

Implementation of Green Building Regulations by Small and Medium Construction Companies; Case Study in Ternate, North Maluku

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Abstract— The concept of environmentally friendly has been widely applied in various fields and sectors throughout the world. Awareness of the environment is now increasingly increased because cumulative pollution in the world begins to achieve alarming effects. One sector that contributes a lot to pollution is construction. Therefore, the concept of green construction began to be widely applied globally. This study focuses on applying the concept of green construction by small and medium grade construction companies in Ternate City, North Maluku, Indonesia. The method used in this study is a questionnaire survey and focused group discussion with respondents who are small and medium grade construction companies. The results of this study prove that the application of the green concept by local contractors is still very lacking due to several factors such as finance, management, human resources, to technology. However, this can be overcome by applying regulations in more detail and widespread, balanced with the provision of cheap and easy technology. Thus, the application of the concept of green by local and medium -sized local contractors will become more affordable.

Keywords— Difficulties, Green Contractor, Implementation, Small and Medium Enterprises.

I. INTRODUCTION

Eco friendly building is now the most significant component of the world of construction and design, as it ensures the long-term viability of the planet and its inhabitants, who include not only people but also other living species. According to Greenpeace statistics acquired by DW Indonesia in July 2020, the premature death rate in Indonesia due to air pollution has reached over 9,000 individuals since January 1, 2020.

Early death is reported to have killed 6,100 people in Jakarta, 1,700 people in Surabaya, 410 people in Denpasar, and 1,400 people in Bandung. Furthermore, proper air circulation is required during the Covid-19 Pandemic era, particularly during the present pandemic phase. If there is no good air system, virus transmission through droplet and airborne will be very high to transmit builders of structures.

Green building or green construction is a project that, throughout its life cycle, from design to construction through operation, maintenance, restoration, and destruction, considers negative affects and promotes positive benefits on the climate and natural environment. Nature will achieve this positive impact by protecting, conserving, and reducing the use of natural resources, as well as maintaining the quality of air in the room, considering the environment in the development process, using non-toxic materials, and paying attention to the health of its inhabitants, who all adhere to the rules of continuous improvement.

Green buildings are a tool to increase the efficiency of building resources in the form of energy, water and materials while reducing the impact of buildings on human health and the environment.

The building industry has been designated as a sector in need of special attention in order to satisfy the sustainable development goal. The fundamental reason is that construction is regularly responsible for some of the most serious negative consequences, such as high-scale material consumption and a reputation as a huge trash generator.

II. LITERATURE REVIEW

The construction industry consumes 50% of natural resources, 40% world energy, and 16% water. In addition, the tendency to increase construction activity in addition to the potential to have a negative impact on the environment, also results in a decrease in environmental quality [1][2][3].

Lack of attention to environmental sustainability in development has not only provided adverse damage today, but also has a negative impact on the future. For this reason, a strategy is needed in protecting the environment by adopting environmentally friendly and sustainable construction through green construction.

A. Green Construction Concept

Environmentally friendly structures must optimize available natural resources while avoiding the use of excessive amounts of building materials in green construction. Every component of the structure must be interconnected, and no pieces should be constructed in vain.

Construction of environmentally friendly buildings necessitates strong collaboration among contractors, architects, engineers, and clients in order to construct high-quality environmentally friendly structures without sacrificing comfort. When constructing a green building, a number of factors must be examined and met, among them [4].

- The proper utilization of water and other resources is essential.
- Installing solar panels and air turbines in buildings to use sustainable energy.
- Measures to cut pollution and waste. If at all practicable, a location for garbage recycling is required.
- Take into account the residents' quality of life.
- The building's design that allows it to respond to changes in the surroundings.

B. Green Construction in Indonesia

For more than a decade since it was introduced in Indonesia in 2007, until now there has not been much information and evidence that the concept of green construction has been successfully implemented. Based on the survey results of 20 buildings using the Green Construction (MAGC) assessment model, concluded that the achievements of private contractors tend to be below 50% from 142 assessment indicators. This reflects that the application of the concept of green construction is still not optimal implemented on construction projects [5] [6].

In order to increase the implementation of green construction in Indonesia, the government through the Ministry of Public Works and Public Housing (PUPR) has issued Minister of Public Works and Public Housing Regulation No. 05 of 2015 concerning General Guidelines for Sustainable Construction Implementation in the Implementation of Public Works and Settlement Infrastructure. The purpose of the issuance of the regulation is as a reference in organizing infrastructure by implementing a sustainable construction approach. The scope of the regulation regulates the stages of development consisting of programming stages, technical planning, construction, utilization to the demolition stage.

However, the implications of the issuance of these regulations have not been running optimally, because the application is still minimal. The implementation of Green Construction in Indonesia is still limited to certain projects, and is still dominated by a large national qualifying service provider of government or BUMN. Meanwhile, attention to the national construction service business profile, until 2018 the structure of the construction service business entity in Indonesia is still dominated by small businesses (81%), intermediate businesses 18% and large categories only 1% [5][1][7]. In addition, most infrastructure projects and public projects are controlled by large contractors and SOEs. This increasingly narrowed the potential implementation of green construction among service providers, especially in construction service providers with medium and small qualifications.

C. Obstacles to the application of green concept in Indonesia

As with other developed and developing countries, the implementation of green construction in general still experiences many obstacles. Constraints faced by each country have differences [7][8][9].

Several studies of green construction constraints in other countries which shows that affordability is a major obstacle in the implementation of sustainable projects. Several studies also revealed the three main obstacles of Green Construction in, namely, an increase in costs, longer implementation time, as well as limited information and green suppliers [10] [11]. They also identified high investment factors, slow investment recovery, and lack of financial incentives as a small contractor constraint in adopting sustainable construction [12][13]. Meanwhile, another study identify Green Construction Constraints in developing countries due to lack of adequate education at the school and university level, as well as lack of research and development to promote Green Construction [14][15]. Lack of demand and lack of pressure by the government are the two main obstacles in the practice of green construction [16][17]. Other studies recorded several causes of low practice of sustainable practice, namely, lack of awareness, lack of knowledge, poor law enforcement, lack of education and experience, and passive culture among developers [18][19]. Furthermore, in addition to lack of awareness and knowledge, other factors that cause low implementation of green construction are lack of industrial guidelines, such as green labels and the availability of green products and technology that are still limited [20][21]. These constraints if not resolved properly will cause a greater impact and far more complex treatment. In general, obstacles that are well managed, have the potential to increase the implementation of green construction [22][23][24].

III. METHODOLOGY

This study took the example of the case of the application of the concept of green construction in Ternate City, North Maluku Province. The subject in this study is a local construction company with small and medium levels. The subject numbered 52 companies with a composition of 39 small companies and 13 medium companies. The method applied is to use a questionnaire and focused group discussion with parameters and indicators in the form of aspects of the application of green construction in the construction work that has been done.

The response from the study subject was then analyzed to determine specifically the extent to which the implementation of green construction had been carried out in Ternate, along with the obstacles that accompanied its application.

IV. RESULT AND DISCUSSION

A. Construction Company Grade Classification

Grade is determined based on the amount of capital, experience, and human resources managed by the company. The amount of capital is seen from how much wealth stored by the company. Experience to determine how much the company's experience in carrying out the project. Experience is not only measured from time but also from the amount of wealth obtained from that experience. Human resources illustrate the effectiveness and efficiency of the company in managing its employees.

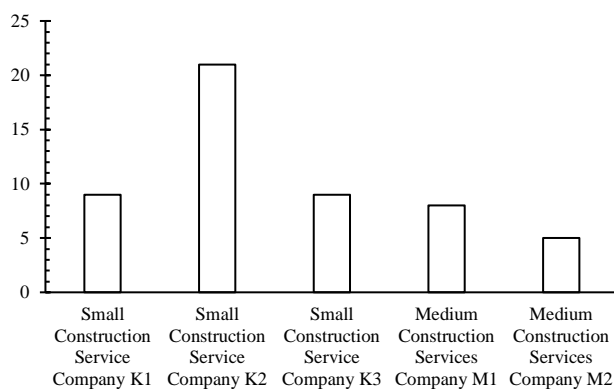


Fig. 1 Construction Company Grade Classification

Construction company classification criteria are determined as follows;

- Qualification of small construction service companies k1
 Provision: Maximum 2 different qualifications and 4 sub -classification of construction service business services.
 Labor/Expert: The requirements for labor/experts are to have a minimum of 1 person who has been certified skills (SKTK). This is useful for small qualification standards so that there are no more problems when running construction services.
 Net worth: The net worth that the company must have at least around Rp. 50,000,000 (fifty million rupiah). Work experience: For small qualifications K1, work experience is not needed.
- Qualification of small construction service companies k2
 Provision: Has a maximum of 2 different classifications and 6 sub -classification of construction service business services.
 Labor/Expert: The requirements for labor/experts are to have a minimum of 1 person who has been certified skills (SKTK).
 Net worth: The net worth that must be owned by a construction company at the K2 level is around Rp 200,000,000 (two hundred million rupiah) to Rp 500,000,000 (five hundred million rupiah).
 Work experience The construction service company at the level of K2 must have a cumulative work experience according to a cumulative sub-field of at least Rp 1,750,000,000, which was obtained for a period of 10 years.
- Qualification of small construction service companies K3
 Provision: Maximum 3 different classifications and 8 sub -fields of classification of construction service business services.
 Labor/Expert: The requirements for labor/experts are to have a minimum of 1 certified workforce (SKTK).
 Net worth: The net worth that must be owned by a K3 construction service company of Rp.

350,000,000 (three hundred and fifty million) to Rp. 500,000,000 (five hundred million rupiah).

Work experience: The K3-level construction service company must have a cumulative work experience of at least Rp 1,750,000,000, which is obtained for a period of 10 years.

- Qualification of Medium Construction Services Companies M1

Provision: Maximum 4 different classifications and 10 sub -classification of construction service business services.

Labor/Expert: The labor/expert requirements:

Must have 1 expert with the qualification of young expert as the Person in Charge of Engineering (PJT).

Must have 1 expert with the qualification of young expertise certification as the person in charge of classification (CHD). CHD can be a maximum of 2 classifications.

Net worth: The net worth that must be owned by a M1 construction company at least Rp. 500,000,000 (five hundred million rupiah).

Work experience: The highest work experience owned is Rp. 833,000,000,000 or cumulatively at least Rp 2,500,000,000, which was obtained for a period of 10 years.

- Qualifications of Medium Construction Services Companies M2

Provision: Maximum 4 different classifications and 12 sub -classification of construction service business services.

Labor/Expert: The labor/expert requirements:

Must have 1 expert with an intermediate expertise qualification as the Person in Charge of Engineering (PJT).

Must have 1 expert with the qualification of young expertise certification as the person in charge of classification (CHD). CHD can concurrently a maximum of 2 different classifications.

Net worth: The net worth that must be owned by the M2 construction service company at least Rp 2,000,000,000 (two billion rupiah).

Work experience: For work experience that must be owned from the highest of Rp 3,300,000,000 per sub-field or cumulatively at least Rp 10,000,000,000 per sub-field obtained for a period of 10 years.

B. Worker Education Level

Many typical construction workers in Indonesia only take education to junior high schools (SMP), even elementary schools (SD). This is the majority because most construction workers come from families who are financially disadvantaged, so they are required to stop going to school and work by relying on energy. The following is the distribution of construction workers from 52 companies based on the education level of workers.

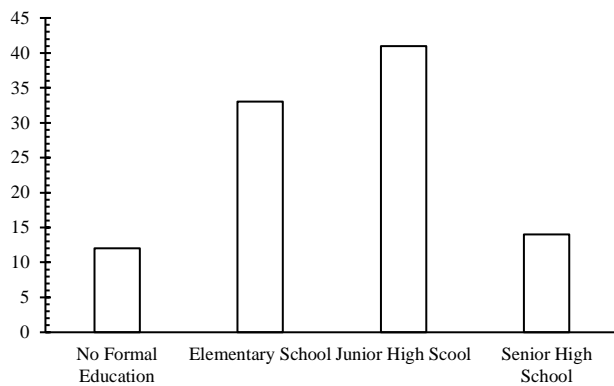


Fig. 2 Construction Worker Education Level

C. Green Aspects Implementation

The application of the concept of green construction includes several aspects including;

- **Appropriate Site Development.**
Coverage of this category in the form of access to public facilities, reduction of motor vehicles, bicycle use, green plant landscape, heat island effect, reduction of load volume of rainwater runoff, site management, attention to buildings or surrounding facilities.
- **Energy Efficiency and Conservation.**
In this category, all forms of optimization of the efficiency of energy use in buildings, commissioning in air conditioning equipment, energy savings in the lighting and conditioning system of air, recording and supervision of energy use, operation and maintenance of AC equipment, renewable energy use and reducing energy emissions, are covered inside it.
- **Water Conservation**
This category includes a sub -measurement of water consumption, maintenance and inspection of plumbing systems, efficiency of clean water use, water quality testing, recycled water use, use of filtration systems to produce drinking water, reducing water use from deep wells and the use of auto stop taps.
- **Resources and cycle materials.**
This category includes the use of refrigerant, the use of environmentally friendly materials, waste management, waste sorting, B3 waste management and distribution of used goods.
- **Indoor Health and Comfort.**
In this category, it includes the air quality of the room, the regulation of the cigarette smoke environment, the supervision of CO₂ and CO gas, the measurement of air quality in space, measurement of visual comfort, measuring sound levels and building comfort surveys.
- **Building Environment Management.**
This category includes innovations in improving building quality, the availability of documents about complete buildings, the existence of a team that maintains the principle of green building and

training in the operation and maintenance of aspects of green building in full.

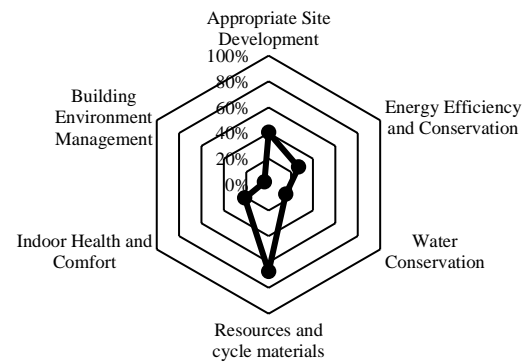


Fig. 3 Implementation Level of Green Construction Aspects

D. Difficulties Factor on Implementation of Green Construction Aspects

Problems or obstacles faced by local contractor companies in applying the concept of green construction can be observed in the following figure.

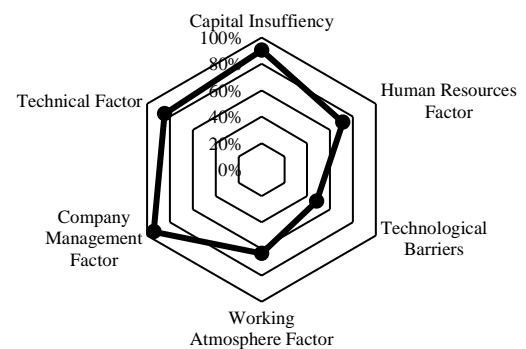


Fig. 3 Implementation Level of Green Construction Aspects

The majority of small and middle grade companies are still unable to apply the concept of green construction as a whole. There are indications that the lack of application of the concept of green in construction is caused by benefits that cannot be felt directly by the company. Almost all construction companies have stated that they have not been able to apply the green concept due to inadequate capital. Almost all of these companies think that the application of the concept of green is not a profitable investment.

On the other hand, the reuse of materials such as wood, nails and other construction materials has been widely applied. This is because the benefits can be felt immediately; Reducing project operational costs is relatively significant.

While in terms of human resources, almost all construction workers are active smokers, causing the application of clean air quality factors to be a separate obstacle for these companies. Many workers' habits are very difficult to remove or regulated; given the low level of education; So that awareness of the importance of the concept of green becomes very lacking.

V. CONCLUSION

In Conclusion, the application of the concept of green for small and medium -level companies is still lacking. This can have a negative impact on the development of construction in the future. Considering that environmental pollution has become more widespread, there needs to be a more effective application of regulations related to environmental issues in the world of construction. In addition, there needs to be an increase in the awareness of construction companies about environmental pollution in the long run. Another thing that can be done is to apply a simple simple green concept and the technology is not difficult to apply. Thus, regulations can be determined and balanced with the ability of small and medium class companies in applying the green concept.

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