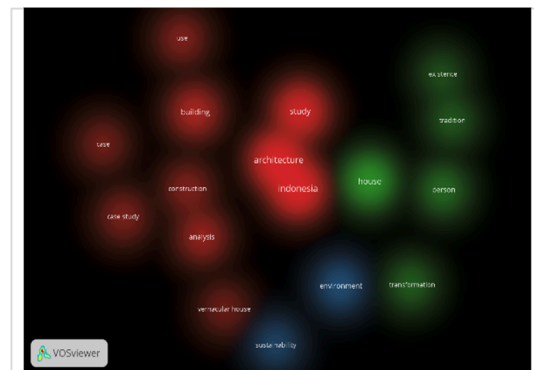


Figure 5. Thematic density map of Indonesian vernacular architecture research

Emerging trends

The analysis of recent publications (2010-2024) revealed emerging research trends (see table 2).

Table 2. Emerging trends in Indonesian vernacular architecture research (2010-2024)

Emerging trend	% of Recent papers	Key topics	Example study
Disaster Resilience	18%	Earthquake resistance, flood mitigation, climate adaptation	"The Resilience of Javanese Meaning in the Architectural Acculturation of Javanese with Chinese Ethnic Houses in the Kampong of Sumber Girang and Babagan in Lasem " (Salura and Bachtiar Fauzy 2012)
Digital Documentation	22%	3D scanning, photogrammetry, virtual reality modeling	"Techniques on Heritage Preservation Using Lighting Computation in Virtual Environment " (Rafi et al. 2010)
Bioclimatic Performance	25%	Thermal comfort, natural ventilation, energy efficiency	"Sustainable Architectural Design in a Traditional Balinese Housing in Accordance to the Concept of Tri Mandala " (Aryani and Tanuwidjaja 2013)
Sustainable Tourism	20%	Cultural preservation, economic impact, community involvement	"Tongging Leisure Park with Neo-Vernacular Architecture Approach" (Rahman and Nurlisa Ginting 2020)
Urban Adaptation	15%	Urban housing design, public spaces, modern interpretations of traditional forms	"Contemporary challenges of the Indonesian vernacular architecture in responding to climate change" (Rajendra 2021)

The current developments in the study of Indonesian vernacular architecture demonstrate a notable change in attention and approach, in line with worldwide architectural discussions and addressing urgent modern concerns. These trends not only illustrate the development of the subject but also emphasize its growing significance in tackling contemporary socioeconomic and environmental problems. Disaster resilience, which accounts for 18% of recent studies, has become a critical field of research, most likely due to Indonesia's susceptibility to natural calamities. This phenomenon corresponds to worldwide apprehensions regarding climate change and its influence on constructed surroundings. The emphasis on earthquake resistance and flood mitigation in vernacular architecture indicates an increasing acknowledgment of traditional wisdom in constructing resilient buildings. An example of this research area is the study " The Resilience of Javanese Meaning in the Architectural Acculturation of Javanese with Chinese Ethnic Houses in the Kampong of Sumber Girang and Babagan in Lasem " ([Fauzy, Antariksa Sudikno, and Purnama Salura 2012](#)), which investigates the ways in which vernacular architectural principles might enhance the construction of structures that are resistant to disasters.

The increasing prevalence of Digital Documentation, which accounts for 22% of articles, signifies a significant methodological progress in the discipline. Utilizing 3D scanning, photogrammetry, and virtual reality modeling to capture vernacular architecture not only safeguards cultural heritage but also enables more intricate examination of traditional construction methods. This is exemplified in research such as " Techniques on Heritage Preservation Using Lighting Computation in Virtual Environment " ([Rafi et al. 2009](#)), which showcases the use of digital technologies in conserving and analyzing traditional architecture.

With 25% of studies, there is a notable emphasis on Bioclimatic Performance, which reflects a rising interest in the ecological knowledge inherent in traditional building. Research on thermal comfort, natural ventilation, and energy efficiency in traditional structures adds to the wider discussion on sustainable architecture. An example of this trend may be seen in the study " Sustainable Architectural Design in a Tradi-Tional Balinese Housing in Accordance to the Concept of Tri Mandala " ([Aryani and Tanuwidjaja 2013](#)), which is in accordance with the research conducted by [Zhai and Previtali \(2010\)](#) on the assessment of energy efficiency in historical vernacular architecture.

The rise of Sustainable Tourism (20% of articles) as a research topic signifies the convergence of vernacular architecture with economic progress and cultural conservation. An example of this trend may be seen in studies such as "Tongging Leisure Park with Neo-Vernacular Architecture Approach" (Rahman and Nurlisa Ginting 2020), which investigates the role of traditional architectural styles in promoting sustainable tourism growth.

Urban Adaptation, which accounts for 15% of current research articles, is a noteworthy trend that connects classical architectural expertise with modern urban difficulties. This is demonstrated in research such as "Contemporary challenges of the Indonesian vernacular architecture in responding to climate change" (Rajendra 2021), which supports the viewpoint of Vellinga (2014) regarding the adaptation of vernacular architecture to contemporary circumstances and difficulties. These growing developments suggest a move towards more practical and multidisciplinary research in Indonesian vernacular architecture, going beyond the strictly descriptive methods mentioned by Asquith and Vellinga (2006). They exemplify a shift from exclusively studying history to conducting research that actively involves current concerns of sustainability, resilience, and cultural preservation in response to modernization and climate change.

The patterns indicate an increasing acknowledgment of vernacular architecture, not only as a topic of scholarly research, but also as a significant asset for tackling present-day architectural and environmental issues. This transition corresponds to the viewpoint of Rapoport (2006), who stressed the significance of comprehending vernacular design as a paradigmatic system for modern architecture. Furthermore, the emphasis on sustainability and environmental effectiveness in the study of vernacular architecture aligns with Kubba (2017) research on merging traditional knowledge with sustainable design principles. Many studies also share a focus on cultural identification and preservation, which is in line with Waterson (2014) anthropological approach to Southeast Asian architecture. Waterson emphasizes the cultural relevance that is present in the architectural forms of the local community.

Conclusions

This bibliometric examination of vernacular architecture research in Indonesia uncovers significant discoveries that offer fresh insights to the discipline. A notable advancement is the growing inclination towards practical research, as evidenced by recent studies that demonstrate a noticeable rise in subjects such as disaster resilience, digital documentation, bioclimatic performance, sustainable tourism, and urban adaptability. This transition signifies a novel methodology in the discipline, connecting the divide between academic investigations and real-world implementations of vernacular architectural ideas. The analysis also reveals the growing multidisciplinary nature of vernacular architecture research in Indonesia, incorporating many subjects such as cultural studies, environmental science, and urban planning. This is a novel, comprehensive method for comprehending and safeguarding vernacular architecture. An important discovery is the large disparity in the geographical emphasis of study, with eastern Indonesia being significantly underrepresented. This highlights the pressing necessity for more extensive regional studies. The research highlights the growing importance of sustainability and recognizes the ecological knowledge present in traditional building practices. This suggests a change in perspective, where vernacular architecture is not only seen as cultural heritage, but also as a potential solution for current challenges in terms of sustainability. The advent of digital documentation tools signifies a technical shift in the discipline, providing novel methodologies for documenting and assessing conventional structures. Furthermore, the emphasis on catastrophe resilience and urban adaptation represents a novel approach to examining the application of traditional knowledge in tackling contemporary urban and environmental challenges.

These findings suggest a shift in the discussion on Indonesian vernacular architecture, moving away from solely descriptive or historical studies towards more practical, interdisciplinary, and future-focused study. This shift provides fresh insights on the significance of vernacular design in tackling modern challenges such as sustainability, disaster resilience, and urban development. The analysis also emphasizes important topics for future research, specifically

the requirement for broader geographical representation and additional investigation into the incorporation of vernacular ideas into contemporary architectural and urban planning processes. These findings can provide guidance to scholars, policymakers, and practitioners in Indonesia's architectural and urban development field, helping them design more comprehensive, sustainable, and culturally aware approaches.

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Author(s) contribution

Muhamad Ratodi contributed to the research concepts preparation, methodologies, investigations, data analysis, visualization, articles drafting and revisions.

Arfiani Syariah contribute to the research concepts preparation and literature reviews, data analysis, of article drafts preparation and validation.

Oktavi Elok Hapsari contribute to methodology, supervision, and validation.

Mega Ayundya Widiastuti contribute to methodology, supervision, and validation.

Rita Ernawati contribute to methodology, supervision, and validation.

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