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Legal and Regulatory Review on the Implementation of Green Construction in Indonesia

Yuwono Imanto[1], Sami'an[2], Sarwono Hardjomuljadi[3]
[1,2,3]Department of Construction Law, University of Pekalongan, Indonesia
Email: yuwono.imanto@gmail.com, dosen.samian@gmail.com, sarwonohm2@gmail.com

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ABSTRACT

The implementation of green construction concept in Indonesia's construction industry is increasing as a response to the need for sustainable development. However, the application of this concept is not without challenges, which can cause the potential for legal and regulatory issues. This study aims to explore the implications of green construction implementation from technical, legal, environmental and regulatory perspectives.This research approach was conducted using qualitative methods, with data collected from literature and interviews with experts involved in green construction. Data is gathered through literature studies and confirm results using the Delphi method. The findings reveal that a lack of comprehensive understanding of green construction principles often leads to potential disputes among stakeholders, particularly in risk management, responsibility allocation, and different interpretations of technical and legal aspects.
The study identifies key challenges such as additional costs for eco-friendly technologies and non-compliance with green building standards and government regulations as major contributors to legal issues as well. To mitigate these risks, harmonization of regulations, strengthening of contract documents, and dissemination of green construction knowledge among stakeholders are essential.This study provides recommendations for construction industry players to manage potential legal issues in construction contracts while supporting the more effective implementation of green construction in Indonesia.

INTRODUCTION

The construction industry plays an important role in economic and social development in Indonesia. As a sector that contributes greatly to Gross Domestic Product (GDP), the construction sector is also known as one of the industries that has a significant impact on the environment. With increasing global attention to the issues of climate change and environmental conservation, various countries, including Indonesia, have begun to adopt the concept of sustainable development in construction projects. One approach to supporting sustainable development is the implementation of green construction. This

concept aims to reduce environmental impacts through efficient use of resources, waste management, and the application of environmentally friendly technologies.(Massie et al., 2018)

However, the implementation of green construction in Indonesia still faces many challenges. In some cases, the implementation of this concept can trigger legal problems between the parties involved, such as contractors, consultants, and project owners. Disputes often arise due to differences in interpretation of technical requirements and green construction standards, inconsistencies between project plans and implementation, and unexpected additional costs.(Adikusumo, 2010). In addition, the lack of comprehensive understanding of green construction principles among stakeholders is also a contributing factor to the problem.(Kembaren et al., 2023).

In Indonesia, the implementation of green construction refers to various regulations, such as the Greenship standard from GBCI, the Regulation of the Minister of Public Works and Public Housing (PUPR) on Green Buildings, the Regulation of the Minister of Environment and SNI. Each of these regulations provides quite clear guidelines and guidance, but the challenges in implementation are related to problems in technical, environmental, legal aspects, and synchronization of each regulation. For example, construction projects that adopt the principles of green construction often require new technology materials and working methods that are different from conventional construction, which can ultimately lead to disagreements or conflicts and legal problems among the parties involved.(Firmawan et al., 2023)

Problems in construction projects are complex and multidimensional. This not only affects the continuity of the project, but also the business relationship between the parties involved. In the context of green construction, the potential for disputes and legal problems becomes higher because of the additional aspects that need to be managed, such as compliance with environmental standards, use of environmentally friendly materials, and energy efficiency which will increase costs. Therefore, this study is relevant to identify and analyse the impact of green construction implementation on the potential for construction legal problems in Indonesia.

The objectives of this study are: 1) To identify the main factors that cause potential legal problems in green construction-based construction projects; 2) To analyze the impact of green construction implementation on the relationship between parties involved in the construction project; 3) To identify strategic steps to reduce the potential for disputes in green construction-based construction projects; and 4) To provide recommendations for effective implementation of green construction.

LITERATURE REVIEW

Greenship of GBCI :

Greenship is a green building assessment system developed by the Green Building Council Indonesia (GBCI). This system is designed to encourage the implementation of sustainable building principles in the construction industry. As a developing country with increasing urbanization rates, Indonesia needs a framework that can ensure environmentally friendly, efficient, and sustainable buildings. Greenship is here as a guide for building owners, developers, and contractors to design, build, and manage buildings that minimize environmental impacts.

Greenship Concept

Greenship is the concept of sustainable development that emphasizes energy efficiency, water conservation, use of environmentally friendly materials, and waste management. This system also supports the creation of a healthy living environment for building occupants by improving indoor air quality and natural lighting.(Massie et al., 2018). This concept is in line with the global sustainable development goals initiated by the United Nations (UN).

Greenship Assessment Categories

Greenship (Indonesia, 2014) divides its assessment into six main categories to ensure a holistic approach to sustainability, namely: 1) Appropriate Site Development (ASD) which evaluate the management of the project site to minimize the impact on the surrounding environment, including ecosystem conservation and wastewater management.(Adikusumo, 2010); 2) Energy Efficiency and Conservation (EEC) which focuses on reducing energy consumption and implementing renewable

energy. This category includes the use of energy-saving technologies and efficient building designs.(Naurah et al., 2022); 3) Water Conservation (WAC) which focuses on efficient water use management by implementing water-saving sanitation installations and wastewater treatment. This management reduces the impact of water resource exploitation.(Kembaren et al., 2023); 4) Material Resources and Cycle (MRC) which focuse on the use of environmentally friendly building materials, recycling of construction materials, and reducing waste during the construction process.(Firmawan et al., 2023); 5) Indoor Health and Comfort (IHC) which ensures the health and comfort of occupants through indoor air quality control, natural lighting, and ergonomic interior design; and 6) Building and Environment Management (BEM) which focuses on the involvement of energy efficiency monitoring and operational waste management during the life of the building.

Greenship Implementation Challenges

The challenge of implementing Greenship is the lack of stakeholder understanding. Many construction industry players do not fully understand the benefits and mechanisms of Greenship, so its implementation is still limited.(Kembaren et al., 2023). These challenges are caused by: 1) high initial costs because the implementation of environmentally friendly technologies often requires large initial investments, which is a barrier for developers; 2) lack of supporting regulations because even though there are policies related to green buildings, their implementation is not yet fully evenly distributed throughout Indonesia; and 3) limited resources and technology caused by not all regions having access to adequate environmentally friendly building materials or energy-saving technologies.(Rejeki et al., 2018). Currently the Greenship standard is used for private green buildings.

Regulatory Principles in Green Building

Green building is an approach to development that focuses on energy efficiency, resource management, and reducing environmental impact. In Indonesia, this concept has begun to be implemented along with the increasing global awareness of environmental sustainability. The Indonesian government has formulated various regulations to support sustainable development through the implementation of the green building concept. These regulations aim to encourage construction actors to meet strict environmental standards while ensuring efficiency in the use of energy, water, and building materials.

Legal Basis and Legislation for Green Building in Indonesia

Law Number 28 of 2002 regulates building construction with the principles of safety, health, comfort, and sustainability. Article 4 emphasizes that every building must be designed to meet these principles.(President, 2002)

Regulation of the Minister of Public Works and Public Housing (PUPR) No. 02/PRT/M/2015 concerning Green Buildings is the main guideline for implementing green buildings in Indonesia. This regulation covers energy efficiency, water conservation, waste management, and the use of environmentally friendly materials.(Massie et al., 2018)

Regulation of the Minister of Environment no. 8 of 2010 is concerning Green Building Criteria and Certification regulates technical guidelines and criteria for the management of environmentally friendly buildings in Indonesia. The main focus of this regulation is to encourage sustainable development by considering environmental aspects in the design, construction, and operation of buildings.

SNI 03-2396-2001 is Indonesian National Standard that provides technical guidance for the design and implementation of green buildings. This standard focuses on the principles of sustainability and resource efficiency in the design, construction, and operation of buildings.(Building, 1991)

Key Principles of Green Building Regulation and Legislation

The main principles of Green Building in the regulation are related to: 1) energy efficiency; 2) water conversion; 3) use of environmentally friendly materials; and 4) health and comfort of occupants.

In relation to energy efficiency, there are regulations requiring the use of energy-saving technologies in building design and operation, including LED lighting, efficient air conditioning, and solar panels. Minister of PUPR Regulation No. 02/PRT/M/2015 emphasizes the importance of calculating energy consumption in building planning.(Adikusumo, 2010). Regarding water conversion, buildings are required to use technology that supports water efficiency, such as water-saving sinks and toilets, rainwater treatment systems, and wastewater recycling. The use of materials that can be recycled or have a low environmental impact is one of the main requirements in the construction of green buildings. This is regulated in Minister of PUPR Regulation No. 22/PRT/M/2018 concerning Construction Material Management (Naurah et al., 2022). Attention to the health and comfort of occupants is regulated in regulations prioritizing designs that support indoor air quality and natural lighting to improve the health and productivity of building occupants.

Important Aspects in Building Construction Regulations

Safety is a major aspect in building construction. Article 7 of Law No. 28 of 2002 requires that every building is designed with attention to the risks of earthquakes, fires, and other hazards. These safety standards include the use of building materials that meet national and international standards. Buildings must have functions in accordance with their designation, such as residential, commercial, or public facilities. PP No. 36/2005 Article 11 stipulates that changes in building function must obtain approval from the local government. Building construction must meet administrative requirements, such as a Building Construction Permit (IMB) and other supporting documents. The IMB, which is now the PBG (Building Construction Approval), is a legal document that ensures that the building construction plan has met all applicable provisions.

Minister of PUPR Regulation No. 02/PRT/M/2015 requires the implementation of green building principles for certain buildings, including energy efficiency, water management, and the use of environmentally friendly materials. This policy is in line with global efforts to reduce the negative impacts of development on the environment. After completion of construction, buildings must be maintained to ensure their functionality and safety. PP No. 36/2005 Article 40 stipulates that building owners are responsible for routine maintenance and periodic inspections.(Government of the Republic of Indonesia, 2005)

Challenges in Implementing Regulations

Many developers, especially in the regions, do not understand the applicable regulations, so that violations often occur, such as construction without a building permit or the use of materials that do not meet standards. Differences in regulations between the central and regional governments can cause confusion for construction business actors. Harmonization of regulations is key to overcoming this problem. Supervision of the implementation of building construction is often weak, especially in remote areas. This can result in low building quality and increased safety risks. The implementation of green building principles is often considered expensive by developers, so not all projects comply with regulations related to energy efficiency and environmental sustainability.

Green Construction is a development approach that focuses on sustainability and efforts to `support human health and well-being. Amidst increasing global awareness of climate change, green construction is becoming a major solution in the construction industry to reduce carbon emissions and promote sustainable development. Regulation of the Minister of Public Works and Public Housing (PUPR) Number 02/PRT/M/2015 is concerning Green Buildings. Green construction is based on the main principles that ensure that construction projects meet the following aspects: 1) Energy Efficiency; 2) Use of environmentally friendly materials; 3) water management; 4) waste management; and 5) health and comfort of occupants

Energy efficiency is done by optimizing energy use during the construction and operational processes of buildings, by utilizing renewable energy such as solar panels. Reducing water consumption

through water-saving technology, wastewater management, and rainwater recycling. Using materials that can be recycled, have a low environmental impact, and come from sustainable sources. Waste management is done by recycling or minimizing disposal to construction waste landfills. Attention to the health and comfort of occupants is done by ensuring good indoor air quality, natural lighting, and green spaces that support health. Green construcion can reduce the carbon footprint of the construction sector, which is known as one of the largest emitters in the world. Long-term cost efficiency of using energy and water-saving technology can reduce building operational costs in the long term. Improved health and air quality and good lighting inside buildings improve occupant health and work productivity. The added value of building properties that meet green construction standards has a higher selling value and is attractive to investors who care about the environment.

Challenges in Green Construction Implementation are: 1) High initial costs because the implementation of environmentally friendly technology often requires a large initial investment, which is an obstacle for developers; 2) Lack of understanding and awareness of many industry players who do not fully understand the benefits of green construction, so that its implementation is not evenly distributed; 3) Limited local technology and resources because not all regions have access to technology and materials that support green construction and 4) Regulations and regulatory incentives that encourage the implementation of green construction are still limited in several countries, including Indonesia.

Regulations Regarding Green Construction in Indonesia

In Indonesia, green construction has begun to be regulated in several policies and regulations, such as: 1) Law No. 28 of 2002 concerning Building Construction, which provides a legal basis for building construction that takes into account the principles of safety, comfort, and sustainability.
And 2) Regulation of the Minister of PUPR No. 02/PRT/M/2015 concerning Green Buildings, which regulates energy efficiency, water management, and environmentally friendly materials and 2)

Understanding of Green Building and Green Construction(Thoengsal, 2024) (Minister of Public Works and Public Housing of the Republic of Indonesia, 2015) (Sudiartha et al., 2015)

*Green Building*is a development concept that emphasizes efficiency in the use of resources (energy, water, and materials) throughout the life cycle of a building, from planning, construction, to operation and demolition. The goal is to reduce negative impacts on the environment and improve the quality of life of its occupants. Green Construction, on the other hand, focuses more on sustainable and environmentally friendly building processes. This includes the selection of environmentally friendly materials, construction methods that minimize waste, and the implementation of technologies that reduce carbon emissions during the construction process.

Green Building and green construction has the main goal of sustainability and reducing negative impacts on the environment, Green building emphasizes more on building design and performance, while green construction focuses more on construction methods and processes.
Green construction is the implementation of green building development, where environmentally friendly construction processes ensure that sustainably designed buildings remain consistent with environmental goals.

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Building Regulations and potential legal issues

Building construction in Indonesia is regulated by various regulations that aim to ensure the safety, function, comfort, and sustainability of buildings. These regulations cover various aspects, from planning, implementation, to building maintenance. As a rapidly developing country, Indonesia faces challenges in managing building construction to allign with the needs of society and the environment. This study discusses the laws and regulations related to building construction in general, with an emphasis on the legal framework applicable in Indonesia with the aim of avoiding potential legal problems and construction disputes.

One of the main causes of disputes in construction contracts is differences in interpretation of the contents of the contract. This can occur due to ambiguity in the language of the contract or a lack of understanding of the technical provisions.(Adikusumo, 2010)

Green construction projects often face technical and environmental uncertainties that can affect project implementation. These uncertainties can lead to changes in the scope of work and cause conflict between the parties involved.(Kembaren et al., 2023)

A construction contract is a legal agreement between two or more parties that regulates the implementation of construction work, including planning, implementation, and completion of the project. This contract is the basis for the working relationship between the project owner and the contractor, with the aim of ensuring that the project runs according to the agreed agreement.(Massie et al., 2018). Construction contracts involve various elements, such as time, cost, quality, and the responsibilities of each party. In the context of sustainable development, construction contracts must also include the principles of environmental friendliness and resource efficiency.(Firmawan et al., 2023) The Main Components of a Construction Contract are: 1) Parties involved; 2) Scope of work; 3) Time and cost provisions; and 4) Dispute resolution provisions.

Legal Issues and Construction Contract Disputes

Construction contract disputes are disagreement between parties nvolved in the implementation of a construction project due to differences in interpretation of the contents of the contract, breach of agreement, or unforeseen events that affect the implementation of the work. These disputes often occur due to the complexity of construction projects involving many parties, ranging from project owners, contractors, subcontractors, to consultants.

The construction industry is known as one of the sectors that is vulnerable to disputes, because it involves high risks, the need for intensive coordination, and dependence on various resources and regulations. In a legal context, construction contract disputes can impact the continuity of the project, business relationships, and the reputation of the parties involved.

The implementation of Green Construction in the construction process of Green Buildings in Indonesia can cause various legal issues and potential construction disputes. Some of the main issues that often arise are due to lack of detailed regulation: The absence of specific regulations regarding the implementation of green construction can lead to different interpretations among construction industry players, thereby increasing the risk of disputes. Mistakes in planning and implementing projects that do not comply with green construction standards can result in building failure, which can potentially lead to lawsuits. Lack of awareness and understanding of green construction among contractors and other stakeholders can lead to breaches of contracts and environmental standards, leading to legal disputes. Construction waste management that is not in accordance with the principles of green construction can cause environmental and legal problems. The absence of adequate documentation regarding the implementation of green construction can make it difficult to prove compliance with the established standards, thus triggering disputes.

To reduce the risk of legal issues and disputes in the implementation of green construction, it is recommended that construction industry players: 1) Follow regulations such as the Regulation of the Minister of Public Works and Public Housing Number 02/PRT/M/2015 concerning Green Buildings; 2) Conduct training and socialization on the importance of implementing green construction for all parties involved in the project; 3) Establish specific contract clauses related to implementing green construction to avoid different interpretations; and 4) Record every step of implementing green construction as evidence of compliance with the established standards.

Regulations Governing Construction Contract Disputes

Law Number 2 of 2017 concerning Construction Services regulates rights, obligations, and dispute resolution in construction projects.(BPK, 2017) article 52: Settlement of disputes through mediation, conciliation or arbitration.

Law No. 30 of 1999 concerning Arbitration and Alternative Dispute Resolution Provides a legal basis for dispute resolution through arbitration.(Siregar, 2021). Regulation of the Minister of PUPR Number 22/PRT/M/2018 regulates the implementation green construction, including legal aspects in dispute resolution.

METHOD

This research approach was conducted using qualitative methods, with data collected from literature and interviews with experts involved in green construction. Data is gathered through literature studies and confirm results with experts using the Delphi method. The findings reveal that a lack of comprehensive understanding of green construction principles often leads to potential disputes among stakeholders, particularly in risk management, cost allocation, environmental aspects and different interpretations of technical and legal aspects.

RESULT AND DISCUSSION

Comparison of the relationship between Green Building and Green Construction Regulations and Legislation in Indonesia and opportunities for synchronization

In this research, the legal regulations studied are 1) Greenship of GBCI 2014; 2) Law No. 28 of 2002; 3) Regulation of the Minister of PUPR No. 02/PRT/M/2015; 4) , Regulation of the Minister of Environment No. 8 of 2010; and 5) SNI 03-2396-2001

Table 1. Comparison of Regulations and Legislation regarding Greenbuilding

Aspect	Greenship of GBCI	Law No. 28 of 2002	PUPR Ministerial Regulation No. 02/PRT/M/2015	Ministry of Environment Regulation No. 8 of 2010	SNI 03-2396-2001
Green Building Techniques	Provides technical standards for energy efficiency, ventilation and natural lighting.	Provides structural safety and technical comfort of buildings.	Technical standards for energy-efficient design, natural lighting and ventilation.	Technical standards for sustainable building design.	Technical standards for spatial planning and buildings in residential areas.
Environment	Prioritize ecosystem protection, location sustainability, and urban heat island reduction.	Integrating spatial planning and environmental management.	Reducing environmental impact with sustainable site design.	Focus on environmental impact mitigation and ecosystem sustainability.	Focus on environmental preservation and green open spaces.
Eco-Friendly Materials	Using environmentally friendly and VOC-free certified materials.	Does not specifically discuss environmentally friendly materials.	Use of environmentally friendly, local and certified materials.	Encourage the use of local and hazardous material free materials.	Prioritize local and environmentally friendly materials.
Energy Efficiency	Using energy-saving technology and renewable energy.	Energy efficiency is one of the technical considerations of a building.	Energy efficiency is a key criterion, including the use of renewable energy.	Promote the use of renewable energy and energy-saving technologies.	Energy efficiency in spatial and building design.

Aspect	Greenship of GBCI	Law No. 28 of 2002	PUPR Ministerial Regulation No. 02/PRT/M/2015	Ministry of Environment Regulation No. 8 of 2010	SNI 03-2396-2001
Water Management	Wastewater treatment systems, rainwater harvesting, and water saving devices.	Promote water management, especially in public buildings.	Water recycling, rainwater management and water saving devices are prioritized.	Wastewater recycling systems and rainwater harvesting are prioritized.	Rainwater management and water-saving irrigation systems.
Waste Management	3R principle for construction and operational waste.	Emphasizes construction waste management in accordance with regulations.	3R-based construction and operational waste management.	Construction waste management with the 3R principle.	Domestic waste management based on 3R.
Occupant Health and Comfort	Ensuring air ventilation, natural lighting and low emission interior materials.	Ensuring thermal comfort, ventilation and lighting.	Indoor air quality, temperature comfort, and natural lighting.	Ensure ventilation, natural lighting, and low VOC materials.	Ensure good ventilation and lighting in the house.

Table 2. Similarities in Regulations and Legislation regarding Greenbuilding

Aspect	Equality
Green Building Techniques	All regulations emphasize the importance of technical standards that support energy efficiency, ventilation and natural lighting.
Environment	Prioritize environmental conservation, ecosystem protection, and sustainable spatial planning.
Eco-Friendly Materials	Encourage the use of eco-friendly, certified or local materials to reduce environmental impact.
Energy Efficiency	Energy efficiency is a key aspect in building planning and operation, including the use of renewable energy.
Water Management	Water management, such as water recycling, rainwater harvesting, and water-saving devices, is prioritized by all regulations.
Waste Management	The 3R principle (Reduce, Reuse, Recycle) is used as an approach to managing construction and operational waste.
Occupant Health and Comfort	Indoor air quality, natural ventilation, natural lighting, and low VOC materials are emphasized in all regulations.

Table 3. Differences in Regulations and Legislation on Greenbuilding

Aspect	Greenship of GBCI 2014	Law No. 28 of 2002	PUPR Ministerial Regulation No. 02/PRT/M/2015	Ministry of Environment Regulation No. 8 of 2010	SNI 03-2396-2001
Green Building Techniques	Technical standards include green building certification	More focus on the safety and structural comfort of the building.	Emphasizing energy-efficient and renewable technical design.	Technical standards include sustainable design and	Focus on spatial planning and land efficiency.

Aspect	Greenship of GBCI 2014	Law No. 28 of 2002	PUPR Ministerial Regulation No. 02/PRT/M/2015	Ministry of Environment Regulation No. 8 of 2010	SNI 03-2396-2001
	with comprehensive assessment.			modern technologies.	
Environment	Has a special focus on urban heat islands and ecosystem integration.	The environment is seen from the spatial layout and security of the location.	Environmental impact management is a major focus.	Focus on environmental impact mitigation and ecosystem sustainability.	The environment is seen from the sustainability of the area and green open space.
Eco-Friendly Materials	Prioritizing ceried materials and innovation in material design.	Does not explicitly discuss environmentally friendly materials.	Use of certified materials and efficiency of local materials.	Promote local and hazardous material free.	Prioritize local materials for housing construction.
Energy Efficiency	Encourage the use of advanced technologies for energy optimization.	Energy efficiency is considered a technical consideration only.	Energy efficiency through modern building design and technology.	Integrating renewable energy into building operations.	Energy efficiency is applied to spatial design.
Water Management	Wastewater recycling systems and rainwater harvesting are a must.	Does not regulate water management in detail.	Comprehensive water management with advanced technology.	Water recycling systems and rainwater harvesting are highly recommended.	Rainwater management to reduce the impact of flooding.
Waste Management	Integrating waste management into building operational standards.	Emphasizes construction waste regulation, not operational.	Implementing 3R for construction and operational waste.	3R-based waste management is applied consistently.	Waste management is more directed at domestic waste.
Occupants Health and Comfort	Focus on occupant comfort and free from hazardous materials.	Prioritizes public convenience without specific environmental standards.	Focus on ventilation, lighting and thermal comfort.	Emphasizes air ventilation and low VOC materials.	Focus on ventilation and lighting in the house.

The focus of regulations and legislation from the aspects of green building and green construction can be seen in Table 4.

Table 4. Focus of Regulations and Legislation from the Aspect of Greenbuilding and Green Construction

Aspect	Greenship of GBCI 2014	Law No. 28 of 2002	Minister PUPR Regulation No. 02/PRT/M/2015	Ministry of Environment Regulation No. 8 of 2010	SNI 03-2396-2001
Green Building	Establish green building certification assessment standards with criteria such as energy efficiency, environmentally friendly materials, and occupant health.	Focus on safety, comfort and building function without specific criteria related to sustainability or green certification.	Provides technical guidance for green buildings, covering energy efficiency, environmentally friendly materials, and indoor air quality.	Provides green building criteria and certification that includes energy efficiency, water efficiency, and environmentally friendly materials.	Focus on spatial planning and environmental planning to create sustainable residential areas.
Green Construction	Prioritizing sustainability principles in construction, including waste management, use of certified materials, and low-emission technologies.	Emphasizes construction safety and compliance with technical regulations without mentioning environmental aspects or environmentally friendly materials.	Integrating 3R principles in construction, energy-saving technologies, and construction waste management.	Emphasizing environmental impact mitigation in construction through waste management and the use of environmentally friendly local materials.	Provides guidance on domestic waste management and use of local materials without mentioning advanced technology or green certification.

Results of interviews with several green building and green construction experts

In this study, interviews were conducted with 6 experts in the field of Green Building and Green Construction from stakeholders ABCG: Academician (Lecturers from FTSP Trisakti University), Business (2 Urban Designers), Community (Chairman of Green Building Council Indonesia) and Government (2 Directors of the Ministry of Public Works).

The summary of the interview results can be seen in Table 5.

Question	Resume
What are the challenges that often arise in implementing green construction?	Challenges in implementing green construction encompass technical, economic, social, and regulatory aspects. Respondents identified key barriers such as high initial costs for environmentally friendly materials and technologies, and uncertain returns on investment that hinder widespread adoption. Inconsistent, overlapping, and relatively new regulations are also barriers, coupled with a lack of easily accessible incentives. Limited human resources such as experts and skilled workers in green construction further complicate implementation, especially in remote areas. Awareness and understanding of the philosophy and principles of green construction by communities, developers, and contractors is still low, resulting in resistance to change. Technical challenges also arise in planning,

Question	Resume
	design, and measurement, which require a multidisciplinary approach and careful management. Access to environmentally friendly materials is often limited, especially in remote areas. In addition, local environmental challenges, such as topography and climate, and socio-economic impacts on communities around the project add to the complexity of implementation. The entire green construction process, from start to finish, requires measurable management to maximize resource conservation and minimize environmental impacts. Collaboration between government, industry, and communities is essential to address these challenges and encourage wider adoption.
What are the causes of construction disputes in the implementation of Green Construction?	Here is a revised and condensed version of the responses to one paragraph while retaining the key points from all respondents: Construction disputes in the implementation of green construction are caused by various technical, administrative, and social factors. The main causes include different interpretations and emphases on government regulations, including differences in technical and design standards, such as energy efficiency and material use. Inconsistencies between planning and implementation, due to different understandings between owners, planners, and contractors, also trigger conflicts. Incomprehensive regulations and different interpretations of green building performance standards and certifications, such as in PUPR Circular Letter Number 01/SE/M/2022, add to the complexity. Failure to meet green construction specifications, cost increases due to environmentally friendly materials or technologies, and poorly managed changes in the scope of work are also the main triggers. In addition, lack of coordination between related parties, local community rejection of the project's environmental impacts, and conflicts between aesthetics and design functions are often sources of disputes. Managing these disputes requires clear contracts, intensive communication, effective risk management, and a thorough understanding of green construction standards and objectives to create harmony between parties.
How to align technical requirements in green construction in relation to Law Number 28 of 2002, Regulation of the Minister of PUPR No. 02/PRT/M2015, Greenship Standard from GBCI 2004 and Regulation of the Minister of Environment 08 of 2010	Alignment of technical requirements for green construction requires a comprehensive approach considering the differences in focus and scope between Law Number 28 of 2002, the Greenship standard from GBCI, and Regulation of the Minister of Environment Number 8 of 2010. Law Number 28 of 2002 and its derivative regulations (PP Number 21 of 2021) are the main references in building construction projects, especially for government buildings, while GBCI standards are more often used in private projects for assessing sustainability aspects. Regulation of the Minister of Environment Number 8 of 2010 focuses on environmental impact control, but is considered less relevant because it is not within the realm of technical building regulations. The Regulation of the Minister of Environment needs to be aligned with Regulation of the Minister of PUPR No.02/PRT/M 2015, which includes technical standards for construction. The GBCI standard offers more detailed criteria in energy efficiency, water, and environmentally friendly material management, while the law is more general. Potential misalignment occurs when the technical approach

Question	Resume
	does not support detailed green aspects, especially in sustainability measurements such as carbon emissions and construction waste management. To align, it is necessary to ensure that all regulations follow the basic framework of applicable laws, with monitoring mechanisms that comply with GBCI standards, and adjust the focus of the Minister of Environment Regulation on managing environmental impacts related to construction.
How are the prospects for implementing Green Construction in the next 5 years related to Green Construction Technical Standards and Government Regulations?	The prospect of implementing green construction in the next five years is seen as positive but still faces challenges. Continuously updated regulations, such as the Regulation of the Minister of PUPR No. 02/PRT/M/2015 concerning Green Buildings, provide a strong legal basis to encourage the implementation of green building principles. The global trend towards net zero and sustainability, as well as the commitment of business actors to ESG, are significant drivers. Support from financial institutions through green funds and international collaboration also accelerate implementation. However, obstacles remain, such as the lack of synchronization of several regulations, for example between Regulation of the Minister of PUPR Number 9 of 2021 concerning Guidelines for Sustainable Construction and Regulation of the Minister of PUPR Number 21 of 2021 concerning Assessment of Green Building Performance. In addition, the focus of implementation is still more inclined towards technical aspects such as equipment and materials, compared to the passive design approach. Great opportunities are seen in increasing public awareness of sustainability, especially from the younger generation, as well as technology that increasingly supports energy efficiency and climate change mitigation. The success of implementation is highly dependent on the government's consistency in maintaining its commitment to sustainable development, harmonizing regulations, increasing incentives, and strengthening infrastructure supporting green development. Collaboration between government, communities and the private sector will be key to accelerating the adoption of green construction.

From the results of interviews with Green Building and Green Construction experts, several things can be concluded: 1) The need for synchronization of green building standards and various government regulations related to green building and green construction in Indonesia 2). The need for socialization of various standards and Government Regulations on Green Building for Green Building Stakeholders: Building owners, consultants, contractors, building material providers, the government as regulator, associations and the community; 4) the need for clear incentives for Building Owners who implement green building and green construction standards; 5) The need for specific and clear contract standards for the construction of green buildings that implement Green Construction implementation.

CONCLUSION

From the Legal and Legislative Aspect
The implementation of green construction in Indonesia is still hampered by regulations that are not yet fully harmonized and comprehensive. Existing regulations, such as the Regulation of the Minister of PUPR Number 02/PRT/M/2015, are not well integrated with other spatial planning and environmental management policies. The ambiguity in law enforcement often triggers disputes between construction industry players, especially in terms of compliance with green building principles. The solution involves harmonizing national regulations with international standards and increasing supervisory capacity.

From the Technical Aspect of Green Buildings
The implementation of green building techniques is often hampered by the lack of application of technologies that support energy efficiency, water management, and waste control. Several green building projects fail to meet the technical standards set by the Green Building Council Indonesia (GBCI) due to the lack of detailed technical guidelines. To support green building techniques, it is necessary to strengthen the technical monitoring and evaluation system, as well as the development of local technologies that support sustainability.

From the Environmental Aspect
Green construction has a positive impact on environmental conservation, but inconsistent implementation often results in negative impacts such as poorly managed construction waste. Many industry players still ignore environmental principles due to weak legal sanctions and lack of incentives for environmentally friendly development. Integration between green construction policies and national environmental planning is needed to ensure the sustainability of the ecosystem.

From the aspect of construction material availability
Environmentally friendly materials that support green construction are not yet fully available locally, often requiring high-cost imports. The lack of national standards for green construction materials is a barrier to ensuring their quality and sustainability. There needs to be an incentive policy for the development of domestic green construction materials to support the implementation of green building.

From the Construction Equipment Aspect
Environmentally friendly construction equipment has not been widely adopted by local contractors, mainly due to high investment costs. Standards for the use of low-emission heavy equipment have not been specifically regulated in national regulations. Subsidy policies or tax incentives for the adoption of environmentally friendly equipment need to be implemented to accelerate the transition.

From the Aspect of Human Resource Readiness
The readiness of construction workers to understand and implement green construction is still very limited. The lack of specific training and certification related to green construction hampers implementation in the field. Collaboration is needed between the government, construction associations, and academics to increase the capacity of human resources in green construction.

From the Environmental Social Governance (ESG) Aspect
ESG implementation in green construction projects is still minimal, with most industry players only focusing on environmental aspects without considering social impacts and good governance. Transparency and accountability in ESG reporting are not yet standard in the construction sector. There needs to be specific regulations that encourage ESG integration in every green building project.

From the GBCI Greenship Standard Aspect
The Greenship standards set by GBCI are often not fully implemented due to lack of understanding and incentives for construction actors. Some projects only focus on certain aspects such as energy

efficiency, while other aspects such as water and waste management tend to be neglected. Efforts to increase awareness and certification of the Greenship standards are needed to ensure holistic and measurable implementation. Currently, Greenship is still mostly only applied to private projects.

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