

Important Factors of Green Building Construction Project Implementation in Indonesia

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Key words: design, bidding, construction, operation and maintenance, institutional

SUMMARY

Green building has contributed in easing global warming. Green building is one manifestation of concern for environmental sustainability in construction. Green building is designed to reduce the overall impact of development on the environment and human health. Green building is not only related to the management of energy saving and waste management, but also to how well the building materials do not harm the environment, both short term and long term. The purpose of this study was to discover the importance of factors of green building construction project implementation in Indonesia. The study was by conducting survey in Jabodetabek, the central area of green building construction project in Indonesia. In this study the primary data is collected from experts, consultant, and contractors of green building projects to confirm the importance of the factors. It can be concluded that the most important factors in the construction phase are quality of materials and technology of green building; furthermore, the second important factors are in the design phase including the knowledge and orientation of consultant to the green building, and the budget of the project owner.

RINGKASAN

Green building berkontribusi dalam mengurangi pemanasan global. *Green building* adalah satu manifestasi dari perhatian masyarakat konstruksi terhadap keberlangsungan lingkungan. *Green building* dirancang untuk mengurangi dampak keseluruhan dari pembangunan kepada lingkungan dan kesehatan manusia. *Green Building* tidak hanya mengenai pengelolaan dari penghematan energi dan pengelolaan limbah (*waste*) konstruksi, tetapi juga mengenai bagaimana bahan bangunan tidak membahayakan lingkungan, baik dalam jangka pendek dan menengah. Tujuan dari studi ini adalah mengungkap tingkat pentingnya dari faktor-faktor penerapan proyek konstruksi dari *green building* di Indonesia yaitu di Jabodetabek. Dalam studi ini data primer dikumpulkan dari pakar, konsultan, dan kontraktor dari proyek green building untuk memastikan tingkat pentingnya dari faktor-faktor tersebut. Dapat disimpulkan bahwa faktor yang paling penting adalah pada fase konstruksi, yaitu kualitas material, dan teknologi dari green building; Selain itu, faktor terpenting kedua adalah dalam fase perancangan yaitu pengetahuan dan orientasi dari konsultan perencana terhadap green building, dan juga ketersediaan budget dari pemilik proyek.

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1. INTRODUCTION

A green building is one whose construction and lifetime of operation assure the healthiest possible environment while representing the most efficient and least disruptive use of land, water, energy and resources (GGGC, 2016). It relates mostly with how equipping a building with water-saving mechanisms. Any building, old or new, can be outfitted with low-flow plumbing fixtures, such as faucets and toilets, aiding communities and the country in water conservation programs. In addition, building occupants can reuse stormwater, graywater, and treated wastewater for everyday needs such as toilet flushing, and landscape and indoor plant watering (Satterfield, 2009). Furthermore, the definition of “Green Building”, from the United States Environmental Protection Agency (USEPA), is the construction of building structures using processes that are environmentally responsible and resource-efficient throughout a building lifecycle ranging from the determination of the design, construction, use, maintenance, renovation, and deconstruction. On the other hand, Indonesia Infrastructure Development Policy for next 5 years focused on improving people's productivity. Airport, traditional market, high rise apartment buildings, industrial zones , and so on are examples of infrastructure development focus . Therefore, green building standards in the implementation of the infrastructure development in Indonesia is important (PU, 2015)

Two things were the subject of attention of the Government of Indonesia is the extent to which the application of green building technologies in the construction work in Indonesia carried out and how the percentage of the use of domestic products in the construction works. The foregoing emphasizes how important and strategic application of technology and the level of use of the product in the country in the implementation of green building projects in improving the performance of construction services, which in turn directly affect the nation's economic growth in the era of globalization. The purpose of this study was to discover the importance of factors of green building construction project implementation in Indonesia (PU, 2015)

2. GREEN BUILDING PROJECTS IN INDONESIA

Green building certification process in Indonesia began only in the year of 2011 in line with the Regulation of Minister of Environment number 8 year 2010 on Criteria and Certification of Green Building. Consequently, green building experts, consultants, and contractors are still very few in Indonesia (around 20-30 persons/institutions). From the data collected in green building certification institution in Indonesia, it can be illustrated the map of green building project in Indonesia (Figure 1); green buildings which has been certified are 28 buildings, while in certification process is as many as 79 buildings, so the total is 107 buildings (Mochtar et. al., 2015):

- a. 84 projects around the agglomerations city of Jabodetabek (Jakarta-Bogor-Tangerang-Bekasi) with the percentage of 78.5%.

- b. 14 projects on Java island outside Jabodetabek or 13.1%, among others in the city of Semarang, Surabaya, Tuban, Ngawi, Purwakarta, Karawang and Subang.
- c. 1 project on the island of Bali, or 1%.
- d. 6 projects on the island of Sumatra, or 5.6% of jobs are in the city Bintan, Palembang and Pekanbaru
- e. 1 project on the island of Borneo/Kalimantan, or 1% in Samarinda

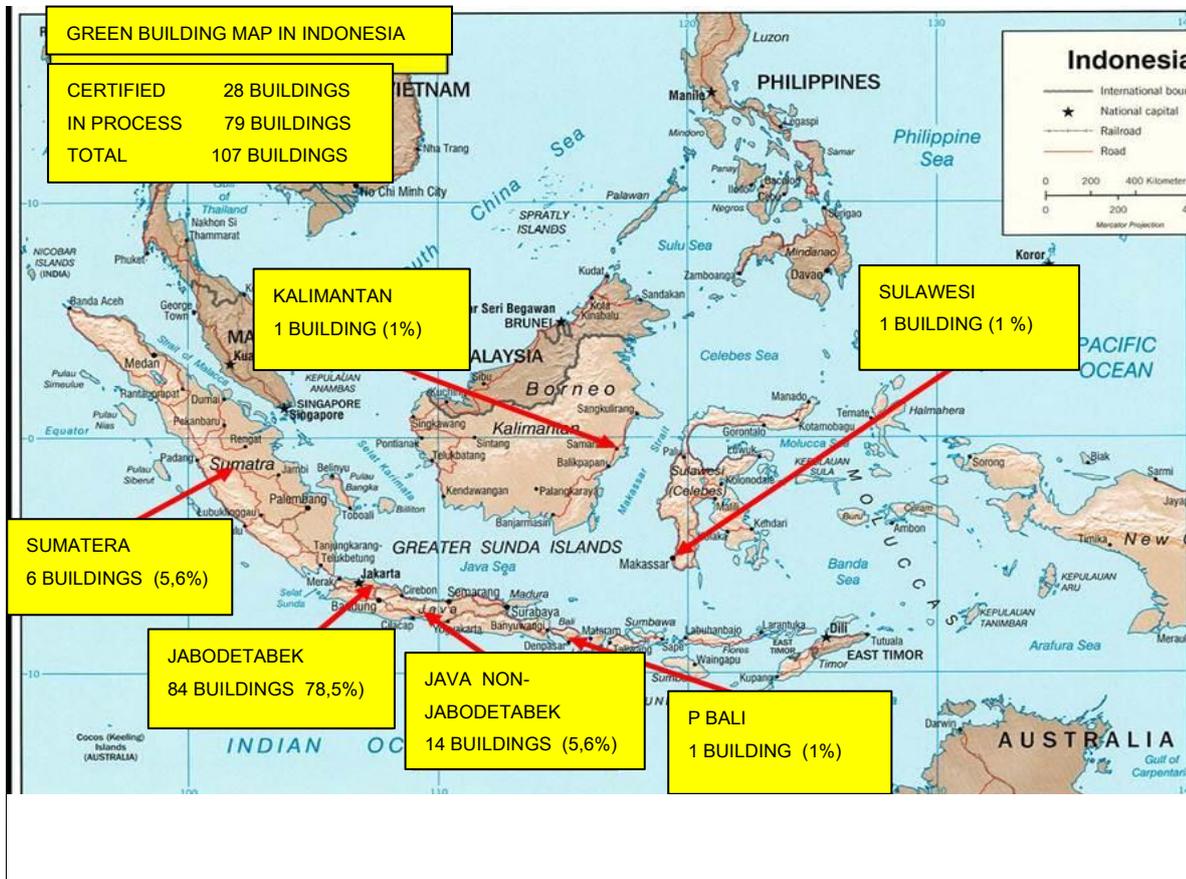


Figure 1. Map of Green Buildings in Indonesia (Mochtar, et. al., 2015)

- f. 1 project on the island of Sulawesi or 1%.

From these data, when compared with the development of green building in Asean countries, particularly Singapore (2155 buildings began in 2005) and Malaysia (976 buildings began in 2009), it can be said that the development in Indonesia is still very low and very slow (Mochtar et. al., 2015).

Factors of green building implementation in Indonesia is developed based on in-depth interviews with three green building experts based on their knowledge and experience; the factors are categorized in phases of design, bidding, construction, and operation and maintenance, and finally the institutional factor (Table 1).

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Table 1. Factors of Green Building Impelmentation in Indonesia

No	Phase	Factors
1	Design	<ul style="list-style-type: none"> a. Owner orientation to green building b. Consultant orientation to green building c. Incentives for green building based design d. Green building design standards e. Consultant knowledge in green building f. Owner's budget g. Higher complexity in green building design compared to regular building h. Databases of green building products/accesories i. Price of green building materials/systems j. Availability of green building materials/systems k. Quality of green building materials/systems
2	Bidding	<ul style="list-style-type: none"> a. Green building oriented bidding document b. Green building accentuatuion in prebid meeting c. Green building policy consistency in proposal evaluation d. Green building score weight in proposal evaluation
3	Construction	<ul style="list-style-type: none"> a. Green building policy consistency of owner and consultant b. Green building materials and equipment approvals by owner and consultant c. Database of green building materials/systems d. Price of of green building materials/systems e. Quality of green building materials/systems f. Availability and delivery services of green building materials/systems g. Incentives for green building construction phase
4	Operation & Maintenance (O&M)	<ul style="list-style-type: none"> a. Consistency of building management on green materials/systems substitution b. Databases in green materials/process substitution c. Price of of green building materials/systems substitution d. Standard of of green building materials/systems substitution
5	Institutional	<ul style="list-style-type: none"> a. Green building regulation b. Institution for green building standardization c. Norm, Standards, Codes, and Criteria for green building conctruction implementation d. Law system and enforcement in green building project implementation e. Incentives for green building design, bidding, construction, and O&M implementation f. Socialization of Norm, Standards, Codes, and Criteria for green building conctruction implementation

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3. METHODOLOGY

3.1. The Survey

The study was by conducting survey in Jakarta, the central area of green buildings in Indonesia. In this study the primary data is collected from experts, consultant, and contractors of green building projects based on their experience, to confirm the importance of the factors, using each importance factor score from 1=very not important, 2= not important, 3= important, and finally not important, 3=neutral, 4= important, and finally 5= very important

3.2.Data Analysis

The importance factors of green building project implementation in Indonesia are analyzed using simple statistic analysis, namely mean score analysis of each importance factor score. By using this analysis, the importance of each factors and importance of each category is found, and then interpreted.

4. FINDINGS AND DISCUSSION

In this section the result of a survey to experts, consultant, and contractors of green building projects and its policy implication is presented. Questionnaires are sent out to 20 respondents, and ten are returned and duly filled out, making the rate of return is 50 percent. From now on, those responding contractors are called "respondents".

Table 2 presents data regarding the mean score of importance factors of green building construction project implementation in Indonesia from respondents perspective. From Table 2, it can be seen that based on average of the mean scores the rank of importance factor, start from the most important to less important, is categories or phases of (1) construction, (2) design, (3) bidding, (4) institutional, and finally (5) operation and maintenance. The first and second most important factor categories will be discussed further.

The first most important factor category or phase is in construction phase, with its most important factor is the quality of green building materials/systems. In Indonesia, respondents believe that green building concept is relatively new (only since 2011), so that materials and systems quality for green building purposes such as energy save lights, green air conditioners, water save toilet accessories is still not standardized and in turn it may deter green building construction project implementation. Consequently, for the future regulations and standards of green building materials/systems quality should be developed if green building construction project implementation is to be improved.

The second most important factor category or phase is in design phase, with its most important factors: consultant orientation to green building, green building standards, consultant knowledge in green building concept, and finally owner's budget. Indonesian consultant orientation and knowledge on green building concept is relatively not well developed yet, and in some degree, based on respondents experience, it affects the implementation of green building construction project; less orientation and knowledge of consultant in green building concept may lead to difficulty

implementation of green building construction project in Indonesia. For the future, its improvement such as university

Table 2. Mean Score of Importance Factors

No	Phase	Factors	Mean Score
1	Design (4.35) (Rank 2)	<ul style="list-style-type: none"> a. Owner orientation to green building 4.4 b. Consultant orientation to green building 4.6 c. Incentives for green building based design 4.0 d. Green building design standards 4.6 e. Consultant knowledge in green building 4.6 f. Owner's budget 4.6 g. Complexity in green building design 4.0 h. Databases of green building products/accesories 4.2 i. Price of green building materials/systems 4.4 j. Availability of green building materials/systems 4.0 k. Quality of green building materials/systems 	
2	Bidding (4.25) (Rank 3)	<ul style="list-style-type: none"> a. Green building oriented bidding document 4.4 b. Green building accentuatuion in prebid meeting 4.4 c. Green building policy consistency in proposal evaluation 4.0 d. Green building score weight in proposal evaluation 4.2 	
3	Construction (4.37) (Rank 1)	<ul style="list-style-type: none"> a. Green building policy consistency of owner and consultant 4.4 b. Green building materials and equipment approvals by owner and consultant 4.4 c. Database of green building materials/systems 4.4 d. Price of green building materials/systems 4.4 e. Quality of green building materials/systems 4.6 f. Availability and delivery services of green building materials/systems 4.4 g. Incentives for green building construction phase 4.0 	
4	Operation and Maintenance (O&M) (4.100) (Rank 5)	<ul style="list-style-type: none"> a. Consistency of building management on green materials/systems substitution 4.0 b. Databases in green materials/process substitution 4.0 c. Price of of green building materials/systems substitution 4.2 	

		d. Standard of of green building materials/systems substitution	4.2
5	Institutional (4.19) (Rank 4)	a. Green building regulation b. Institution for green building standardization c. Norms, Standards, Codes, and Criteria for green building construction implementation d. Law system and enforcement in green building project implementation e. Incentives for green building design, bidding, construction, and O&M implementation f. Socialization of Norms, Standards, Codes, and Criteria for green building construction implementation	4.6 4.8 4.0 4.2 3.8 3.75

curriculum on green building concepts and also socialization of green building concepts to consultant professionals should make this problem solved. Furthermore, there is no green building design standards in Indonesia. As the result designers have no standards in designing green building construction project which in turn, according to respondents experience, may lower the implementation of green building construction project. For the future, design standards for green building should be developed by relevant institution so that designers have easiness and more confidence in conducting green building design, and thus the implementation of green building construction project in Indonesia is improved. Finally, respondents believe that the owner's budget frequently affect the implementation of green building project in Indonesia. Because there are more special materials/systems in green building than in non-green building (water recycle system, solar panel electrical system etc.), the first cost of green building may be higher than the non-green building, but then the operational cost of green building is much lower than non-green building especially its energy cost; this phenomena may deter the implementation of green building project for limited owner's budget for the project. For the future, some incentives program for owner budget plan are necessary to boost the implementation og green building project in Indonesia, besides more socialization program of green building importance in order to minimize global warming effects, and socialization program of significant cost saving in long time period (sometimes above 50 years) of green building O&M.

5. CONCLUSION

From this study it can be concluded that :

a. The amount of green building that has been certified since 2011 is 28 buildings, while in certification process is 79 buildings, so the total is 107 buildings. Compared with the development of green building in foreign countries, especially Singapore (2155 building since 2007) and Malaysia (50 buildings since 2009,, it can be said that the development in Indonesia is still very low and very slow.

- b. The most important factors in the construction phase are quality of materials and technology of green building; furthermore, the second important factors are in the design phase including the knowledge and orientation of consultant to the green building, and the budget of the project owner.
- c. As the implication, some policies are necessary to improve the implementation of green building project including development of regulations and standard for green materials/systems quality, improvement of university curriculum on green building concepts and also socialization of green building concepts to consultant professionals, development of green design standards, and finally provision of incentives program for owner budget plan, socialization program of green building importance in order to minimize global warming effects, and socialization program of significant cost saving in time period (sometimes above 50 years) of green building O&M.

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BIOGRAPHICAL NOTES

- Experienced in teaching at universities (home based on Indonesia Institute of Technology- ITI), researching, and consulting (design, supervision and management) in construction areas
- Around 30 publications in various international and national journals and conferences on productivity improvement, pricing strategies, marketing expenditures, production management, and green construction issues.
- Member of Jakarta Construction Development Board (LPJKP Jakarta), Indonesia Construction Experts Association (ATAKI), Indonesia Consultant Experts Societies (INTAKINDO)

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