

Optimizing the Implementation of Sustainable Green Construction Strategies Post the Covid-19 Pandemic in Jakarta

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Abstract

Green construction is a sustainable movement that aims to create environmentally friendly construction starting from the planning, implementation, to the use of construction materials that are environmentally friendly and efficient in the use of resources. This study aims to examine the implementation of green construction strategies in construction projects in Jakarta, as well as analyze the optimization of sustainable green construction strategies post Covid-19 pandemic. This research is qualitative research using a case study approach. Primary data was obtained through in-depth interviews and FGD. Construction companies in Jakarta are expected to have concrete actions to optimize green construction strategies, one of which is strategic action by using green technology in construction. The strategy of green construction companies is to take innovative steps in creating environmentally friendly construction by using efficient resources to create environmentally friendly green construction. The next strategy is sustainability action, in which green construction companies try to create environmental sustainability so that the role of innovators in the field of green construction is needed, especially for construction companies that apply green technology. The main strategies are financial benefits for stakeholders, public policies in facilitating green construction, government support and knowledge development in green construction. Comprehensive and well-planned sustainable green construction management is a long-term investment for the construction industry. To achieve the sustainability of the green construction industry, companies that use green technology play an important role. Supported by using the ISPHI method, they can become leading innovators in implementing post-Covid-19 sustainable green construction strategies in Jakarta.

Keywords

Green, Construction, Sustainability, Strategy, Technology

1. Introduction

As a developing country, Indonesia is experiencing rapid development in various sectors, especially the construction industry. The construction industry cannot be separated from the application of technology. The higher rate of business growth and the need for infrastructure from before has created a new problem, namely pollution which is increasing along with the increase in industry, especially in Jakarta as the capital city of Indonesia which is still experiencing growth both in terms of economy and population density (www.thejakartapost.com).

Regulations related to sustainable and comprehensive green construction are considered as a new regulatory rule that must be applied, even though Indonesia has long been trying to build a sustainable green development ecosystem. Regulations regarding green construction are still in the socialization stage. During the Covid-19 pandemic, the government's attention was shifted to the health sector and active in strategic actions for the country's economic recovery, so that this caused the development of sustainable construction regulations to be slightly hampered. During the pandemic it also caused several long-term strategies that support the implementation of sustainable green construction, such as increasing public-private sector collaboration and increasing the value of green construction being delayed in implementation (Ministry of PUPR, 2021). On the positive side is that the pandemic has increased public awareness of the importance of creating green construction and a healthy environment.

The post pandemic Covid-19 situation is the right momentum for the world of construction to change and find new formulas that are more effective, efficient, and sustainable. Meanwhile, for construction work that involves many parts, reengineering and redesigning of project implementation is carried out so that it can be completed more quickly and efficiently. Jakarta is a densely populated metropolitan city, based on data from the DKI Jakarta Province Central Statistics Agency, where the population of DKI Jakarta in 2022 is projected to reach 10.64 million people (www.jakarta.bps.go.id). Jakarta with a high level of construction development, pollution level of waste generated from construction projects will also increase every year. Even though construction waste management has been carried out, its performance is still not satisfactory because it faces many challenges and problems.

Construction waste will cause environmental pollution so that it has the potential to hinder the pace of sustainable development in the construction industry (Cheng et al. 2022). It is important to focus on an efficient construction waste treatment process to lighten the burden on the environment (Hasan et al. 2022). Therefore, it is important to increase the effectiveness of the construction waste management system to reduce environmental impacts and provide economic benefits, especially in developing countries (Oviedo, 2021).

During the Covid-19 pandemic, healthy air circulation is needed, which is very vulnerable to the spread of droplets and transmission of viruses through the air which have the potential to be transmitted if there is no good air circulation system. The importance of implementing environmentally friendly construction for the health of the earth and humans is the most important part in the world of construction. The increase in building construction projects is causing climate change and environmental problems, especially the use of building materials that cause energy waste and are not environmentally friendly which can damage the ecological balance which increases the earth's temperature (Newas et al. 2020).

The strategy for reducing waste and managing green construction projects in Jakarta is currently still ineffective, so a qualified strategy must emerge to implement green construction for construction industry development projects in Jakarta. Thus, this research is useful for stakeholders in the green construction industry who are concerned with sustainable strategies related to optimizing the implementation of post-Covid-19 sustainable green construction strategies in Jakarta.

1.1 Objectives

This study aims to examine and analyze the implementation of green construction strategies in construction projects in Jakarta, as well as how to optimize the implementation of sustainable green construction strategies after the Covid-19 pandemic in Jakarta.

2. Literature Review

Green Construction

Green Construction is a planning and implementation process in the construction process that is carried out to minimize the negative impacts arising from construction activities and aims to maintain environmental stability with the needs of human life so that it can be utilized in present and future generations (Ervianto, 2021). The benefits of implementing green construction are divided into two, namely benefits for the economy and benefits for the environment (Ervianto, 2021), which include:

- a) Save energy
The high use of energy in the construction sector requires efforts to reduce the amount of energy used.
- b) Save water
Construction activities require large amounts of water resources, so that water use efficiency measures are needed in construction activities.
- c) Waste Material
Liquid, solid, and gas waste are types of waste generated from the construction process, so that the emergence of residual material from construction activities must be minimized.

2.1 Green Construction Concept

The concept of green construction is a concept that is needed in the field of development today to prevent global warming. Based on the requirements issued by the Green Building Council Indonesia regarding the requirements for the Greenship New Building category that must be met by new buildings (www.gbcindonesia.org), namely:

a) Appropriate Site Development

The scope of this category includes access to public facilities, reduction of motorized vehicles, use of bicycles, greening of the landscape, the heat island effect, reduction of the volume load of rainwater runoff, site management, attention to the surrounding buildings or facilities.

b) Energy Efficiency and Conservation

This category includes optimizing the efficient use of energy in buildings, saving energy in lighting systems, re-commissioning air conditioning equipment, monitoring energy use, operating and maintaining electrical equipment, using renewable energy, and energy emission efficiency.

c) Water Conservation

This category includes the measurement of water consumption, inspection and maintenance of piping systems, efficient use of clean water, water quality testing, use of recycled water, use of filtration systems to produce drinking water, reduction of water use from deep wells and use of automatic stop taps.

d) Material Resources and Cycle

This category includes the use of refrigerants, using environmentally friendly materials, waste segregation processes, B3 waste management systems, and the distribution cycle of recycled goods.

e) Indoor Health and Comfort

Included in this category are environmental regulation of cigarette smoke, indoor air quality control, monitoring of CO and CO² exhaust gases, measuring visual comfort, measuring noise levels, and monitoring comfort levels.

f) Building Environment Management

This category includes innovations to improve building quality, availability of complete building documents, a team that maintains green building principles and training in the operation and maintenance of complete green building aspects.

Of the six concepts above, they fall into the category of construction work (Ervianto, 2021) namely: Material Sources and Cycles, Health and Comfort in Indoor Conditions and Project Environmental Management.

The green construction category based on GreenShip certainly has objectives that must be met as well as being a benchmark for whether green construction has been carried out or implemented. The following is a further explanation based on GreenShip New Building (www.gbcindonesia.org) namely:

a) Reuse of used buildings and materials

Reusing used materials from existing buildings to reduce the use of raw materials for construction activities, thereby reducing the amount of waste generated in final disposal and extending the useful life of a material.

b) Eco-friendly material

The purpose of this category is that there is an ecological historical record of the raw material extraction process, and the production process of these materials can reduce their use.

c) Use of refrigerant without ODP

The purpose of applying this category is to use a cooling system in all buildings that is non-ozone depleting.

d) Certified wood

The application of this category aims to make the use of wood-based materials accountable to preserve the forest. The selection of wood to be used meets the standards set by the government.

e) Regional materials

The purpose of applying this category is to reduce the carbon footprint of the modes of transportation used to mobilize project activities. For material selection, location and fabrication are selected within 1000 km and within the territory of Indonesia at least 80% of the total material costs.

f) Monitoring of CO² levels

The purpose of applying this category is to overcome the level of measurement of the amount of carbon dioxide (CO²) in regulating the entry and exit of air in a building.

g) Environmental control of cigarette smoke

The purpose of implementing this category is to reduce exposure to cigarette smoke to building interiors and building users to maintain the health of workers. By placing a sign "Prohibited recommended" and not providing a building for smoking in the building. Where available, building distance of at least 5 m from window openings, outside air intakes, entrances.

h) Chemical pollutants

The purpose of implementing this category is to reduce air pollution from chemicals in building materials which

can interfere with the comfort and health of construction workers and building users in the future. The benchmarks used in this category are using paint for wall work with low VOC, using composite wood products and laminating adhesives and having low formaldehyde content and having certification recognized by the Green Building Council Indonesia.

- i) Lighting level
The purpose of this category is to prevent visual disturbances to workers and building users due to the selection of lighting levels that are less than optimal so that they are not in accordance with the control power of the human eye regulated in SNI 03-6197-2011.
- j) Noise level
The purpose of this category is to maintain the noise level in a room to remain at optimal conditions. This is regulated in SNI 03-6386-2000.
- k) Project design planning
The purpose of implementing this category is to direct building to have a green building design from the initial stage so that it is easier to achieve a green building rating.
- l) Pollution from construction activities
The purpose of implementing this category is to destroy waste generated from construction activities before being taken to final disposal and minimize pollution from construction activities.

2.2 Green Construction Control

Green construction refers to technical construction that aims to ensure the level of safety, quality, and other requirements through scientific and technological studies, by minimizing resource savings and reducing construction activities that have a negative impact on the environment. There are four parts to environmental protection, which are material saving, water saving, energy saving, land use saving and environmental protection.

Referring to the construction documents and project design drawings combined with the construction organization design and actual site conditions of the main features of the project, the considerations regarding the engineering quality and construction safety assurance system, engineering project organization and management, construction site layout, total construction schedule control and other matters will be formulated through a special plan for the implementation of the green construction strategy. Regarding control items and green construction scheme targets are shown in table 1 below.

Table 1. Green construction project control and target

Serial number	Control project	Control objectives
1	Saving material and material resources utilization	The actual loss rate of material is reduced by 30%
2	Water conservation and water resources utilization	The allocation ratio of water-saving appliances reached 80%, The actual water consumption is reduced by 30%
3	Energy conservation and energy utilization	Save 10% on actual electricity consumption
4	Economical use of land and construction land	The effective utilization ratio of temporary facilities is greater than 90%
5	Environmental protection	Dust control, Noise control, Light pollution Control, Sewage control, Construction waste control

3. Methods

This research is qualitative descriptive research that uses a case study approach model. Data collection was carried out according to the focus of the research, namely how to implement strategies carried out by construction companies in the framework of sustainable strategies related to optimizing the implementation of post-Covid-19 sustainable green construction strategies in Jakarta.

Qualitative data analysis used in this research is using an interactive model, namely where the components of data analysis include data reduction, data presentation, and interactive verification during data collection (Sugiyono, 2019). Then the discussion will go deeper on how construction companies in Jakarta sustainable strategies have related to optimizing the implementation of post-Covid-19 sustainable green construction strategies in Jakarta.

In this research, the first stage was conducted in-depth interviews with 8 construction practitioners and consultants from several construction companies in Jakarta. Interview questions were formulated based on a literature review, then a summary of the results of the interviews was presented in focus group discussions and continued with a discussion of the results of the interviews with all respondents to obtain suggestions for effective strategies to optimize the strategies of sustainable green construction post pandemic Covid-19 in Jakarta.

4. Data Collection

Primary data collection techniques were obtained through Focus Group Discussions and in-depth interviews with semi-structured methods. The criteria for research respondents are people who have a good understanding and are directly involved in implementing effective strategies in optimizing green construction within a minimum period of the last three years, as well as understanding well how effective strategies are for optimizing sustainable green construction strategies after the Covid-19 pandemic in Jakarta. The respondents in question were 8 construction practitioners and consultants from several major construction companies in Jakarta. The duration of the in-depth interviews was approximately one hour for each respondent. Furthermore, the findings of effective strategies regarding optimizing the implementation of green construction and how effective the strategy for optimizing sustainable green construction strategies after the Covid-19 pandemic in Jakarta.

Meanwhile, secondary data was obtained through documents, proposals, books, reports, scientific journals, publications, studies of related regulations, government reports, and previous research relevant to this research within the last five years. Interviews were discussed in focus group discussions. The meeting began with a presentation of the findings of the researchers, then each respondent shared insights on an effective strategy for optimizing the development of sustainable green construction post pandemic Covid-19 in Jakarta.

5. Results and Discussion

5.1 Results

Green construction is a construction plan whose life cycle starts from the planning, construction, operation, maintenance, demolition stages, to anticipating negative impacts and creating positive impacts on the climate and the surrounding natural environment. Positive impacts are carried out by protecting, saving energy, reducing the use of natural resources, maintaining air quality, considering environmental factors in the development process, using safe and non-toxic materials, or not damaging the surrounding environment and paying attention to the health and safety of the surrounding population, all of which adhere to continuity principle. Green construction aims to increase the efficiency of energy, water and material resources while minimizing the adverse impact on the environment and human health.

Construction professionals feel the need to reduce the negative impact the construction industry has on the environment. One of their efforts was the formation of the Green Building Council Indonesia (GBCI) in 2009, with a mission to raise awareness about the impact of the Indonesian construction industry on the environment. GBCI then developed Greenship which is a rating tool to determine the level of environmental friendliness of a construction building. This tool was adopted from other rating systems such as the United States Green Building Council (USGBC) LEED rating system. Overall, this tool can measure several aspects, such as materials used, building energy use, and location selection. The total score of each category determines the green level of the building. This rating system was developed by an advisory and steering board composed of government officials, which is expected to enter the market more quickly through government support. However, green construction has not been fully enforced by the government. The number of projects pursuing green building certification has been relatively low since the program was launched. The lack of enforcement of sustainable construction itself does not mean that there are no effective efforts from the construction industry in Indonesia, where there are other initiatives to promote sustainable construction in big cities especially Jakarta.

The criteria for obtaining certification are saving water and electricity by around 30%-70%, as well as saving energy. The availability of responsible waste management and appropriate land use are also determining factors in obtaining

certification. Requirements and guidelines for implementing green construction for buildings covering a certain building area in Jakarta, there are several green building requirements and guidelines for implementing green buildings, such as building envelope, air conditioning and ventilation, lighting systems, electricity and vertical transportation, air efficiency, and landscape management.

Green Construction Regulations in Jakarta serve as a reference for the public to implement this policy, both commercially and residentially, where there are already regulations regarding Green Construction contained in DKI Jakarta Governor Regulation Number 38 of 2012. This regulation is supported by the International Finance Corporation (IFC), the Government of Switzerland, as well as the Government of Hungary. This Governor Regulation began to be fully implemented in 2013. According to this Governor Regulation, green buildings are buildings that, from planning, implementation, construction, use, maintenance, to deconstruction, are responsible for the environment and use resources efficiently. This Governor Regulation explains the technical requirements for environmentally friendly new buildings, starting from air efficiency and energy, land and waste management, indoor air quality, for the implementation of construction activities, as well as buildings that already include conservation, energy efficiency and water, then thermal comfort and indoor air quality, as well as operational management. If these regulations are not complied with, then a building will not have a Building Construction Permit (IMB) for new buildings and will not receive a Function Worthy Certificate (SLF) for buildings that are already standing.

The first criterion that must be considered in environmentally friendly building construction is land use planning. Buildings are not erected on productive or toxic land. Ideally, buildings are built in areas that are equipped with adequate public facilities, so that people can simply walk or cycle to reach them, and do not need to use motorized vehicles as an effort to reduce emissions. In addition, building with an orientation to reduce energy waste besides being equipped with ventilation that allows natural light to enter, the building is also covered with a canopy of plants and trees that provide shade and conduct heat. Meeting these criteria needs to be accompanied by other efforts related to regulating energy use, from air to electricity. Likewise with waste management and construction waste, another factor that is no less important is of course the selection and use of materials, starting from building materials, materials for interior decoration, to cleaning equipment, all must use green materials. In terms of design, architects and interior designers need to work around the use of materials that are not energy intensive. In addition to building issues, the green concept also includes empowering the surrounding community which itself contributes to reducing emissions.

The concept of green construction is one strategy that can encourage environmentally friendly construction business activities to support the sustainability of green construction businesses. The importance of implementing the green construction concept is to start developing the green construction concept in every infrastructure project and construction process. This is also supported by the application of green energy by building waste-fired power plants. This benefit can be felt in every project that uses the green construction concept which has created positive perceptions in every construction process.

This green construction policy is the right step for a green city with the concept of caring for the environment. If not implementing green construction policies, buildings can generate around 40% of greenhouse gas emissions that accelerate the process of climate change (www.jakarta.go.id). The concept of green construction can save around 42% energy use compared to ordinary buildings of the same size, and this concept can also optimize the use of clean water significantly and reduce the resulting water waste (www.jakarta.go.id). Through the use of renewable technologies and materials whose raw materials last a long time, buildings with green concepts can also save natural resources and minimize waste. In addition, it can also increase employee productivity by up to 15 percent, so with this green concept policy, a building can reduce operational costs by around 20-40% which can be used to replace mechanical systems, add facilities/services, and increase employee income (www.jakarta.go.id). This policy can also create new jobs in the construction sector, increase property values, and most importantly of course improve the health of building users.

5.2 Discussion

Green construction as the practice of creating structures and using processes that are environmentally responsible and resource efficient during the project life cycle phase starting from the planning, construction design, project operational, maintenance, renovation, and project deconstruction stages (Kubba, 2012). Every project that uses the concept of green construction is expected to generate positive perceptions in every construction process. Green construction is expected to achieve a balance between environmental capabilities and human needs for green concepts

in every aspect of life. In the context of sustainable development, this stage is an important part of green construction project management.

There are always pros and cons behind every solution, just like the concept of green construction. Although it can be considered as a better choice for environmental health due to reduced carbon emissions and air pollution, implementation of responsible waste management, use of renewable energy, and energy efficiency, but the high cost of development and maintenance, the lack of knowledge of architects and construction workers, and limited technology are some of the stumbling blocks in the development of green construction (Kubba, 2017). Therefore, green construction is only applied to industrial buildings rather than housing. In addition, this concept cannot be truly environmentally friendly if the development opens new land by replacing agricultural land, green fields, or forests.

Sepasgozar et al. (2021) stated that rapid urbanization and infrastructure development projects have increased the unlimited regeneration of construction projects in developed countries. Geographic Information Systems (GIS) and Building Information Models (BIM) are very helpful in the construction waste management process to minimize environmental impacts which are included in green construction elements (Paz et al., 2020). Doan et al. (2021) stated that current contractor drivers are identified as basic operations-based strengths, which include waste segregation/waste management processes, basic resource efficiency, occupant comfort, and awareness of care. One example is the use of the green rating system in New Zealand, which is still in its early stages, where the country can learn from problems that are developing in other countries that are developing sustainable environmental practices.

In addition, green construction development requirements should be planned at the pre-construction stage to ensure that contractors and subcontractors will fully comply with and be aware of the implications of these requirements for their work before and during the life of a green construction development project.

The main strategy that will be recommended here is regarding financial profit for stakeholders, public policy in regulating the green construction process, government support for the green construction industry, and knowledge development in optimizing green construction management related to the design stage, construction and operation stage, and waste treatment.

5.3 Proposed Improvements

All stakeholders involved in a sustainable and environmentally friendly green construction process must be supported by an appropriate information technology system, planning the flow of construction waste from upstream to downstream which can be carried out through efficient and effective strategic planning. Building green construction is indeed much more expensive, but in the long run, operational costs are much more economical. The parameters of green construction need to be socialized more intensively to carry out dissimulation and transformation so that people can better understand the concept of green construction.

The digitization factor in the green construction sector is a strategic step that must be carried out in a comprehensive manner, starting from developing human resources to building an integrated supply chain system from upstream to downstream. In the upstream sector, digital development methods will more quickly produce a competent workforce with a high value of knowledge, skills, and attitudes, while in the downstream sector, digitalization will produce a productive workforce because it has a high standard of values.

The pandemic factor that has been experienced can be used as a benchmark in improving the strategic plan for implementing sustainable green construction. When there is momentum to create investment opportunities in the post-pandemic era that can support the running of a sustainable green construction ecosystem, it is highly hoped that the government's immediate actions will be able to take advantage of this opportunity to spur maximum capitalization and carry out targeted outreach to strengthen the legal foundation for sustainable construction in Indonesia.

Green construction development proposals using the ISPHI method consist of:

- a) Information technology: construction waste management database supported by innovative methods for treating construction waste;
- b) Social aspect: increasing concern for the environment, especially construction waste;
- c) Policies: rules and regulations in green construction planning to construction waste management, certification, awards and sanctions in green construction management;

- d) Human resources: human resources with integrity, creative and innovative in green construction management supported by skills, analytical abilities, and in-depth knowledge of green construction implementation systems; and
- e) Integrated management system: an integrated system towards sustainable green construction management.

Apart from that, another strategy that can be carried out is to apply a solid and clear foundation in a sustainable construction ecosystem, one of which is by implementing long-term macroeconomic policies that can later support green construction companies to survive and be sustainable. Apart from that, it can also begin to develop elements of strategic partnerships with stakeholders in the government and private sectors which are the targets of developing the green construction industry sector. Therefore, green construction is needed as a solution to save the environment.

6. Conclusion

The construction industry needs to re-engineer construction management by adjusting and transforming itself into green construction to complete work effectively, efficiently and at the right time to achieve sustainable optimal results. Green construction here means implementing a construction process that is efficient in terms of all resources used and can be responsible for the surrounding environment to be able to ensure the sustainability of the green ecosystem that is created through the implemented green construction. Especially in the context of green construction sustainability implies a cycle of operation, site design, maintenance, repair, and demolition with minimal environmental damage. The process does require close collaboration between green construction engineers, architects, governments, and clients across all green construction projects. The green construction concept aims to ensure cost-effective building construction methods and should be able to reduce the overall effect on negative environmental impacts, as well as always prioritize human health, through its focus is on implementing the efficient use of green energy and resources, conservation of water and energy savings, occupational health, minimizing pollution and existing construction waste.

It is hoped that the positive impact of the Covid-19 pandemic on policies and changes that have occurred in the construction sector will be one of the drivers of Indonesia's post-pandemic economic growth, especially for construction companies in the Jakarta area. Therefore, it is important to develop an integrated strategy to develop an overall end-to-end green construction strategy to enable sustainable goals to be achieved. The construction industry needs to re-engineer construction management by adjusting and transforming itself in the industrial era 4.0 where technological support is necessary to complete project strategies effectively, efficiently, and achieve sustainable optimal results.

A well-organized green construction organization will produce less waste, so it is very important for the organization to develop a detailed strategy on optimizing green construction strategies to increase the productivity and efficiency of the company, where the company must also be environmentally responsible by sourcing concrete actions to provide solutions to future green construction problems.

Comprehensive and well-planned sustainable green construction management is a long-term investment for the construction industry. The proposed green construction development using the ISPHI method is expected to be the right strategic guideline to strengthen sustainable principles in proper handling and optimize the implementation of post-Covid-19 sustainable green construction strategies in Jakarta.

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Biography

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