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Comparative Analysis of Green Building Hospitals in Karawang and Pemalang

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Abstract

This study aims to analyze and compare the application of the green building concept in two hospitals in Indonesia, namely Permata Keluarga Karawang Hospital and Dr. M. Ashari Pemalang Regional General Hospital (RSUD). Using descriptive qualitative methods and case study approaches, data were collected through observation, interviews, documentation, and measurements in the field. The results show that both hospitals have applied green building principles in various aspects such as energy efficiency, environmental management, and B3 waste management. Permata Keluarga Karawang Hospital excels in the use of energy-saving technology and waste management, while Dr. M. Ashari Pemalang Hospital stands out in staff involvement and environmental management. However, there are still several aspects that need to be improved by both hospitals, such as bicycle parking facilities and rainwater intake systems, to achieve more optimal green building standards. In conclusion, both hospitals have shown a strong commitment to environmental sustainability through the implementation of the green building concept, but further improvements are still needed to achieve more optimal results.

Introduction

In recent years, construction projects have experienced a very significant development and have greatly affected human life in various parts of the world. With the various benefits resulting from modern construction projects that continue to grow increasingly complex, accompanied by increasingly sophisticated technology, it is not spared from various risks that are even greater than before (Adiwinata & Pontan, 2023; Ika & Pinto, 2022). An activity in which there is a plan and schedule for implementation is usually called a construction project. In order for a project to run without obstacles, careful planning must be carried out to achieve the right time, cost, and quality (Xing et al., 2021). However, obstacles often occur during the implementation of construction projects, both those that have been taken into account and obstacles that are beyond the planner's calculations (Puspita et al., 2022; Baldwin & Bordoli, 2014). All buildings require a maintenance consisting of light maintenance, moderate maintenance, and maintenance. The purpose of building maintenance generally achieves functions according to the requirements, needs and desires of users (Hakim & Pontan, 2022; Sacks et al., 2018; Day et al., 2020).

However, if there is a lack of attention or incompatibility of maintenance activities, it will cause bad conditions, namely a decrease in productivity levels due to lack of maintenance of building conditions (Mamaru, 2020). Jakarta. If a building is considered to be in good condition, maintained, and fit for use, then good maintenance must be carried out in

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accordance with the building maintenance procedures that have been established through the Regulation of the Minister of Public Works: Guidelines for the Management of Maintenance and Maintenance of Buildings, Procedures and Methods, Equipment, Performance Standards as well as Building Maintenance are outlined in Public Regulation No. 24/PRT/2008. This guideline can be a reference for building management agencies in carrying out building maintenance and other maintenance tasks to ensure that the building is always in good condition (Razaq Agung Wijasena, 2023; Zhao et al., 2022; Patacas et al., 2020).

A building project is a collection of activities that are completed together. The procedure for converting project resources into the results of activities in the form of buildings in this series of actions (O'Brien et al., 2020). The debate around "green construction" aims to provide solutions to the problems of contemporary urbanization. The six principles of Green Building provide a framework for ecologically responsible building practices. Land use efficiency, air quality and indoor air comfort, material sources and cycles, water conservation, and building environmental management are the six criteria. Knowledgeably, green buildings are buildings that are designed with future generations in mind. Especially those that promote ecological, medical, and social resilience (Purba & Pontan, 2023; Habash, 2022; Harris et al., 2023).

Climate change and worsening environmental degradation have prompted various sectors to implement sustainable practices, including the health sector. One of the concepts that has begun to be widely applied is green building or green building (Agyekum et al., 2022). This concept focuses not only on energy and water efficiency, but also on the creation of a healthy and comfortable environment for its residents (Nainggolan et al., 2023). An eco-friendly hospital, also referred to as a green hospital, is a healthcare facility that is designed, built, renovated, operated, and maintained with environmental and health principles in mind. The concept of an eco-friendly hospital offers many advantages that are not offered by conventional building concepts (Siahay et al., 2023; Dion et al., 2023).

According to the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 21/PRT/M/2021 concerning "performance assessment of green buildings", a green building is a building that meets the technical standards of buildings and has a significant measurable performance in saving energy, water, and other resources through the application of the bgh principle in accordance with the function and classification in each stage of its implementation (Permen PUPR no 21, 2021).

Hospitals as health facilities have an important role in the application of this concept. In addition to operational efficiency, the application of the green building concept in hospitals also aims to create an environment that supports the health of patients and staff (Alatas & Ayuningtyas, 2019; Kumari & Kumar, 2020). In Indonesia, the Green Building Council Indonesia (GBCI) and the Ministry of Health have issued various guidelines to encourage the implementation of green building in hospitals (Widiarsa et al., 2021). This study aims to analyze and compare the application of the concept of green building in two hospitals in Indonesia, namely Karawang Hospital and Dr. M. Ashari Pemalang Hospital. These two hospitals were chosen because both have claimed to have adopted several green building principles in their operations.

Methods

This study uses a descriptive qualitative method with a case study approach. The two hospitals that are the object of the research are Permata Keluarga Karawang Hospital and Dr. M. Ashari Pemalang Hospital. The data used in this study consists of primary and secondary data.

Data Collection

Observation: Conducted to see firsthand the physical condition of the hospital and the implementation of the green building concept.

ISSN: 2716-3865 (Print), 2721-1290 (Online)

Interview: Conducted with hospital management and staff related to environmental management.

Documentation: Includes the collection of documents such as annual reports, environmental reports, and other relevant documents.

On-the-Field Measurements: Measurements are made to assess technical aspects such as energy efficiency, water use, and waste management.

Data Analysis

The data was analyzed descriptively by comparing the results of observations, interviews, documentation, and measurements in both hospitals. This analysis was carried out by referring to the Guidelines for Environmentally Friendly Hospitals from the Ministry of Health of the Republic of Indonesia in 2018 and the assessment criteria from the Green Building Council Indonesia (GBCI).

Results and Discussion

Environmental Leadership and Management

Permata Keluarga Karawang Hospital

Permata Keluarga Karawang Hospital shows a strong commitment to implementing the green building concept through various strategic steps:

Environmental Permits and Supervision: Permata Keluarga Karawang Hospital has obtained all the necessary environmental permits, including AMDAL (Environmental Impact Analysis), WWTP (Wastewater Treatment Plant), and B3 (Hazardous and Toxic Materials) waste management permits. The hospital also regularly conducts environmental surveillance and audits, working closely with independent third parties to ensure compliance with applicable standards and regulations.

Special Green Hospital Team: Permata Keluarga Hospital Karawang formed a special team responsible for the implementation of green hospitals. The team is made up of various departments such as facilities management, engineering, and environmental health. They regularly evaluate and improve green initiatives that are already running.

Training and Education: The management of Permata Keluarga Karawang Hospital regularly conducts training and socialization to all hospital staff on the importance of environmentally friendly practices and ways to reduce negative impacts on the environment.

Dr. M. Ashari Pemalang Hospital

Dr. M. Ashari Pemalang Hospital also has a serious approach to environmental management, although with some differences in its implementation:

Environmental Permits and Compliance: Dr. M. Ashari Hospital has met all environmental permit requirements such as AMDAL and WWTP. They also conduct periodic monitoring to ensure compliance with environmental regulations.

Strategic Plan and Implementation Team: The hospital has a clear strategic plan for the implementation of a green hospital. A special team was formed to oversee the implementation of this plan and ensure that every step is carried out in accordance with the goals that have been set.

Staff Involvement: Dr. M. Ashari Hospital emphasizes the involvement of all levels of staff in the green hospital program. They held open discussions and brainstorming sessions to get new ideas in environmental management.

ISSN: 2716-3865 (Print), 2721-1290 (Online)

Location and Landscape

Permata Keluarga Karawang Hospital

Permata Keluarga Karawang Hospital is located in a strategic area that is easily accessible by public transportation, reducing dependence on private vehicles and reducing carbon emissions:

Transportation Access: The hospital is close to bus stops and train stations, making it easy for patients and staff to use public transportation. This is also supported by clear signs and road directions to the hospital.

Green Areas and Parks: Permata Keluarga Karawang Hospital has a large garden and green area. The park not only serves as a recreation area but also as an area for patient therapy. The large green area also helps in the supply of oxygen and the absorption of carbon dioxide.

Rainwater Catchment System: However, bicycle parking facilities and rainwater catchment systems still need to be improved. Although there are already several rainwater catchment points, the number is not enough to accommodate the existing volume of rainwater, especially during the high-intensity rainy season.

Dr. M. Ashari Pemalang Hospital

The location of Dr. M. Ashari Pemalang Hospital also supports the principle of green building, although there are several aspects that still need to be improved:

Accessibility: The hospital has good access to public transportation. Shuttle bus facilities are available to transport patients and staff to and from the nearest station.

Green Open Space: Dr. M. Ashari Hospital has a large enough green area that is used for various outdoor activities and therapy. The area is also equipped with comfortable and environmentally friendly walking paths.

Bicycle Parking Facilities and Infiltration Systems: Bicycle parking facilities are still limited and not all areas have adequate rainwater intake systems. There needs to be an increase in the number and distribution of these facilities to better support the principles of green building.

Chemical and B3 Management

Permata Keluarga Karawang Hospital

The management of chemicals and B3 waste at Permata Keluarga Hospital Karawang is carried out with strict standards to ensure safety and compliance with regulations:

Storage Facilities: Permata Keluarga Karawang Hospital has adequate B3 waste storage facilities. Each chemical and B3 waste is stored in special containers labeled according to their respective types and hazards.

Handling Procedures: Procedures for handling chemicals and B3 waste are carried out in accordance with strict standard operating procedures (SOPs). Staff involved in handling these materials receive regular training on how to handle safely and respond to emergencies.

Supervision and Audit: Periodically, audits are conducted by third parties to ensure that all processes are running in accordance with the established regulations and standards. The results of this audit are used to make continuous improvements in the management of chemicals and B3 waste.

Dr. M. Ashari Pemalang Hospital

Dr. M. Ashari Pemalang Hospital also has a good B3 chemical and waste management system, although there are several aspects that need to be improved:

ISSN: 2716-3865 (Print), 2721-1290 (Online)

Guidelines and Facilities: The hospital has a comprehensive B3 chemical and waste management guide. Storage facilities already meet security standards, but need to be improved in terms of storage capacity.

Use of Non-Mercury Equipment: The use of non-mercury medical devices and non-freon air conditioners still needs to be increased. Currently, most medical devices still use mercury and air conditioners still use freon which has the potential to damage ozone.

Training and Education: Training and education on B3 chemicals and waste management is provided on a regular basis, but it needs to be expanded so that all staff, including those not directly involved, also understand the importance of good management.

Energy and Water Efficiency

Permata Keluarga Karawang Hospital

Permata Keluarga Karawang Hospital has taken various steps to improve energy efficiency and water use, which is one of the important aspects of green building:

Energy Usage: The hospital uses LED lights throughout the area to reduce energy consumption. In addition, the air conditioning system used is an energy-saving type that can automatically adjust the temperature according to needs.

Water Usage: To save water usage, Permata Keluarga Karawang Hospital uses a toilet with a dual flushing system and automatic sensor faucets that can reduce water waste. In addition, they also have a wastewater recycling system that is used for non-potable purposes such as watering plants and cleaning.

Renewable Energy: Permata Keluarga Karawang Hospital is in the development stage of using renewable energy sources, such as solar panels, to support the hospital's electricity needs. This is expected to reduce dependence on fossil energy sources.

Dr. M. Ashari Pemalang Hospital

Dr. M. Ashari Pemalang Hospital has also implemented several initiatives to improve energy efficiency and water use:

LED Lights and Cooling Systems: The hospital has replaced most conventional lights with more energy-efficient LED lights. The air conditioning system is also set up to save energy by using inverter technology.

Water Saving Facilities: Water usage is well regulated through water-saving facilities such as dual flushing toilets and automatic faucets. In addition, this hospital also has a wastewater recycling facility, although the scale is still limited compared to the Karawang Hospital.

Renewable Energy Development: Dr. M. Ashari Hospital is in the planning stage to integrate renewable energy sources such as solar panels and small wind turbines to meet some of the hospital's energy needs.

From the results of the analysis that has been carried out, it appears that the two hospitals, Permata Keluarga Karawang Hospital and Dr. M. Ashari Pemalang Hospital, have made great efforts to implement the concept of green building. This concept covers various aspects ranging from energy efficiency, environmental management, to waste management. Nonetheless, the implementation and effectiveness of each of these aspects show some notable differences between the two hospitals.

Energy and Water Efficiency

Permata Keluarga Karawang Hospital shows better performance in terms of energy and water efficiency. This can be seen from the use of LED lights throughout the hospital area, which

ISSN: 2716-3865 (Print), 2721-1290 (Online)

significantly reduces energy consumption. In addition, energy-efficient air conditioning systems with inverter technology have helped reduce overall electricity usage. The use of technology like this shows the commitment of Karawang Hospital to reducing carbon footprint and more sustainable energy management.

For water use, Permata Keluarga Karawang Hospital uses dual flushing toilets and automatic sensor faucets. This system not only saves water but also improves sanitation efficiency. The use of recycled water for non-potable purposes such as watering plants and cleaning areas is also a step forward in water resource management. The development of renewable energy such as the installation of solar panels which are in the planning stage further confirms the commitment of Karawang Hospital to clean energy.

Dr. M. Ashari Pemalang Hospital, although it has also implemented LED lights and an efficient air conditioning system, still needs some improvements in the scale and scope of use of energy-saving technology. The use of renewable energy is still in the planning stage and has not been fully implemented. In terms of water management, water-saving facilities such as dual flushing toilets and automatic faucets have been used, but the scale is still limited compared to the Permata Keluarga Karawang Hospital.

B3 Chemicals and Waste Management

Permata Keluarga Karawang Hospital has better management of chemicals and B3 waste with adequate storage facilities and strict handling procedures. Periodic audits by third parties ensure compliance with applicable regulations and standards. Regular training for staff on the management of chemicals and B3 waste is also one of the advantages of Permata Keluarga Karawang Hospital in this aspect. Safety and compliance with environmental regulations are top priorities.

On the other hand, Dr. M. Ashari Pemalang Hospital also has good B3 waste management guidelines and facilities, but it needs to be increased in storage capacity and the use of non-mercury medical devices. Regular training and education are already underway, but the scope needs to be expanded to ensure all staff understand the importance of good management. The use of non-freon air conditioners and non-mercury medical devices is still a challenge that must be overcome.

Environmental Management and Leadership

In terms of environmental management and leadership, Dr. M. Ashari Pemalang Hospital shows excellence with a more organized management structure and the involvement of all levels of staff in the green hospital program. Open discussions and brainstorming sessions are regularly held to get new ideas in environmental management. A clear strategic plan and a dedicated implementation team demonstrate the hospital's commitment to environmental sustainability.

On the other hand, Permata Keluarga Karawang Hospital also shows strong leadership in environmental management. The establishment of a special green hospital team and the implementation of regular environmental audits demonstrate the hospital's commitment to compliance and continuous improvement. Training and socialization to all staff regarding environmentally friendly practices is part of an effective management strategy at Permata Keluarga Hospital Karawang.

Location and Landscape

The location and landscape of the two hospitals also have an important role in the implementation of green building. Permata Keluarga Karawang Hospital is located in a strategic area with good access to public transportation. This reduces reliance on private vehicles and helps reduce carbon emissions. The park and large green areas provide recreation

ISSN: 2716-3865 (Print), 2721-1290 (Online)

and therapy spaces for patients and staff, supporting their mental and physical health. However, bicycle parking facilities and rainwater catchment systems still need to be improved to achieve more optimal green building standards.

Dr. M. Ashari Pemalang Hospital also has good access to public transportation and a fairly large green area. The shuttle bus facilities provided help in reducing the use of private vehicles. Comfortable and eco-friendly walkways support healthy mobility in the hospital area. However, like the Permata Keluarga Karawang Hospital, bicycle parking facilities and rainwater catchment systems still need to be improved.

Conclusion

This study shows that both Permata Keluarga Karawang Hospital and Dr. M. Ashari Pemalang Hospital have made great efforts to implement the concept of green building, with various strategic steps in the fields of energy efficiency, environmental management, and waste management. Although Permata Keluarga Karawang Hospital excels in terms of energy efficiency and management of chemicals and B3 waste, Dr. M. Ashari Pemalang Hospital stands out in its organized environmental management and thorough staff involvement. However, the two hospitals still need to improve several aspects such as bicycle parking facilities and rainwater catchment systems to achieve more optimal green building standards.

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