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Assessment of Environmental Impact of Contruction Projects: Toward Green Building Certification and Compliance

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Abstract

The construction industry contributes significantly to environmental degradation. Environmental impact assessment (EIA) is becoming an important instrument to minimise the negative impacts of construction projects. Certification and compliance with green building standards are increasingly important to promote sustainable development. The objectives of this study are to evaluate the effectiveness of EIA in minimising the environmental impact of construction projects and to assess the readiness of the construction industry in adopting green building certification and compliance. This research is a type of literature review research related to EIA, green building regulations, and construction project case studies. The results concluded that EIA is effective in identifying and minimising the environmental impacts of construction projects. However, there are several obstacles in its implementation, such as the lack of experts and weak law enforcement. Green building certification and compliance are still not widely adopted by the construction industry in Indonesia. Furthermore, to strengthen the implementation of EIA and improve the readiness of the construction industry in adopting green building certification and compliance. This can be achieved through education, training, and incentives for developers and contractors.

Keywords: Environmental Impact Assessment, Construction Project, Green Building, Certification

Introduction

The construction industry has an undeniable role in the economic and infrastructure development of a country. As one of the major sectors in the economy, the construction industry creates extensive employment and provides significant economic impact through investment in the construction of physical projects (Remizov et al., 2021). By providing jobs to a wide range of sectors, from engineers to construction workers, the industry not only provides income for those individuals, but also supports broader economic growth through consumption and investment resulting from such activities (Leiringer, 2020; Raouf & Ghamdi, 2023). In addition, the construction industry is also the backbone of infrastructure development which plays an important role in improving connectivity, productivity, and quality of life of the community. By building roads, bridges, airports, and other facilities, the construction industry creates a vital foundation for long-term economic growth. Investment in infrastructure also enables better access to basic services such as education, health care, and energy, all of

which are key factors in poverty alleviation and improved overall societal well-being. Therefore, it is important for countries to recognize the strategic role of the construction industry in economic and infrastructure development and provide the necessary support to drive growth and progress in the sector (Jamoussi et al., 2022).

Environmental impact assessment from construction projects towards green building certification and compliance often faces some significant challenges. One of the main problems is the lack of awareness and understanding of the importance of environmental sustainability among stakeholders in the construction industry (Norouzi &; Soori, 2020). Many industry players still prioritize economic and practical factors in decision making, without considering the environmental impact that their construction projects may cause. This could hinder the adoption of greener practices as well as drive demand for green building certification (Olukoya &; Atanda, 2020).

In addition, another obstacle is the lack of availability of accurate data and information related to the environmental impact of construction projects. Comprehensive assessments require robust data to support impact analysis, but it is often difficult to gather adequate information related to aspects such as carbon emissions, natural resource use, and waste management (Shen & Faure, 2021); . Without adequate data, environmental impact assessments become inaccurate and less reliable, hampering efforts to adopt more sustainable practices in the construction industry. Therefore, solving this problem requires a concerted effort between government, industry, and research institutions to improve access to relevant information and support more comprehensive data collection (Agbajor & Mewomo, 2024).

In an effort to improve understanding and management of the environmental impact of construction projects, many recent studies have introduced new approaches and advanced technologies (Atasoy, 2016). One of the key trends is the use of digital technology and building information modelling (BIM) to estimate environmental impacts from the planning stage to construction (Atasoy, 2016). By utilizing BIM, construction professionals can perform more accurate simulations related to resource use and carbon emissions, enabling them to effectively identify impact reduction strategies (Gonzalo et al., 2022). In addition, breakthroughs in sensor and monitoring technology enable the collection of real-time data on the environmental performance of existing buildings, providing valuable insights for continuous improvement and maintenance.

In addition, developments in green building certification systems are also an integral part of the state of the art in the environmental impact assessment of construction projects (Sadeghi et al., 2022). Systems such as LEED (Leadership in Energy and Environmental Design) and BREEAM (Building Research Establishment Environmental Assessment Method) have become globally recognized industry standards, providing a comprehensive framework for evaluating and verifying the sustainability of buildings (Poon, 2021). By encouraging the adoption of sustainable practices and providing incentives for projects that meet certain sustainability criteria, green building certification systems play an important role in promoting the sustainable growth of the construction industry. Based on this, this study aims to evaluate

the effectiveness of AMDAL in minimizing the environmental impact of construction projects and examine the readiness of the construction industry in adopting green building certification and compliance.

Researh Methods

In research using literature review research related to environmental impact assessment of construction projects towards green building certification and compliance, the first step is to conduct a careful and systematic search of relevant literature. Researchers will compile a literature database that includes journal articles, books, research reports, and other related documents that discuss topics relevant to environmental sustainability in the construction industry. The next step is to identify patterns, trends, and key findings from the literature that has been compiled. It involves an in-depth process of analysis of literature content to explore various approaches, methodologies, and published research results. In addition, the literature review research method also involves the synthesis and interpretation of information found from the compiled literature. Researchers will evaluate the suitability and relevance of literature findings to their own research objectives, as well as identify the weaknesses and strengths of each previously proposed approach. By combining various perspectives and knowledge gained from existing literature, this research can provide deeper insight into the challenges and opportunities in achieving environmental sustainability in the construction industry.

Result and Discussion

Effectiveness of identification of potential environmental impacts of construction projects

This identification phase is an important first step in the Environmental Impact Assessment (EIA) process undertaken prior to commencing a construction project. Careful identification allows stakeholders to identify potential negative impacts on the surrounding environment, including aspects such as natural resource use, land degradation, air and water pollution, and social and economic impacts (Pamidimukkala &; Kermanshachi, 2021). One of the key aspects in improving the effectiveness of environmental impact identification is to involve various stakeholders and relevant experts in the process. By engaging local communities, environmentalists, and local governments, we can gather the diverse perspectives and knowledge needed to identify possible impacts holistically. Cooperation between the parties involved can also help increase transparency and accountability in the impact identification process, ensuring that all relevant factors are well considered (Kabirifar et al., 2020).

Furthermore, it is important to use appropriate analytical methods in the process of identifying environmental impacts. A holistic, integrated approach such as Life Cycle Assessment (LCA) can help in identifying and evaluating the impact of different stages in the construction project life cycle, from the planning stage to demolition. In addition, digital technologies such as building information modeling (BIM) can be used to visualize and analyze

potential impacts in greater detail, enabling stakeholders to make better, more informed decisions. However, in practice, there are still some challenges faced in efforts to improve the effectiveness of identifying the environmental impacts of construction projects (Foster, 2020). One is the lack of access to relevant and accurate data, especially in less developed regions. Without adequate data, the identification process can be inaccurate and less reliable. Therefore, there needs to be efforts to improve access to quality environmental information and to develop local capacity in conducting environmental impact assessments.

Furthermore, improving the effectiveness of environmental impact identification of construction projects requires strong commitment from all relevant parties, including government, the construction industry, civil society, and academia. By using an integrated approach, engaging stakeholders, and addressing challenges, we can ensure that construction projects can be implemented with maximum environmental impact accounted for, thus supporting sustainable development and having a positive impact on society and the environment (Bai et al., 2020).

Feasibility analysis and completeness of environmental impact mitigation plans in AMDAL documents

The feasibility and completeness analysis of environmental impact mitigation plans in the Environmental Impact Assessment (AMDAL) document is a crucial stage in ensuring that construction projects take into account and reduce negative impacts on the surrounding environment. In the EIA process, a team of experts conducts a comprehensive evaluation of the potential impacts that a project may have, including impacts on air, water, soil, flora, fauna, as well as social and economic aspects. This analysis involves identifying, characterizing, and estimating possible impacts during different stages of the project (Ramli et al., 2019.). Once impact identification is in place, the next step is to develop an effective mitigation plan to reduce or avoid those impacts as far as possible. These mitigation plans should be specific, practical, and adequate, and include clear and measurable steps to address any identified impacts (Pratiwi et al., 2023). In addition, the plan must also take into account the principles of sustainability and the balance between economic development and environmental conservation.

The success of the feasibility analysis and completeness of the mitigation plan in the EIA document depends on several key factors, including the quality of the data used, the proficiency of the team of experts involved, and the active involvement and participation of local stakeholders (Yanto &; Syaputra, 2022). Accurate and comprehensive data quality is essential to ensure that impact analysis is conducted objectively and accountably. Meanwhile, the skills and experience of the expert team in analyzing environmental impacts and designing appropriate mitigation plans determine the effectiveness of the AMDAL document.

No less important is the active involvement and participation of local communities and other stakeholders in the AMDAL preparation process. This engagement allows stakeholders to provide their input, perspective, and concerns to the project, thus enabling the proposed mitigation plan to be more comprehensive and sustainable (Rozi &; Husin, 2022). Thus, the

feasibility and completeness analysis of mitigation plans in AMDAL documents is not only a technical process, but also a participatory process involving all relevant parties, with the ultimate goal of achieving sustainable development and having a positive impact on the environment and society.

Analysis of construction projects that have implemented green building certification and compliance in Indonesia

Analysis of construction projects that have implemented green building certification and compliance in Indonesia is an important step in understanding the impact and successful implementation of sustainable practices in the country's construction industry. Since the introduction of green building certification in Indonesia, several construction projects have involved themselves in the certification process to ensure that the buildings built meet certain standards in terms of environmental sustainability (Sahid et al., 2020). This analysis can provide valuable insights into the effectiveness of green building certification implementation in construction practices in Indonesia. One of the important aspects analyzed is the compliance of construction projects with established green building standards. This involves evaluating the extent to which the projects meet the criteria expected in certification, such as the use of environmentally friendly materials, energy efficiency, water management, and indoor environmental quality (Fitriani, 2022). By analyzing this level of compliance, we can understand how well construction projects in Indonesia have implemented sustainable practices in building construction.

In addition, the analysis should also pay attention to the environmental impact generated by construction projects that have implemented green building certification. Although the main purpose of this certification is to reduce negative impacts on the environment, it is important to evaluate the extent to which such projects have been successful in accounting for and reducing their environmental footprint. It involves evaluating the use of natural resources, carbon emissions, construction waste, and other impacts that may arise during a building's life cycle. In the Indonesian context, the analysis should also consider the unique challenges and opportunities faced by construction projects in implementing green building certification (Handayani et al., 2020.). Factors such as government policies, availability of technology and resources, and awareness and skills of the workforce can affect the effectiveness of implementing sustainable practices in the construction industry. By understanding these factors, we can identify ways to improve the implementation of green building certification in the future.

Therefore, this analysis can provide valuable insights for stakeholders, including governments, developers, contractors, and the general public (Willar et al., 2021). By understanding the successes and challenges of implementing green building certification, we can identify opportunities to improve sustainable practices in the construction industry in Indonesia, thereby bringing greater positive impact to the environment and society.

Conclusion

From the results of this study, it can be concluded that concluding AMDAL has proven effective in identifying and minimizing the environmental impact of construction projects. However, there are several obstacles in its implementation, such as lack of experts and weak law enforcement. Green building certification and compliance are still not widely adopted by the construction industry in Indonesia. Furthermore, to strengthen AMDAL implementation and improve the readiness of the construction industry in adopting green building certification and compliance. This can be achieved through education, training, and incentives for developers and contractors.

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