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Evaluation of Green Area Criteria Assessment in Indonesia: A Systematic Literature Review

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ABSTRACT

This study aims to evaluate the application of green area assessment tools in Indonesia through a systematic literature review. The method employed includes a literature search from 2016 to 2024 using Publish or Perish with databases from Google Scholar, Crossref, and Semantic Scholar, as well as the application of the PRISMA methodology for article selection. This study also involves bibliometric analysis using VOSviewer to map the relationships between keywords. The results show that the application of the green area concept is more focused on the operational phase, with 50% of research concentrated in this area. The Greenship Neighborhood v.1.0 assessment tool is the most dominant, while BGH PUPR is still rarely used. Cluster analysis identifies four main categories in the research, including implementation, location, indicators, and assessment tools. The findings indicate a lack of research in underrepresented sectors such as transportation and industrial facilities, as well as the need for more comprehensive exploration throughout the entire life cycle of buildings. This study recommends the development of policies to support the wider adoption of green area assessment tools and further training for developers. It is expected that the results of this study will contribute to enhancing the implementation of green area concepts in Indonesia, supporting environ[illegible] eco-friendly development.

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1. INTRODUCTION

Climate change and environmental degradation are pressing global challenges, prompting countries to seek sustainable solutions. One of the important efforts is the development of green areas, which aims to reduce the negative impact of development on the environment and improve the quality of life of the community. Green areas are a vital element in sustainable urban planning and development, serving as a counterbalance to the pace of urbanization and industrialization. Green areas, defined as areas dominated by green vegetation, have a crucial role in climate change mitigation, biodiversity conservation, air quality improvement, water conservation, flood risk reduction, urban heat island effect mitigation, as well as improving people's physical and mental health (Bowler et al., 2010; Nowak & Dwyer, 2007; Scott, 2017; Tzoulas et al., 2007; Ulrich, 1984).

Ulrich (1984) His research showed that hospital patients who had a view of the garden from their windows recovered faster compared to patients who did not have a similar view. This underscores the positive impact of green spaces on human welfare. In addition, Tzoulas et al. (2007) it highlights the importance of access to green space in improving the quality of life and welfare of urban communities. This awareness of the importance of green spaces has driven efforts to develop standards and guidelines that can be used to effectively plan, design, and manage green spaces.

In Indonesia, environmental issues are increasingly becoming a major concern along with increasing urbanization and rapid population growth (Raharjo et al., 2022). Uncontrolled urbanization often leads to reduced green open space and increased pollution, which negatively impacts people's quality of life. Increasing land use intensity has a direct impact on increasing greenhouse gas emissions, which exacerbates global warming. Urban development aims not only to utilize the city for the welfare of its inhabitants, but also to improve their quality of life (Kusumawanto & Astuti, 2014). The concept of a sustainable city begins with the impact of human activities on the natural environment. Therefore, it is essential to provide facilities that integrate elements of biodiversity protection in the process of its development (Nugraha & Heston, 2018).

For example, the Indrokilo Botanical Garden (KRI) was built as a means of education and conservation of lowland rainforest plants (Kholid & Syamsiyah, 2020). Efforts like this show a commitment to preserving the environment and providing benefits to the community. In addition, the development of public transportation infrastructure also contributes to sustainable development. The development of environmentally friendly public transportation infrastructure can reduce the impact on the environment (Sari, 2017). This concept is in line with the principles of green city which emphasize the importance of movement and connectivity in green spaces (UI GreenCityMetric, 2025). Sustainable development ultimately becomes very important to ensure a balance between human needs and environmental sustainability.

Along with the new concept of green areas, the need to assess the environment of cities and regions based on their level of greening is an issue that needs to be considered (Karimipour et al., 2015). The level of greenery of a building or area must be able to be placed at a level that can be understood or measured based on certain standards (Rejoni et al., 2016), so a device is needed that can evaluate the sustainability performance of an environment based on a series of criteria (Sharifi et al., 2021). Recent literature has discussed the importance of sustainable development assessments at the community and environmental scales (Berardi, 2011; Turcu, 2013).

The Government of Indonesia has taken steps to support sustainable development, including through regulations and incentives to encourage green development. The first

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green area assessment in Indonesia is the Greenship Neighborhood developed by Green Building Council Indonesia (GBCI) in 2015. Greenship Neighborhood is a comprehensive assessment system to evaluate the sustainability performance of an area, including aspects such as improving land ecology, movement and connectivity, water management and conservation, waste management, and environmental quality. In addition, based on Law Number 28 of 2002 concerning Buildings and Implementing Regulations, the Government through the Ministry of Public Works and Housing has issued Ministerial Regulation Number 21 of 2021 concerning the Performance Assessment of Green Buildings. This Ministerial Regulation aims to provide a framework and performance indicators to evaluate and encourage the application of green building principles, including in buildings, residences, and areas. However, implementation in the field still faces various challenges. Lack of understanding of green development concepts, high costs, low annual certification rates and complexity in assessments are some of the main obstacles. In addition, coordination between government agencies and community involvement also needs to be improved (Mardhiyana et al., 2023; Sapitri & Aziz, 2021). In this context, green area assessment tools, such as the Greenship Neighborhood or BGH PUPR, play an important role in providing guidance and standards to achieve sustainable development goals. Both systems aim to encourage sustainable regional development, but with slightly different approaches and focuses.

Existing research on green area assessment tools is also still very limited, especially related to its effectiveness and application in the context of the environment and regulations in Indonesia. The lack of in-depth comparative analysis further emphasizes the importance of further research to understand how these assessment tools work with each other. The main objective of this systematic literature review is to evaluate the application of green area assessment tools in Indonesia. Specifically, this review aims to: (1) identify relevant studies on the application of green areas in Indonesia, (2) analyze the methods and results of the evaluated studies, (3) research gaps and optimization opportunities.

2. RESEARCH METHODS

This study uses Publish or Perish software that collects and analyzes data from academic citations. The program leverages a variety of sources of information to obtain original citations, then conducts an analysis and provides various citation metrics, such as the number of publications, total citations, and the h-indeks (Harzing, 2007). The databases used are Google Scholar, Crossref, and Semantic Scholar which were chosen because they have a wide coverage of national and international publications regarding green area assessment tools in Indonesia. This database indexes various scientific papers and provides complete metadata, and can accommodate publications in Indonesian and English. The search strategy involves specific keywords such as "Permen PUPR Number 21 of 2021", "Greenship Neighborhood", "Green Area", and "Sustainable Development". The publications used are limited to the last 9 years, namely 2016-2024, to capture the latest trends in this field.

2.1 Paper Selection

The PRISMA methodology is used to process journals because of its systematic framework for identifying, selecting, and synthesizing evidence (Haddaway et al., 2022). This structured approach improves transparency and reproducibility, and reduces the potential for significant literature oversight, especially in the emerging field of green area assessment. This methodology follows the comprehensive PRISMA reporting guidelines (Feng & Law, 2021), by applying certain exclusion criteria (such as no author, source, or abstract, data differences, and duplicates) and inclusion criteria (including publications in Indonesian/English, Indonesian case studies, the use of the assessment tool of the Ministerial Regulation of PUPR

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Number 21 of 2021 or Greenship Neighborhood). This systematic approach ensures the selected articles are relevant and accurate.

2.2 Bibliometric Research

Bibliometric analysis was performed using VOSviewer 1.6.20 to map the patterns and relationships between keywords from article titles and abstracts. This approach leverages databases such as Google Scholar, Crossref, and Semantic Scholar with a focus on publications in Indonesian and English and uses recognized assessment tools to ensure the quality of research. The article selection process is carried out in a structured manner, with the application of clear inclusion and exclusion criteria to minimize potential bias and still maintain scientific accuracy. Through systematic screening and the PRISMA methodology, this analysis maps the relationship of keywords to identify trends, themes, and gaps in research on green areas in Indonesia. The visualization of connected keywords shows areas that have been extensively researched and topics that have not been explored extensively, providing valuable insights for the development of these fields as well as future research directions.

The following are the steps used in the Systematic Literature Review research as shown in the graphic below:

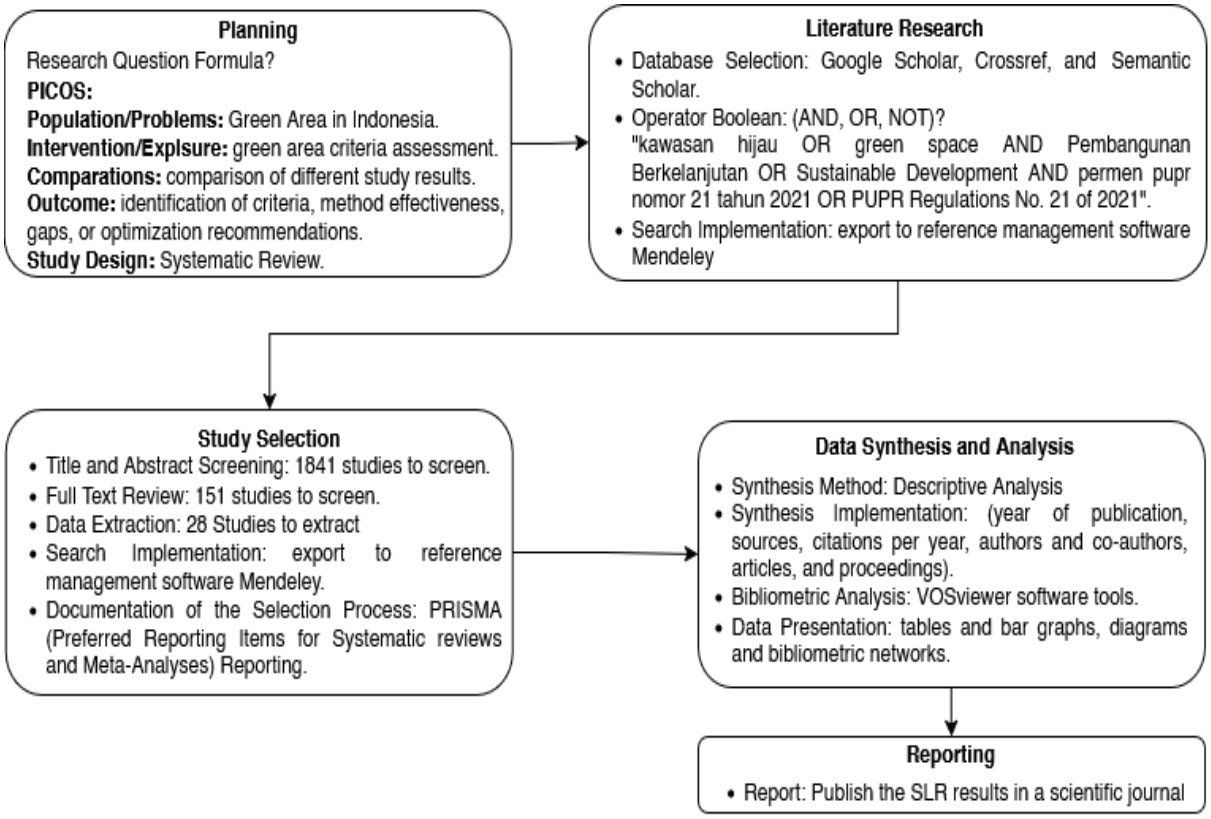

Figure 1. Graphic Stages of Research Methods using Systematic Literature Review. (Source: Analysis, 2025)

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3. RESULTS AND DISCUSSION

3.1 PRISMA Results

The article selection process using the PRISMA methodology with the Publish or Perish version 8 application, as seen in Figure 2, successfully identified 28 articles from 1,896 initial publications taken from the Google Scholar, Crossref and Semantic Scholar databases. The screening process applies exclusion criteria (such as no author, source, or abstract, data differences, and duplicates) as well as inclusion criteria (publication in Indonesian or English, case studies in Indonesian, and the use of at least one assessment tool such as Permen PUPR Number 21 of 2021, Greenship Neighborhood and so on). With the complete filtration process shown in Figure 2:

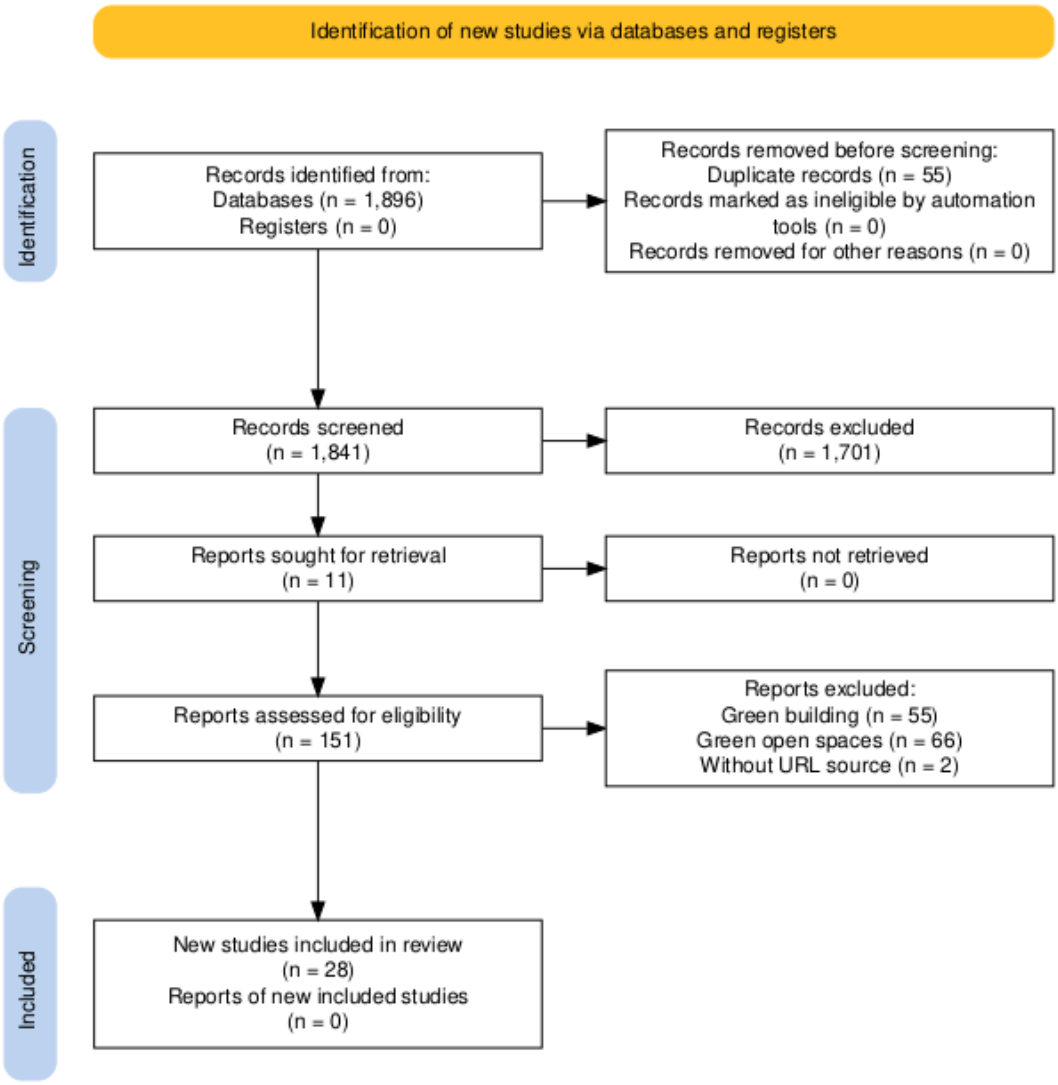

Figure 2. Article Selection Process Using the PRISMA Method
(Source: Analysis, 2025)

The selected articles consisted of 28 articles published from 2016 to 2024 in 24 sources, with an average citation rate of 0,46 per year. The collection also includes 22 peer-reviewed journal articles and 6 conference proceedings, involving 78 authors in collaborative research projects.

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Table 1. Information from Featured Articles

Information	Result	Information	Result
Publication of the Year	2016-2024	Authors and Co-Authors	78
Sources (Journals, theses, etc.)	26	Articles	22
Citations Per Year	0,46	Proceedings/Conferences	6

(Source: Analysis, 2025)

Figure 3 shows the trend of research publications on green areas and their assessment tools in Indonesia, which shows an increasing pattern from 2016 to 2021, and decreased in 2022 but no less than 3 scientific articles published per year until 2024. In 2015 there were no journals published because the first assessment tool in Indonesia, namely the Greenship Neighborhood, was only launched in December 2015 with the peak publication in 2021. Meanwhile, for 2025 there is no possible publication because this year is still running until the time the author makes this scientific article.

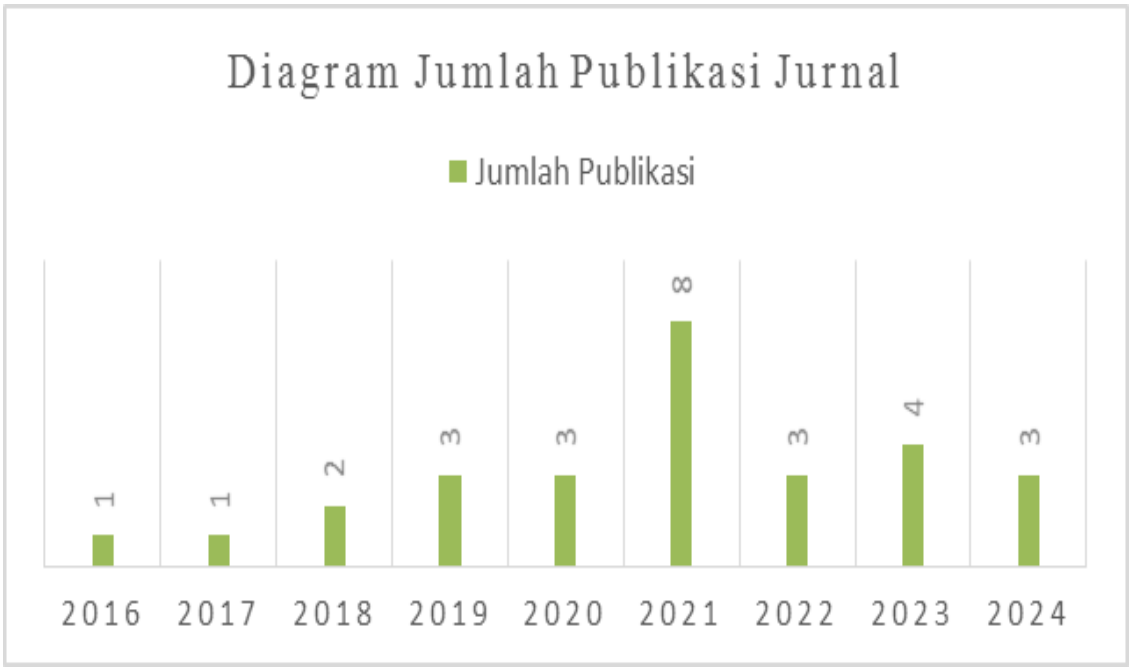

Figure 3. Number of publications released each year
(Source: Analysis, 2025)

Figure 4 illustrates the distribution of citations among the most frequently referenced articles, suggesting that some publications have a significant role in making important contributions to the field of research on green spaces or topics covered in this study. The article with the highest number of citations is most likely to be the primary basis or reference in this study.

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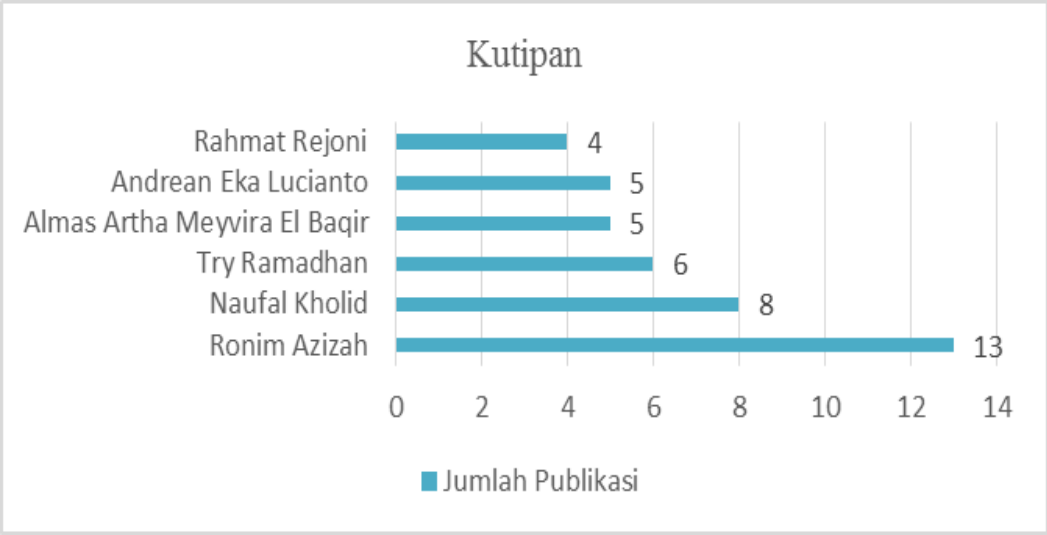

Figure 4. Top 6 Most Cited Publications
(Source: Analysis, 2025)

3.2 Keyword Analysis

The selected articles were then visualized using VoSViewer, and the relationships between keywords are summarized in Table 2 which shows the most frequently appearing keywords in the publications selected for this study. Overall, this table shows that the selected research consistently addresses the concept and application of green spaces in Indonesia, with a primary focus on energy efficiency aspects, assessment criteria, and the role of the Green Building Council Indonesia, namely:

Table 2. Frequency of Keyword Occurrence in Green Area Research

Keywords	Event	Keywords	Event
Area	45	GBCI	7
Assessment	20	Score	6
Concept	13	Point	6
Indonesia	10	Aspect	5
Greenship	7	Indicator	5

(Source: Analysis, 2025)

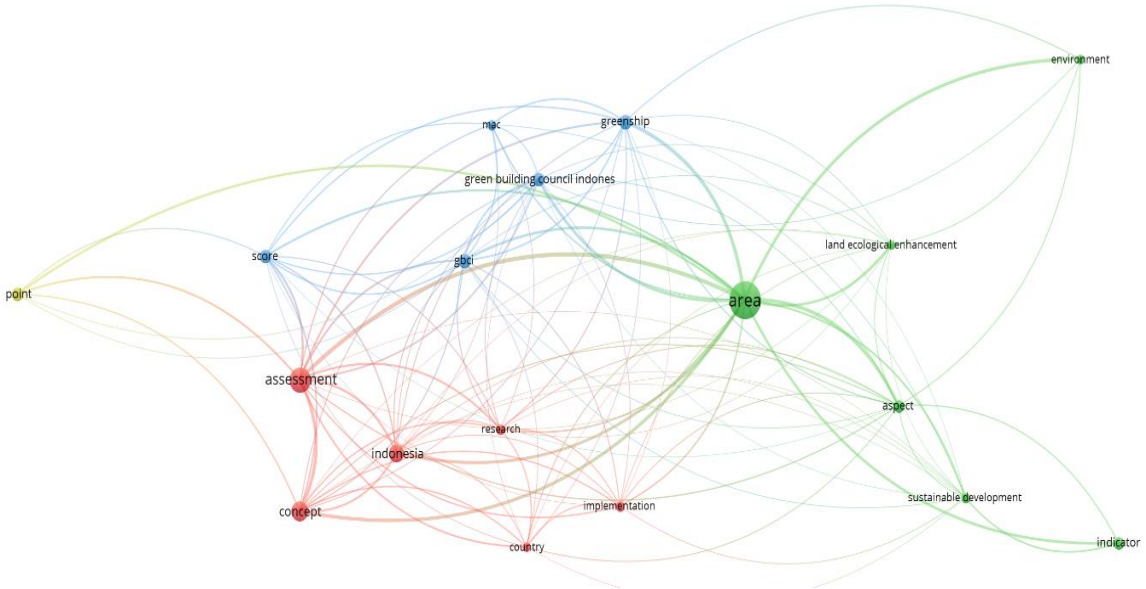

Figure 5. Article Keyword Network Using Vos Viewer
(Source: Analysis, 2025)

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Keyword analysis showed that the term "area" appeared the most often (45 times), followed by "assessment" (20), "concept" (13), "Indonesia" (10), "greenship" and "GBCI" (7 each). Some other important keywords include "score" and "point" (6 each), "aspect" and "indicator" (5 each). Figure 5 shows a bibliometric map illustrating that "area" or region is the main topic in the literature analyzed, with a close relationship with other keywords such as assessment, concept, Indonesia, greenship, GBCI, and point. These keywords are divided into 4 main groups:

a) Red Cluster: Highlights aspects of implementation and research, which includes keywords such as "assessment", "Indonesia", "concept", "research" and "implementation".
b) Green Cluster: Focuses on the aspects of places and indicators, with keywords such as "area", "indicator", "aspect", and "sustainable development".
c) Blue and yellow clusters: focus on aspects of the scoring and scoring tools, with keywords such as "GBCI", "greenship", "score", and "point".

Each cluster depicts an emphasis on the theoretical, practical, and technical aspects of green spaces in Indonesia. The connecting lines between the keywords show that topics such as assessment and research are often discussed in conjunction with green areas or areas, reflecting the complexity and close relationships between the various aspects in the study.

3.3 Green Area Ranking Tool Used in Case Studies in Indonesia

With 28 articles selected using the PRISMA method and analyzed bibliometrically based on the frequency of keyword occurrences, the next step is to conduct an in-depth study of the content of these articles. This study covers three main aspects: (1) the type of area used as a case study, (2) the life cycle stage of the area analyzed, and (3) the Green Area assessment tool applied. A summary of the study of each selected article can be seen in Table 3 below.

Table 3. Summary of the Case Study of Green Areas in Indonesia

No.	Reference	Area Type	Development Stage	Green Area Assessment Tool
1.	(Agustin & Acwin Dwijendra, 2023)	Education/School	Operational	*Greenship neighborhood*
2.	(Dewi et al., 2024)	Housing	Operational/Upgrade	*Greenship neighborhood*
3.	(Kustiani et al., 2023)	Education/Campus	Operational/Upgrade	*Greenship neighborhood*
4.	(Sapitri & Aziz, 2021)	Housing	Operational	*Greenship neighborhood*
5.	(Nurwidyaningrum et al., 2023)	Education/Campus	Operational	*Greenship neighborhood*
6.	(Azizah & Talidah, 2019)	Commercial/tourism	Operational	*Greenship neighborhood*
7.	(Kustiani et al., 2024)	Education/Campus	Operational/Upgrade	*Greenship neighborhood*
8.	(El Baqir & Syamsiyah, 2021)	Commercial/tourism	Operational	*Greenship neighborhood*
9.	(Apogee et al., 2022)	Education/Campus	Operational	*Greenship neighborhood*
10.	(Kholid & Syamsiyah, 2020)	Commercial/tourism	Operational	*Greenship neighborhood*
11.	(Rejoni et al., 2016)	Housing	Operational	*Greenship neighborhood*
12.	(Putra et al., 2024)	Housing	Planning	*Greenship neighborhood*
13.	(Lucianto et al., 2020)	Housing	Operational	*Greenship neighborhood*

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No.	Reference	Area Type	Development Stage	Green Area Assessment Tool
14.	(Muchlis et al., 2019)	Education/Campus	Planning	*Greenship neighborhood*
15.	(A'yuni et al., 2020)	Housing	Operational/Upgrade	*Greenship neighborhood*
16.	(Luziani & Paramita, 2018)	Mixture	Planning	*Greenship neighborhood*
17.	(Ramadhan et al., 2019)	Religious	Planning	*Greenship neighborhood*
18.	(Manggiasih et al., 2019)	Mixture	Planning	*Greenship neighborhood*
19.	(Nurdiani & Katarina, 2021)	Housing	Planning	*Greenship neighborhood*
20.	(Widodo et al., 2021)	Education/Campus	Operational/Upgrade	*Greenship neighborhood*
21.	(Sari, 2017)	Public Transportation	Planning	*Greenship neighborhood*
22.	(Ratnaningsih et al., 2021)	Housing	Planning	*Greenship neighborhood*
23.	(Fajri, 2021)	Housing	Operational	*Greenship neighborhood*
24.	(Oktova, 2022)	Industry	Operational	*Greenship neighborhood*
25.	(Kurniati et al., 2021)	Mixture	Planning	*Non Categories*
26.	(Antoro, 2023)	Housing	Operational	PUPR Ministerial Regulation Number 21 of 2021
27.	(Raharjo et al., 2022)	Housing	Operational	*Greenship neighborhood*
28.	(Dwinanda & Hartanti, 2021)	Mixture	Operational	*Greenship neighborhood*

(Source: Analysis, 2025)

An analysis of 28 case studies on different types of buildings (educational, residential, commercial, industrial and mixed facilities) shows that the main focus lies in the operational phases, especially in terms of improving land ecology, movement and connectivity, water management and conservation, solid and material waste, and community welfare. The assessment tools used vary but the most are the greenship neighborhood, both in the planning and operational phases because the area assessment tool is especially in Indonesia before 2021 and the most popular is only greenship.

Based on the type of building area, the residential sector dominated with 39% (11 cases), followed by educational areas at 25% (7 cases), mixed areas at 14% (4 cases) and commercial at 11% (3 cases). Meanwhile, industrial, religious, and public transportation building areas only have minimal representation, 4% each (1 case). These findings show the more dominant application of green spaces in the housing and education sectors, while revealing significant gaps in the industrial, transportation, and religious sectors.

In the context of the building life cycle, the operational phase occupies the largest proportion, which is about 50% of the total existing studies (14 studies), followed by the planning phase which covers 32% (9 studies), as well as the combination of operational and improvement phases which reaches 18% (5 studies). The dominance of this operational phase indicates that this phase has the longest duration and has the greatest impact on the sustainability of the region. This shows that the sustainability of the area is greatly influenced by how the area is managed and used throughout its operational life. Nonetheless, the limited

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number of studies integrating multiple phases in a building's life cycle highlights the importance of more in-depth research covering all stages of development, from planning, construction, operations, to maintenance and upgrade. This more holistic approach is expected to provide a more comprehensive picture of sustainability in every aspect of the building lifecycle, resulting in more effective solutions to support integrated sustainability principles throughout the development phase.

4. DISCUSSION

This study provides important insights into green area assessment tools, such as *Greenship Neighborhood*, BGH PUPR or non-categories, as well as their application to various types of areas in Indonesia. The results of the analysis show that the research still dominates the use of the GBCI Greenship Neighborhood assessment tool rather than BGH PUPR or other categories, this is influenced because until 2021 Greenship Neighborhood is the only assessment tool for areas in Indonesia that has been running. But in the future, it is hoped that BGH PUPR or other assessment tools developed can also be a reference in the future.

4.1 Achievement of Minimum Standards for Regional Categories

For the achievement of the minimum standards used in each assessment device, for the category of residential areas (11 cases) only 3 categories reached the minimum standard, education areas (7 cases) only 1 was achieved (3 cases only assessed 1 special criteria, namely MAC, SWM or LEE), commercial areas (3 cases) 2 categories were achieved (1 case only assessed MAC criteria), mixed areas (3 cases) 1 case was achieved (1 case specifically assessed LEE) and 1 non-category case (planning stage), industrial area (1 case) 1 was achieved, religious (1 case) in the planning phase, and transportation 1 case specifically assessed LEE. So looking at the data, there is still a lack of achievement of standards for the implementation of green areas in Indonesia.

4.2 Comparison with Other Literature

The findings of this review are in line with the international literature on sustainable development and green area assessment. Previous studies have shown that green area certifications, such as LEED and BREEAM, can provide significant environmental and economic benefits (Lucianto et al., 2020). Çınar Umdu & Alakvuk (2022) In his research he discusses sustainable communities, environments, and cities and their criteria, which provides a broader framework for understanding the concept of sustainable development. This comparison shows that although there are many green assessment tools available, Greenship Neighborhood or BGH PUPR has an advantage in terms of local relevance and potential to encourage sustainable development in Indonesia.

The study also reinforces findings from previous studies on challenges in green area implementation. Lack of understanding, high cost, and complexity of assessments are common challenges faced in different countries. To overcome these challenges, a joint effort from the government, developers, and the community is needed. The government can provide fiscal incentives and policy support. Developers can increase awareness and training. The public can be educated about the benefits of green areas and encourage the adoption of sustainable development practices.

4.3 Comparison with International Trends

To give context to the findings, it would be useful to compare them with international trends in green area assessments. Globally, there is a growing trend towards the use of integrated assessment tools that measure environmental, social and economic impacts, which are often in line with the Sustainable Development Goals (SDGs) of the United Nations.

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Meanwhile, the approach in Indonesia is more focused on environmental metrics, which can limit the overall impact of green area initiatives. This difference can be due to different levels of development and sustainability priorities in the construction sector. In addition, the green zone movement in Indonesia, which is still relatively new compared to developed countries, shows that there is great potential to grow and adapt this assessment tool.

5. CONCLUSION

This study offers an in-depth understanding of the use and effectiveness of green area assessment tools in Indonesia through bibliometric analysis and evaluation of assessment tools based on existing case studies. An analysis of 28 case studies shows that the implementation of the green area concept is more focused on the operational phase, with 50% of the research concentrated in the area.

These findings underscore the importance of community, resource management and ecology during the operational life of the region in achieving environmental sustainability. The most commonly used assessment tool is Greenship Neighborhood v.1.0, which is dominant in the planning, operational, and improvement phases. while BGH PUPR only has 1 study for residential areas, this indicates that BGH PUPR is still not widely known so this can be a gap in further research.

Bibliometric analysis revealed that the main keywords in the literature studied included "area", "assessment", "concept", "Indonesia", and "greenship", each of which showed a fairly high frequency of occurrence. Through cluster analysis, the keywords are grouped into 4 (four) main categories: Red Cluster, which focuses on implementation and research aspects, Green Cluster, which focuses on aspects of place and indicators, and yellow or blue clusters focus on aspects of assessment and scoring tools. This mapping shows that topics such as assessment and research are often discussed in conjunction with the concept of green areas or areas.

In addition, the study reveals the urgent need for further exploration in underrepresented sectors, such as transportation facilities, industry, and houses of worship, and highlights shortcomings in studies that thoroughly integrate different phases in the building life cycle. For policymakers, it is critical to encourage the development of policies that support the adoption of green area assessment tools by providing the incentives and resources needed for green projects. Developers and practitioners are expected to improve their training and understanding of existing assessment tools, especially in their application in underrepresented sectors. In addition, academics are encouraged to carry out further research that includes a comparative analysis of green area assessment tools on an international scale, with the aim of identifying best practices that can be adapted and implemented effectively in Indonesia.

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