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Development System on Integrated Regional Building Permit Policy to Enhance Green Building Life Cycle Achievement

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Abstract: Green building is a friendly environment building concept that can answer the problems of the negative impact of buildings on environmental sustainability both at this time and in the future. At the beginning of the development of a green building, there were relatively many challenges experienced specifically to begin the adaptation of changing concepts from conventional to the concept of green building by stakeholders building buildings specifically by building tenant and building management. This study aims to identify the targets expected by the building stakeholders for the success of the green building concept, especially in the operational and maintenance phases of the building. This research was carried out with a qualitative and quantitative method approach. In-depth interviews are used to identify and validate the initial performance variables expected by tenants and building management from the implementation of green building. The quantitative stage for survey respondents knows the expected performance characteristics during the operation and maintenance period of the building. This study resulted in several recommendations including local and regional building policies affecting the leverage of tenants and building management for the implementation of green building that had been planned and built. The main targets that influence the ability to implement the concept are the efficiency of resources for building operations and maintenance, which include the use of energy and water. Final validation was carried out with the qualitative method by appointing several experts to assess the results of respondents' surveys where they agreed with the results because technology and policies were relatively developed to regulate the use of energy and water resources in buildings. Besides that, the direct management of the building was also felt when the building was saved, this became an achievement for the building they managed.

Keywords: green building; regional policy; building life cycle

1. Introduction

The energy use in the world harms the environment with contributed to 80% of the world greenhouse gas production [1), 2)]. Energy use is 75% to meet urban needs. From the total greenhouse number, building construction and operational activities contribute up to 40% [3)]. Besides that, other resources such as clean water and building materials which building construction need up a quarter of the world's needs. Therefore, in the early stages of developing several green building policies to curb the operation and maintenance of buildings controlling energy use and carbon emissions is a top priority [4), 5)]. The policies issued have the aim to improve the ability of technological innovation and control the cost of green features so that they can reach all green building stakeholders. [6)] in a previous study stated that sustainable infrastructure policies become more effective by considering policy mixes. For example, renewable energy policies to reduce the use of fossil energy and transportation policies to reduce the use of personal vehicles, but in general there are not many policies that determine the amount of energy efficiency or the amount of carbon emission reduction that must be achieved. The need for these values greatly influences the expected achievement goals in sustainable infrastructure to predict the long-term needs of the availability of these resources.

Integration of stakeholder needs is an effective way to form policy mixes, especially in green building, because each policy has different needs for time, region, and its users [7]. Besides that, green building policies will succeed by minimizing the contradictions between goals and instruments that measure the success of these achievements. An example is the renewable energy policy, which is issued together with the targeted target of the expected amount of energy efficiency, which is an aligned mixes policy. Some of the green building policies in the world can be seen in Table 1. The focus of green building policies that are the world's main concern is the aspect of indoor health and comfort because almost all rating tools consider this [8].

Other problems apart from green building policies have not been integrated, the low implementation of environmentally friendly concepts in buildings, especially in developing countries, namely lack of building stakeholder awareness, unavailable of incentive, lack of integration of regulations, lack of innovative equipment source: [9]. Previous research recommends an incentive model in the form of expedited permit and technical assistance. However, the research has not yet reached the integration model of the two types of incentives. Besides that, please note that the building will take a long time to operate and maintain compared to planning and construction. Therefore it is necessary to have an assessment of the needs of tenants and building management to maintain green building performance. Some things that need to be considered to determine the successful implementation of a green building according to previous research in Vietnam, Ghana, Pakistan, and Indonesia. The gap is the main target of carrying out this research.

This study aims to identify the targets expected by building stakeholders for the success of the green building concept, especially in the operational and maintenance phases of the building. The key success factors become input for policy formulation in this research specifically case studies in Indonesia. Indonesia is a country with a relatively low number of green buildings said compared to other countries that already have a rating tools policy.

Table 1. Green building rating tools in the world countries.

Code	Barriers
I1	Lack of building stakeholder awareness [10]
I2	Unavailable of incentive [11]
I3	Lack of integrated codes and regulations [12]
I4	Lack of education/ training in building design and construction [13]
I5	Lack of guidance from the regulatory authority [11]
I6	High initial investment affected the long payback period [14]
I7	Lack of availability of green building case studies [15]
I8	Lack of financial resources [16]
I9	Lack of professional knowledge [17]
I10	Challenges of innovative equipment in design and construction methods [16]

Therefore, this research is expected to be able to integrate existing regional policies to unite the acceleration of licensing as an incentive for green building. Until 2015, Indonesia has 23 green buildings which are relatively far behind when compared to countries in Southeast Asia such as Malaysia and Singapore, which each has 137 and 1,696 green buildings [18]. Besides that, Indonesia as a developing country still does not have a clear commitment to achieving the targets of implementing green building. Thus, the purpose of this study is to determine the key success factors of the green building operation and maintenance implementation in the context of economic, environment development, knowledge improvement, and regional policy.

2. Methodology

This study used the qualitative and quantitative method in developing a survey process to address local government perspectives on green building incentive model particularly in the capital city of Indonesia. After that, semi-structured interviews allowing green building experts in Indonesia the freedom to actively engage in sharing their views on their terms. Six experts have been successfully interviewed consisting of green building council, green building practitioners, regional government, and academicians, to conduct constructive validation on this research.

A pilot study applied the quantitative method in this research. This process conducts through the distribution of a structured questionnaire to 30 respondents. It was the minimum number of fulfills data processes requirements on SEM-PLS operation [19]. All measures were rated on a six-point Likert-type scale, ranging from 1 (very low effect) to 6 (very high impact) without the moderate option. After the pilot study and validation process, the distribution of a structured questionnaire to 45 respondents. The respondents come from the building tenants as an owner and building management who they are the responsibility to green building implementation. The most data collection classified the respondents as the certified building owner in green building. Also, they come from 12 of 18 green building owners in Indonesia. Out of 50 distributed questionnaire, 45 operating responses were obtained which represent a ninety percent response rate of all respondent.

Fig. 1 shows aspects that influence the success of green building that is integrated with research considerations under previous research. Regional policy, economic and knowledge aspects are research recommendations [9], while this study examines other aspects that influence the development of the green building, namely environmental change [20]. Therefore, these four aspects are renewed for this research, namely green building certification by considering four factors that successfully implement green building for the provision of incentives and building permits.

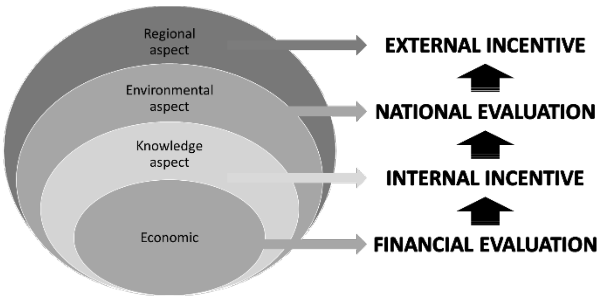

Fig. 1: Conceptual framework.

Economic problems in building development such as prices of green features, the green investor or lender, accurate in payback period, uncertainty the operational and maintenance costs, and property and land tax value [21]. The difference of green building complexity one another, it makes building certification has a different cost or unpredictable in values. This technical matter is an example of how a project with green construction methods has the potential of cost optimization especially to achieve the green building aspects [16]. The diversification condition of the building environment makes the different building specifications or own unique potential to get building efficiency and effectiveness [22]. There is no exact guidance to reach green building achievement. A comprehensive building planning has proven to increase operational performance two times better than conventional buildings. Building owners can maintain the title of green building with economic reasons for the achievement of comfort and a sustainable environment. Based on the literature found, the following can be hypothesized:

H1: An unstable condition of economic growth value (KSE) negatively influences the green building achievement sustainability (SUST).

H2: An unstable condition of economic growth value (KSE) positively influences the tenant comfortability (COMF).

H3: An unstable condition of economic growth value (KSE) positively influences the resilient building environment (ENVI).

H4: Resilient building environment (ENVI) positively influences the building resources efficiency (EFF).

H5: Resilient building environment (ENVI) positively influences the tenant comfortability (COMF).

The knowledge level of community in green building implementation influences building achievement especially in building design, construction, and operation. [22] explained that building stakeholders included the policy-maker, owners, consultants, and contractors, is responsible to educate the all building stakeholder to improve their knowledge of green building concepts. Technological innovation is difficult to accept due to low knowledge and curiosity. After the economic uncertainty, environmental change, and knowledge uncertainty indicators are identified, the next step is to identify regional policy forms according to the operational and maintenance needs of the building. Therefore, this stage is a determinant of the direction of green building policies that apply regionally to support the target program of achieving efficiency and effectiveness in the use of regional resources. Buildings that enter the operational phase require building technical service licensing requirements, final assessment or recertification certification in the existing green building, and consideration of providing incentives. In 2000 the Chinese State Government developed friendly environment policies by efficiency in energy use by 16% through research funded directly by the government. By 2015, China has reduced successfully carbon emissions by 17% [23]. Furthermore, China's policy in energy efficiency will be increased by 30% in 2020. However, some districts in China have achieved more than the energy efficiency target of about 50%. Some countries not only measure their regional achievements only from the energy aspect but also indicators on regional aspects in several countries in the world include the amount of water conservation and increase the building indoor healthy and comfort to the occupants [24]. The previous literature was collected which they posit that:

H6: Continuous knowledge improvement (KNOW) positively influences the green building achievement sustainability (SUST).

H7: Continuous knowledge improvement (KNOW) influences the level of difficulty in building manage (MNG)

H8: Overall building policy (RP) positively influences the building resource efficiency (EFF).

H9: Overall building policy (RP) positively influences the building management integration (MNG).

As a tribute to efforts to achieve regional policy targets, incentives are needed. The incentive needs that are the main attraction for implementing green buildings are measured as benefits that have not yet been received as a result of the high initial green building investment costs. Therefore, incentives for green operational and maintenance are a tool to encourage building tenants and management to perform in environmentally friendly actions. Besides that, incentives in green building operations and maintenance act as price stabilizers of green features in maintenance, ensuring successful implementation of green retrofitting, and increasing the number of existing conventional buildings to be green building concepts. In this part of the literature study, several hypotheses developed an incentive scheme in a certified green building. They stated:

H10: The green building achievement sustainability (SUST) positively influences an incentive model (INC).

H11: The building resources efficiency (EFF) positively influences an incentive model (INC).

H12: The tenant comfortability (COMF) positively

influences an incentive model (INC).
H13: The building management integration (MNG) positively influences an incentive model (INC).
The theoretical framework of the current study is empirically tested in the context of economic, environmental development, knowledge, and regional policy. It includes direct effects from dimensions of green building life cycle costs towards incentives of the structure of building life cycle. This study tests this framework in Indonesia as a case study place.

These critical success factors are tested to investigate the potential relationship between the incentive, building permit, and green building certification. Economic in response to the initial incremental cost of a green building which strongly depends on the country's situation. Regional policies as the role of government to support the green building concept in operational and maintenance implementation [25], besides that environmental development aspect as a process of changing the needs and lifestyle of human and the knowledge aspect to improve the awareness of the renewal technology and its implementation [26]. Base on the literature above, there are four endogen variables (economic, environmental development, knowledge improvement, regional policy, and green building implementation) observed in this study with 40 variable indicators were indicated.

3. Demographic information

Based on the received questionnaire, the majority of the responses were filled by males representing 75% and 25% were by females, with the ages of 25 to 35 years old representing and above 50 years obtaining 35%, and 65% respectively. Regarding education, respondents who have a degree were 72% but those with a master's degree were 28% and no Ph.D. With regards to working or living experience in green building, respondents who have below 5 years were more with 26%, those having between 5 to 10 years were 10% then 32% represents those with 10 years and above respectively.

4. Data Analysis

This paper aims to examine and establish the purposes and impact of green building implementation on creating an incentive structure in regional policy. Partial least square structural equation modeling analysis (PLS-SEM) procedure was applied for the analyses of the proposed study model using the SMARTPLS 3.0 software [27]. According to the previous research, the analysis implemented a two-stage analytical method to test the measurement model or validity and reliability analysis and structural model or hypothesis testing. Based on the test of load factor and AVE values, eight construct indicators must be eliminated because they are below the parameter limit value. The eight indicators are Effi3, KSE1, KSE2, KSE5, RP1, Sust1, TK4, and TMI7. 32 of 40 variable indicators would be analyzed as the results.

5. Research results

5.1 Measurement model

The reliability of the latent construct is tested by comparison of the amount of alpha and Cronbach composite reliability that both values must be greater than 0.70 [27]. The Cronbach's alpha and composite reliability values for four constructs surpassed the threshold value of 0.70 consisted of knowledge, manageable, incentive, and regional policy. Means of standardized factor loadings and Average Variance Extracted (AVE) is examined the convergent validity with a bootstrapping analysis of 500 subsamples. The result demonstrated that the standardized loadings of all measurement items were greater than 0.60 with no cross-loadings except COMF_1-2, ENVI_1-5, KSE_3-4, MNG_2-3, and SUST_3. Based on the measurement analysis process, 20 of 32 were the significant variable indicators (p-values less than 0.001). Besides that, they have strong convergent validity and well loaded on their constructs. Besides that, the convergent validity was also achieved when the AVE values of each construct in the model were found to be larger than 0.50 except indicator Comfort, Environment Development, Economic, and Manageable.

The result of the discriminant validity examination by comparing the shared variances between factors with individual factor AVE. All shared variances between factors in the model were lower than the square root of the individual factor AVE, confirming the satisfactory discriminant validity and that that the constructs were both conceptually and empirically dissimilar from each other. Kind of incentive model has the strongest correlation with the green building achievement sustainability (R-value equals to 0.570 and p-value is less than 0.01), followed by efficiency (R-value equals to 0.500 and p-value is less than 0.01), and regional policy (R-value equals to 0.409 and p-value is less than 0.01). Thus, each factor was statistically distinct from the other. The GOF index for this study was 0.42, which indicates a high Goodness-of Fit index (GOF > 0.36) and that the model has better explaining power in comparison with the baseline values defined above. Thus, the model provides adequate support to validate the PLS model globally.

5.2 Structural model

In this section, a review was conducted on an evaluation of the intensity of the SEM-PLS structural model as the objective of the study. R2 values measurements and the corresponding t-values have been performed at this stage to measure the significance of the indicator variables. Furthermore, the model was determined to have predictive relevance, as the cross-validated redundancy result (the Stone-Geisser's test Q2) was 0.166, which is greater than 0. The R-square value for the endogenous variable was 0.74, which exceeded the minimum level of 10% suggested, signifying a strong explanatory power for the model (i.e. all independent variables accounted for 40% of the total variance in green building internal incentive). Specifically, the results of the path coefficients and t-values were itemized whereby regional policy in green building implementation is seen to have a significant and positive link with green building efficiency value which it is well within expectations ($\beta 8=0.208$, T-value=2.286, P-value<0.023), while other hypotheses are not answered or do not have a significant relationship.

6. Discussion

This study assessed the impact of green construction in the context of economic, environmental development, knowledge, and regional policy on building incentive modeling. Finally, the low efficiency of economic problems, building environment conditions, knowledge improvement, and regional mandatory was not ascertained. The results support the previous research in obstacles to green building implementation that green building implementation has to support with good regional policy. Therefore, this study continues the final validation discussion to green building experts in Indonesia both from the regional government, expert teams from academicians, and green professionals.

The Responsibility Assignment Matrix (RAM) was integrated into the building permit process. It was simpler to meet the time limit for new buildings. This system is considered by the experts to be able to increase the reliability of the new building permit process specifically for the new green building. There will be a cut in licensing time which was previously 6 months to 1 year, with this scheme expected to be only a maximum of 3 months. The way to do that is through the licensing system integration using an online system so that it can integrate several institutions related to building permits. Besides that, the government also provides technical assistance so that in the feasibility study session the process does not exceed 1.5 months for each area of expertise.

In existing buildings, buildings that have passed the construction phase into the operational phase. Before the building enters the operational phase, the building's technical feasibility is first assessed. As in new buildings, existing buildings need the acceleration of technically feasible certificates for building integrated with green building certification and consideration of incentives. The acceleration obtained in green building licensing previously took 3 to 6 months to be a month. The government building permits that need to be integrated are integrated permit service agency, public work, spatial planning and land-use PWSPL) departments, regional revenue offices (IOR), and regional spatial planning coordinating boards (RSPCB), and the ministry of regional affairs (MIA).

The finding from this quantitative research proves the building permit quality process. Besides that, the building owner or management wants certainty in the value of the green building efficiency expected by each region. The stakeholders in the government there are in-depth interviews also agree with the value of efficiency as a parameter of the success of a green building. The input parameters are according to the advice of the experts that are derived from energy efficiency, water conservation, reduction in the amount of solid waste, and a reduction in the number of carbon emissions from electricity use. These parameters are also expected to facilitate the consideration of giving fiscal or non-fiscal incentives to green buildings.

7. Conclusion

This research is part of the process of solving the problem of the low number of green buildings in several developing countries that already have green building rating tools. The main problems are related to economic aspects, regional policy, environmental development, and knowledge. Previous research has discussed a lot from the perspective of green building planning and construction, namely through the provision of fiscal and non-fiscal incentives. Whereas the key factors for green building success are not only determined in the building phase but rather most are determined in operation and maintenance.

The operational and maintenance phase of a building is the longest phase throughout the building's service life. Therefore, this research has successfully solved the problem of lack of attractiveness of building owners and building management in green building sustainability. Two main problems were answered, namely the unclear flow of green building certification in building permits and incentives. Besides that, there is no certainty about the aspects that measure the success of achieving green building efficiency and effectiveness.

This study proves that one significant relationship in response to the hypothesis of this study is that building owners in the operational and maintenance phases require regional policy clarity so that they can direct the achievement of building efficiency targets in all aspects of building operation and maintenance. This research has also succeeded in providing an overview of expedited permit incentives for green buildings that achieve the highest level of certification. Benchmarks for achievement are energy efficiency, water conservation, reduction in the amount of solid waste, and reduction in carbon emissions. Building licensing according to building stakeholders is very significant with technical assistance and an integrated licensing system online. Therefore, this study recommends further research to suggest the need for further research on evaluating the implementation of integrated building permits with green building certification and incentives.

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