

The Impact of Green Construction Factors on Project Cost in Banda Aceh

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Abstract:

Global warming is an environmental issue that is constantly being discussed in the world. The construction industry sector is one of the sectors that can cause global warming. Therefore, the concept of Green construction was introduced, which aims to reduce the bad effects due to global warming. Green construction is a sustainable movement, which aims to create construction from the planning, implementation and use of environmentally friendly construction products. This study aims to determine the effect of green construction factors on construction project costs in the city of Banda Aceh. The data used in this study were primary data, and secondary data, questionnaire data was processed using *Software Statistical Package for Sosial Sciences (SPSS 23.0 for Windows)*. Based on the results of the study, it is found that among the five independent variables, only three variables can affect project costs, namely the occupational health and safety management system. (0.006), Environmentally friendly behavior (0.027), Use of construction materials (0.007).

Keywords —Green, construction, impact, factor, project.

I. INTRODUCTION

Green Construction is currently growing, this is because there is public awareness of the importance of the environment. Environmental damage occurs due to new land clearing, illegal logging, and other activities that have the

potential to destroy nature. Construction activities are one of the activities that can damage the environment. According to Faiola and Shulman (2007), people believe that global warming is the most critical environmental problem in the world. According to the United Nations Environment Program (UNEP 2007), the construction industry

has the greatest influence on environmental problems, because the construction industry can use up a lot of energy, and its contribution to global warming.

Green Construction can minimize the damage that has occurred, and as a way to repair the damage that has occurred. Many countries have started implementing Green Construction in construction projects, and Green Construction is starting to become a standard in construction construction. The development of the construction industry is currently growing rapidly, this can be seen from the increasing growth of construction every year, namely the construction of buildings, roads and bridges. With the increasing intensity of construction, therefore, it is important to make new regulations, which are in line with the current construction needs.

One of the government's concerns in current construction activities is Green Construction. The goal of Green Construction is to produce output from a sustainable construction process, and minimize the waste generated by construction projects, and create output that is in harmony with nature. According to Harimurti (2016), Green construction is a sustainable movement that aspires to the creation of construction from the planning stage, construction implementation, and use of environmentally friendly products, efficient in

energy and resource use, and low cost. According to Adji (2016), the green construction target has 6 criteria to be applied at the project site, namely: land use, energy efficiency and conservation, water conservation, project environmental management, material sources and cycles, and health and comfort in the project area.

According to Sinulingga (2012), one of the green construction plans is to replace parts of the building with local material components. Sofwan (2009), one of the reasons construction companies in Indonesia have not implemented the green construction concept is because it requires high costs, and they have not thought about the quality that will be produced. In fact, the implementation of green construction concepts will not reduce quality, and vice versa.

2. METHODOLOGY

The method used in this research to collect data was the sampling method. The data used in this study were primary data and secondary data. The instrument used was a questionnaire, and each answer would be given an assessment according to a predetermined scale, namely the Likert scale. The results of the opinions of all respondents were then processed using ordinal logistic regression.

2.1 Questionnaire Design

The questionnaire used in this study was a closed questionnaire. where respondents only choose from the answers provided. The questionnaire is divided into two parts, namely the questionnaire part A and part B. According to Johnson (2000). Respondents in this study were contracting companies in Banda Aceh. The number of respondents in this study were 30 respondents.

The factors of implementing green construction consist of 5 factors, namely; Occupational health and safety management systems (X1), Environmentally friendly behavior (X2), Use of construction materials (X3), Selection of suppliers (X4), Energy conservation (X5). The five factors are broken down into 27 indicators. Respondents were asked to rate each variable.

2.2 Data Processing

The research data processing method used in this study was Microsoft Excel 2013, and the Statistical Package Software for Social Sciences (SPSS 23.0 for Windows). The results of this data processing were in the form of diagrams and tables that are easier to understand.

2.3 Ordinal Logistic Regression

Ordinal logistic regression analysis is a statistical method that describes the relationship between a response variable with more than one predictor variable, where the response variable is more than two categories and the measurement scale is level (Hosmer 1989). The logistic regression model is to estimate the size of the regression coefficient. Furthermore, this regression coefficient will show the magnitude of the influence between the independent variables on the dependent variable, namely the effect of the green construction factor on the project cost.

3. RESULTS AND DISCUSSION

3.1 Model Fitting Information

To determine the effect of green construction factors on construction project costs, it is carried out by analyzing ordinal logistic regression. To assess the fit of the model is done by comparing the $-2\log$ Likelihood value, namely by entering the -2LogL intercept value which includes all the independent variables (intercept only). The model fits the data, when -2LogL which includes only the intercept or includes all independent variables into the model with a significant value ($p < .05$). The

value of the Model Fitting Information can be seen in Table 3.1 below :

Tabel3.1 Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	63.128			
Final	47.552	15.577	5	.008

Link function: Logit.

The results of -2 Log likelihood in Table 3.1, show that the Model Fitting Information -2log Likelihood explains that without including the independent variable (intercept only) the value is 63,128. However, by including the independent variable in the (final) model, the value decreased to 47,552. The change in value is the chi-square value, where this number is reduced by 15,577 and has a significant value of (sig. 0.008) ($p < 0.05$).

Therefore, the model is in accordance with the test results. It can be concluded that there is a fit of the model by including all the independent variables. The -2log likelihood test shows that it is statistically significant, and capable of improving the model. Thus, testing the hypothesis, where the effect of the green construction factor on the project cost variable cannot be rejected or influenced.

3.2 Goodness-of-Fit

The Goodness of Fit value is carried out to find out whether there is a suitability of the model

with the data, for more details, it can be seen in Table 3.2 below:

Tabel 3.2 Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	55.927	53	.366
Deviance	47.552	53	.685

Link function: Logit

Based on Table 3.2, the Goodness of Fit shows that the model conformity test with the data. Pearson value is 55,927 with a significance of 0.366 (> 0.05), and a Deviance of 47,552 with a significance of 0.685 (> 0.05). This means that the model according to empirical data or the model is suitable for use.

3.3 Pseudo R-Square

The Pseudo R-Square value shows how much the independent variable is able to explain the dependent variable. For more details, it can be seen in the following Table 3.3:

Tabel 3.3 Pseudo R-Square

Cox and Snell	.405
Nagelkerke	.461
McFadden	.247

Link function: Logit.

Based on Table 3.3, McFadden R-Squared is used to determine how much the contribution of the independent variable to the dependent variable. The value of the influence of the

dependent variable on the independent variable can be seen in the McFadden value as presented in Table 3.3. Based on the results shown in Table 4.3, it can be seen that the McFadden value is 0.247. Therefore, the dependent variable (Project Cost) can be explained by the independent variable (occupational health and safety management system, environmentally friendly behavior, use of construction materials, selection of suppliers, energy conservation) of 24.7%.

3.4 Test of Parallel Lines

The test results of the Test of Parallel Lines are based on Table 3.4, which shows that the -2 Log Likelihood value has a significant reduction as indicated by a significance level above 0.05 (0.399). Therefore, it can be concluded that by including the five independent variables, the model can be improved. For more details, it can be seen in Table 3.4 below:

Tabel 3.4 Test of Parallel Lines^a

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	47.552			
General	42.410	5.142	5	.399

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.^a

a. Link function: Logit.

3.5 Parameter Estimates

Based on the Estimates parameter value in Table 3.5. shows that among the five independent variables, only three variables can affect project costs, namely occupational health and safety management systems (0.006), environmentally friendly behavior (0.027), use of construction materials (0.007). The significance level of these variables is less than 0.05. Hence, the results show that all three variables affect project costs at the 5% level.

Tabel 3.5 Parameter Estimates

	Estimate	Std. Error	Wald	df	Sig.
Threshold [Y = 3]	11.570	6.848	2.855	1	.091
[Y = 4]	14.086	7.068	3.971	1	.046
Location TOT_SMKK	6.089	2.226	7.483	1	.006
TOT_PRL	3.055	1.380	4.902	1	.027
TOT_PMK	-4.547	1.685	7.281	1	.007
TOT_PP	1.648	1.121	2.160	1	.142
TOT_EK	-2.731	1.398	3.815	1	.051

Link function: Logit.

Meanwhile, the insignificant variables from the results of ordinal regression testing at the 5% level are supplier selection (0.142), energy conservation (0.051). The variable is significant at greater than 0.05, this indicates that the hypothesis is rejected, where the variable does not affect project costs.

4. CONCLUSION

Based on the research results, it shows that three green construction variables can affect project costs, namely occupational health and safety management systems (0.006), environmentally friendly behavior (0.027), use of construction materials (0.007).

The Occupational Safety and Health Management System is a protection system for workers and construction services to minimize and avoid the risk of moral and material loss, loss of working hours, as well as human safety and the surrounding environment, which in turn can support an effective and efficient performance improvement. According to (Pangkey 2012), the Occupational Health and Safety Management System needs to be well planned and implemented at the project site,

this is done to avoid increasing project costs, reducing the number of workers who have accidents or occupational diseases, and can improve performance in project implementation.

Environmentally friendly behavior factors such as environmental training are very important in implementing green construction (Erviyanto 2013), According to (Jaya 2013), Replanting on land that has been completed, and localizing the spread of dust with a dust safety net on surrounding buildings is one of the factors of environmentally friendly behavior in construction projects. According to

(Dianita 2014), the use of construction materials has an effect on project costs in implementing green construction.

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