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Literature Review of the Green Building Concept of the Minister of PUPR RI Regulation Number 21 of 2021 concerning Evaluation Performance Building Building Green

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ABSTRACT: The green building concept has been adopted as the main approach in the development of this project. The purpose of this final project is to analyze and implement the green building concept based on the Regulation of the Minister of Public Works and Public Housing Number 21 of 2021 concerning Building Performance Assessment. In the initial stage, a literature study was conducted to understand the principles and important aspects of the green building concept in detail to understand the requirements and criteria that must be met in the implementation of this concept. Evaluation was conducted to assess the level of compliance with applicable regulations. In the implementation stage, it includes the selection of environmentally friendly materials, optimization of energy use through the installation of solar panels and the use of energy-saving equipment, efficient water management, and utilization of recycling and organic waste. The results of this final project are expected to provide a deep understanding of the implementation of the green building concept. It is also hoped that there will be recommendations and steps for improvement that can improve efficiency and environmental sustainability within this housing.

KEYWORDS: Green Building, green building requirements, green building criteria, environment sustainability

I. INTRODUCTION

Fundamentally, development aims to achieve societal well-being. Public awareness, shaped by experiences of success and failure, significantly influences their understanding of the developments occurring around them. This awareness has led to a paradigm shift in development, where the focus on economic growth has started to shift toward sustainable development. Conventional economic growth has paved the way for sustainable development, considering the mounting environmental issues that create new challenges.

Although conventional development has succeeded in driving economic growth, this approach often fails in social and ecological aspects. This failure is attributed to the dominance of economic development, which neglects social and environmental considerations.

Global warming is a phenomenon that describes climate change, particularly the warming of the atmosphere that affects the Earth's surface. It refers to the rise in average temperatures in the atmosphere, oceans, and land. This temperature increase is caused by the accumulation of gases trapped in the lower layers of the atmosphere, resulting in the greenhouse effect, which subsequently raises the Earth's surface temperature. Experts believe that climate change, including global warming, has occurred throughout Earth's history and will continue. Some evidence of global warming is already visible. Indonesia, located on the equator, is one of the countries most affected by global warming. Climate change in Indonesia represents a significant challenge faced globally, with the melting ice in the Arctic and Antarctic being one example.

Signs of global warming include various disasters, such as floods, landslides, droughts, crop failures, and prolonged social conflicts. Environmental damage and global warming are occurring worldwide, including in Indonesia. The current energy crisis is a major concern, given the increasing energy demand alongside population growth. Although various energy sources have been utilized to meet this demand, the threat of an energy crisis remains due to the limited availability of natural resources.

Environmental damage caused by development begins with site selection. Building locations significantly impact the ecological footprint. Construction on natural land can threaten existing flora and fauna habitats, potentially leading to biodiversity loss. During the construction phase, material and energy consumption tends to be high, as these materials are derived from the exploitation of natural resources and industrial activities that generate waste.

After the construction phase, environmental issues continue during the building's operation and maintenance stages, where key concerns include electricity consumption, water usage, and waste management. The concept of green buildings refers to environmentally friendly building designs. Implementing the green building concept is considered

essential and needs to be regulated by the government. Ministerial Regulation of the Ministry of Public Works and Housing No. 21 of 2021 on the Criteria Assessment of Green Buildings acknowledges the importance of eco-friendly buildings and reflects the government's commitment to addressing environmental issues through building regulations.

The concept of energy efficiency in green buildings is known as green construction, and its end product is referred to as a green building. Together, they form an energy-efficient system by optimizing energy use without compromising user functionality, comfort, or productivity. The green building concept is expected to offer solutions to reduce environmental damage and minimize carbon emissions that contribute to global warming.

II. METHOD

Procedures research in Posts This started in ensure objective research is recognize implementation construction prolonged sourced in the literature review. When before to be continued analyze Posts linked construction prolonged , tried exploration map legislation that had applies in Indonesia, which will be discussed construction prolonged . Procedures research This listed analysis quantitative descriptive , which is needed for help respond problem research (Biantoro & Kholil, 2020) .

Information used in research This shaped information secondary is shaped Posts shaped daily research scientific . Procedures in gather Posts linked collected on the database " Google Schoolar " with using advanced search tools. Settings in the Scopus database includes arrangement language (in Indonesian) and year publication from 2014 to by 2024. The application used is Mendeley , Viosviewer And Publish or Perish. Stages study This as following

a. Formulate Problem
b. Searching for literature (identification)
c. Filter results search literature
d. Analysis results literature
e. Give conclusion study
f.

III. RESULT

The ranking of awareness levels regarding investigated technologies indicates that architects in the study area are most aware of solar energy systems and least aware of energy-efficient windows. A similar trend was observed in the ranking of technology implementation: natural lighting strategies were the most widely adopted, while biofuel systems were the least utilized by architects in the study area during the 1980s. The research also revealed that the primary barrier preventing architects from implementing green building technologies is client resistance, as noted in the findings (Opoko et al., 2022).

Green buildings offer benefits such as reducing energy usage and operational costs, improving air quality, and creating healthier working environments. In India, green building rating systems include GRIHA, LEED, and IGBC. Eco-friendly buildings conserve energy and water, lower CO2 emissions, and employ techniques such as rainwater harvesting and greywater reuse. However, initial challenges like high construction costs and a lack of incentives remain significant obstacles. Implementing eco-friendly solutions in building projects is crucial to creating a sustainable and healthy environment (Ushir & Awasare, 2023) .

Table 1 Green Building Performance

No	Penilaian Green Building	Energi	Indoor	Material	Air	Sampah	Ekonomi	Tapak
1	Efisiensi Energi	(Opoko et al., 2022), (Ushir & Awasare, 2023); (Zhao & Gao, 2022) (Kaposztasova et al., 2024)(Delavar et al., 2023)						
2	Kenyamanan Indoor		(Kusuma et al., 2022); (Zulkiflee & Ismail, 2023); (Damayanti et al., 2024)					
3	Pemanfaatan Green Material			(He et al., 2017), (Bediako et al., 2016; Delgado et al., 2016); (Dahy, 2019); (Fonseca et al., 2024); (Czarnecki & Rudner, 2023)				
4	Pengelolaan Air				(Ahmad et al., 2022; Zhang et al., 2019)(Shen et al., 2020; Y. Xu, 2021)			
5	Pengelolaan Sampah					(Utomo et al., 2022); (Jo et al., 2024); (Delgado et al., 2016; Shi et al., 2019)		
6	Biaya Ekonomi Green Building						(Biantoro, 2018), (Rubio et al., 2024)(Liu et al., 2024; Z. Xu et al., 2019; Ziaee et al., 2022); (Martaningtyas, 2023)	
7	Tapak							(Rahardjo & Purwanto, 2024); (Siregar et al., 2019); (Aushaf et al., 2022); (Putra et al., 2024)

Based on Table 1 results evaluation green building performance presented in the 20 journals reviewed , then when served in form can seen on graph below This .

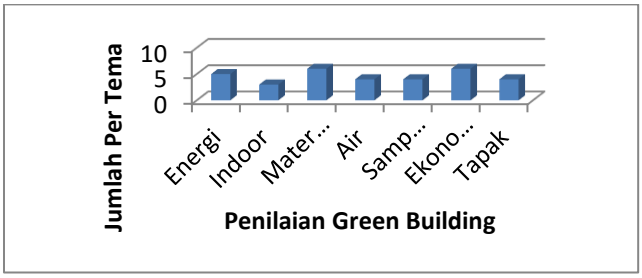

Figure 1 Green Building Assessment

Results study Topic from beginning use Publish or Perish app with 2020 – 2024 publication results there is on Table 2 below :

Table 2. Result Data Metrics Beginning Search "Green Building"

No	Description	Data
1	Pubication Years	2020 - 2024
2	Citation Years	4 (2020 – 2024)
3	Papers	100

4	Citation	169
5	Cites / Year	42.25
6	Cites / paper	1.69
7	Authors/paper	2.42
8	H index	7
9	G Index	8

Results study This on show that for 4 years final draft *green building* the more Lots discussed , along with the more increasing awareness public will concern environment . Concept sustainability Also applied in development And management building so that Lots manager building apply green building concept . Implementation green building concept can measured through various methods that have been acknowledged its existence , so that easy for for manager For increase implementation of green building in the buildings it manages .

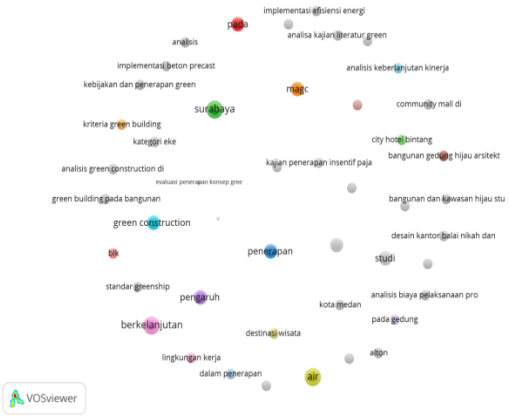

Figure 2 Network Visualization

Furthermore results mapping use application *Vosviewer* about the latest trends about *Green Building Overlay Visualization* can seen on Figure 2. Getting brighter color in the form of color yellow , yellow greenish so more and more latest or Topic the Still new talked about , on the contrary more and more dark so has been talked about for a long time . After identify mapping as well as clustering based on the keyword green building using network visualization, next is carry out mapping as well as clustering trend green building research sourced on footsteps Historical Data obtained from Overlay visualization results on figure 3. can made into reference For recognize And know the state of the art of research about green building trends during period 2020-2024.

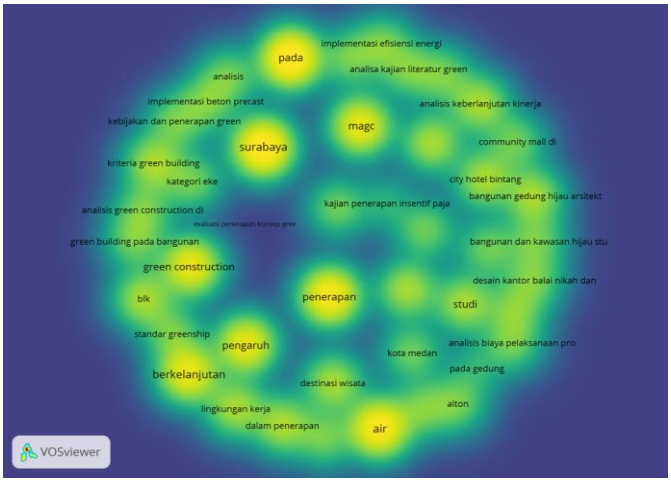

Figure 3 Density Visualization

Bibliometric analysis using density visualization provides deep insights into the relationships between various nodes in a research network. As shown in Figure 2, there are areas of high density, particularly among interconnected nodes.

One of the assessment criteria for Green Buildings, as outlined in the *Technical Guidelines for Green Building Assessment*, includes OTTV and WWR. These two criteria are essential components of the *Energy Efficiency in Building Envelope* category. For Green Buildings, the prescribed OTTV must not exceed 35 Watts/m², while the WWR should be less than 30%. The *Building Performance Assessment for Green Buildings Using Building Compliance Form V3.0* highlights these criteria. The government has been striving to implement the concept of Green Buildings (GBH) to promote environmentally friendly construction. To achieve this, it is necessary to assess the performance of Green Buildings as stipulated in the Ministry of Public Works and Housing Regulation No. 21 of 2021 (Rosyita et al., 2023). The Green Building concept is vital to preserving environmental sustainability. According to the regulation, performance assessment includes parameters used to obtain points (Priyanto et al., 2024).

Several studies have explored the impact of smart sensing networks in controlling ventilation, air conditioning, and lighting. This article analyzes environmental system modeling, which can optimize energy and operational costs while providing benefits such as controlled ventilation and improved indoor air quality in real building applications. Therefore, smart integration with intelligent technologies (IoT) will not only reduce energy and cost requirements but also enhance comfort levels in a shorter time.

Research conducted by Biantoro (2018) on electrical audits and energy efficiency demonstrated the efforts made by building managers to implement the green building concept (Biantoro, 2018). Drainage planning and the use of flood detection tools equipped with sensors are part of water resource management. By identifying flood arrival times and the volume of incoming water, building managers can better

prepare to mitigate the impact of flooding (Biantoro et al., 2022).

IV. CONCLUSION

The conclusion of the final assignment on the implementation of the green building concept is as follows:

1. The green building theme that is still widely researched is about the use of green materials and economic efficiency resulting from the implementation of green buildings. Public awareness of the implementation of green buildings can reduce various costs, one of which is reducing electricity costs, causing this theme to be frequently researched.
2. The application of the green building concept has been widely studied, especially regarding water management and waste management. Water as one of the important aspects in people's lives is one of the themes that has received attention from researchers.

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