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Achievement and Cost Efficiency Analysis of Implementing Green Construction on A Public Service Mall Construction in the City of Tegal

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Abstract

Green construction (GC) is a concept aiming at reducing the negative environmental impacts of construction activities during construction planning and implementation stages. The Public Service Mall Building Project in Tegal City is a building project that requires costs from planning to maintenance. The construction project certainly requires substantial costs. This research aims to evaluate the achievements and determine the cost efficiency of green construction. This research was conducted through a preliminary survey of the involved parties who understand the green construction concept to identify the most applied categories: the use of refrigerants without Ozone Depleting Potential (ODP), regional materials, environmental control over cigarette smoke, and pollution from construction activities. The type of research is qualitative, with data collection techniques carried out through interviews and direct observation. The data analysis for cost efficiency involves comparing green construction projects with non-green construction projects. The results of the benchmark measurements for using refrigerants without Ozone Depleting Potential (ODP), regional materials, and environmental control over cigarette smoke in the green construction projects achieved 100%, while the benchmark measurement results for green construction concerning pollution from construction activities achieved 50%. Based on the cost usage analysis of the upper structure construction of the Public Service Mall Building in Tegal City, the cost usage of the GC project is 9.25% more efficient than that of the conventional one.

Keywords: green, construction, questionnaire, costs

I. INTRODUCTION

Undoubtedly, the rapid progress of the development sector will have an impact on the environment. It can cause several impacts: increased greenhouse gas emissions to the environment, resulting in climate change, global warming, and an energy crisis that may occur. An effort to minimize global warming is made by applying the concept of "green building" or green building. Green building itself is a concept of a sustainable building that can reduce environmental damage due to construction activities during the planning stage, construction, or even the use stage [1].

According to the decree of the Minister of Public Works and Public Housing of Indonesia (PUPR), Regulation Number 21 of 2021, concerning the Performance Evaluation of Green Buildings, building construction in Indonesia is expected to implement the green construction concept (GC). GC itself is an idea that is applied at the planning and implementation stages of the construction process, which aims to reduce the negative environmental impacts of construction activities.

GC is a concept in the planning and implementation stage of the construction process that aims to reduce the negative impacts of construction activities that impact environmental damage. Another goal of the concept is to reduce air, water, and soil pollution during the construction phase [2]. It is expected that the creation of green buildings will increase user comfort and reduce environmental impacts. Green construction emphasizes the principle of efficient use of resources for environmental conservation. Green construction is concerned with cost, quality, time, energy, land, and ecosystems [3].

To date, Tegal City does not yet have a building that implements the green construction concept. Developments in Tegal City continue to evolve, such as by improving and adding infrastructure. One of the development projects in Tegal City is the Tegal City Public Service Mall Building Development project. Building construction requires costs during construction, so a comparison analysis is necessary to review the comparative costs of using the GC and conventional concepts. The use of the green building concept has been regulated by the previously-mentioned decree (PUPR Number 21 of 2021), discussing the Performance Evaluation of Green Buildings. This study aims to evaluate the achievements and determine the cost efficiency of using the GC concept, which is expected in the Public Service Mall building construction in Tegal that has implemented the GC concept. The GC criteria assessment uses the greenship assessment version 1.2 from the Green Building Council of Indonesia [4]. According to [5], there are 12 categories of GC based on the greenship new building version 1.2. This statement is supported by [6], which states that GC criteria include managerial and operational aspects. Managerial aspects include involving a Greenship Professional (GP) as a member of the project team, pollution management from construction activities, independent management of organic and inorganic waste processing, rainwater management at the project site, design management of air quality system designs on the project, management of life cycle cost designs and building maintenance, innovating water use savings, innovating construction waste processing, and maintaining buildings during construction. Operational aspects include management of construction waste and residual waste, management of water during construction, control of environmental disturbances, energy efficiency, sources, and material cycles. These categories are research variables.

Implementing GC has the potential for cost savings and positive environmental impacts. Several previous studies have not included comparing the usage costs between GC and conventional projects. Construction costs are costs used in implementing a project. Construction costs are divided into indirect costs and direct costs [7]. Cost savings occur since the GC concept can minimize damage and provide a way to fix errors that occur [8]. A previous study [1] stated that the cost savings of GC construction projects can be seen in the operational stage of the building. The savings are around 30-50% compared to conventional methods.

II. LITERATURE REVIEW

A previous study [9] had similarities to the proposed study; both used a rating system of Greenship New Building version 1.2 as an assessment parameter but with different subparameters. The research specifically differs by including cost efficiency in applying the GC at the research location conducted in the Public Service Mall building in Tegal.

According to [10], GC is the planning and implementation of a construction activity based on contract documents, aiming to reduce the negative impacts caused by the construction activity so as to create a balance between the needs of the current and future generations of humans and the environment. In addition, a study [11] stated that Green Construction (GC) is a concept that is carried out from the planning, construction, operation, and maintenance stages that pay attention to the saving aspect by trying to use natural resources sufficiently to maintain the air quality in the building and protect the health of the building's occupants as well as paying attention to the concept of sustainability.

GC was first introduced in Indonesia 10 years ago to reduce the negative impacts caused by construction projects. Several regulations were issued to regulate the use of the GC concept. Some of these regulations include a minister decree of PUPR Number 45 of 2007, Number 2 of 2015, Number 21 of 2021, Presidential Instruction Number 2 of 2008, a decree of the Minister of State for the Environment Number 8 of 2010, Circular Letter of the Director General of PUPR Number 86 of 2016 and Assessment Tools from the Green Building Council of Indonesia [4]. These regulations ensure that the green building concept can be implemented by fulfilling technical requirements and prioritizing green building aspects. [12].

According to [5] in [13], there are 28 categories during designing, of which 12 categories are in the construction stage: 1) reuse of buildings and used materials, 2) environmentally friendly materials, 3) use of refrigerants without Ozone Depleting Potential (ODP), 4) materials from local areas, 5) certified wood, 6) monitoring of carbon dioxide (CO_2) concentrations, 7) environmental control of cigarette smoke, 8) pollution from construction activities, 9) chemical pollutants, 10) noise levels, 11) lighting levels, 12) GP as a project member.

Implementing GC can save costs and positively impact the environment. Construction costs are costs used to run a project. Construction costs are divided into two: direct costs and indirect costs. Direct cost elements include material, wage, equipment, and subcontractor costs. Indirect cost elements are employee salaries, office costs, and public facility procurement costs [7].

Buildings with the Greenship concept can save operational costs compared to those that do not apply the green building concept. These cost savings occur since GC can minimize damage and provide a way to fix errors that occur [8]. Moreover, study findings by [1] revealed that cost savings in GC projects can be observed in the operational phase of the building. The cost can save around 30-50% compared to conventional methods. However, this statement does not follow the argument stated by [14], stating that applying GC requires higher costs, as much as 1-25%. These costs are due to the complexity of the design and modeling costs required to implement GC in construction projects.

III. METHODS

A. Research Locations

The research was conducted at the Public Service Mall development project in Tegal, located in Kemandungan Village, West Tegal, Tegal City, Central Java. Figure 1 shows the map location of the research.

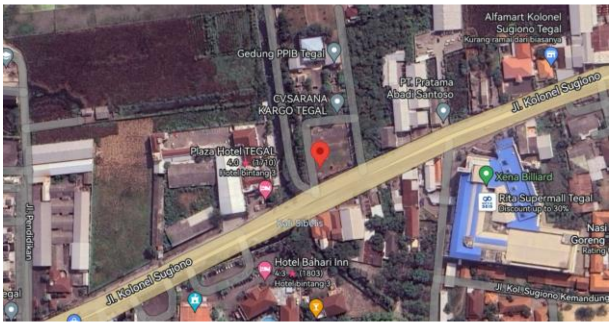

Figure 1. Research location

B. Research Variables

According to [5], there are 12 categories of GC based on Greenship new building version 1.2 during the construction stage. The Green Building Council of Indonesia has released an assessment system for greenship new buildings version 1.2, which includes several standards and benchmarks. The categories that will be used as research variables are:

1. Reusing used buildings and materials – used materials from old buildings and/or other places can be utilized to minimize the need for new raw materials. This is expected to minimize waste disposed of in landfills and extend the service life of a material.
2. Use of environmentally friendly materials – the objective is to minimize the ecological impacts of raw material extraction and the material production process.
3. Use of refrigerants without Ozone Depleting Potential (ODP) – materials that cannot destroy the ozone layer can be selected.
4. Use of materials from local areas – this aims to minimize the carbon pollution footprint of transportation vehicles used in material distribution and increase domestic economic growth.
5. Use of certified wood – using raw wood materials whose origin can be accounted for so that there is a guarantee regarding the protection of forest sustainability.
6. Monitoring of CO_2 concentration – monitoring carbon dioxide levels by regulating the inflow and outflow of fresh air to protect the health of the building's occupants.
7. Environmental control of cigarette smoke – the exposure of interior material surfaces and building occupants to air pollution due to cigarette smoke can be minimized. Thus, the health of the building occupants can be better maintained.
8. Environmental control of chemical pollutants – air pollution from building material emissions can be minimized, as they potentially harm the health and comfort of construction workers and future building occupants.
9. Noise level control – noise levels in buildings are regulated to keep them at a good level.
10. Lighting level control – visual disturbances due to lighting levels that are not suitable for the accommodation capacity of the building occupants' eyes can be avoided.
11. Pollution control from construction activities – pollution arising from construction activities and waste disposed of at landfills (final disposal sites) can be minimized.
12. GP as a project member – the inclusion of the person is to guide the design steps of a green building from the initial stage to facilitate the realization of a design that meets a good rating.

C. Preliminary Survey

A preliminary survey was conducted to obtain the main variables to be studied as research objects based on green construction (GC) experts. The preliminary survey was conducted by filling out a questionnaire by two people from the engineering team, two from the supervisory team, and two from the contractor team. There were 12 questions in the questionnaire based on 12 categories at the construction stage. The questionnaire results were used to determine the category that was considered most applicable to the project. After the questionnaire data in the preliminary survey had been filled out, data analysis was carried out to identify the most applicable GC category using standard deviation and mean values. The mean value represents the average, while the standard deviation measures the extent to which the data is spread from the average. Mean and standard deviation can be calculated with these formulations:

$$\bar{x} = \frac{\Sigma xi}{n} \quad (1)$$

$$s = \sqrt{\frac{\Sigma X^2}{n-1}} \quad (2)$$

note:
$\bar{x}$: *mean*
n: the number of data
s: standard deviation
x: average

A dividing line of the mean and standard deviation values marked the division in the diagram in Figure 2. The line divides the diagram into four parts: quadrant 1 to quadrant 4. The determination of the category level was arranged based on the most determining category (quadrant 1) to the least determining category (quadrant 4).

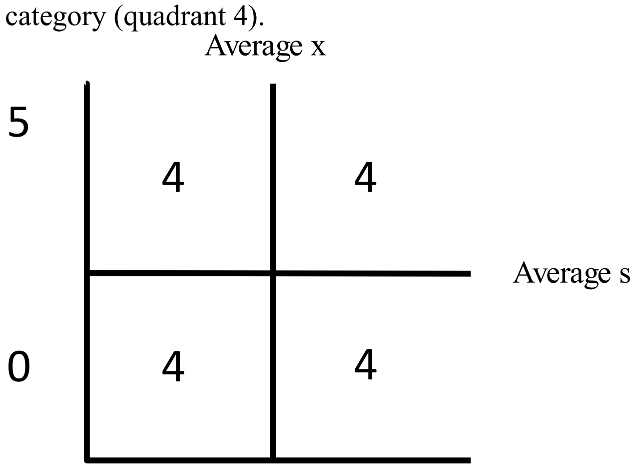

Figure 2. Division of quadrants

Quadrant's Value Arrangement:

- Quadrant 1: Small standard deviation score with large mean
- Large mean: Respondents valued the factor greatly
- Small standard deviation: Respondents agreed with the statement
- Quadrant 2: Small standard deviation score with small mean
- Small mean: Respondents less valued the factor
- Small standard deviation: Respondents agreed with the statement
- Quadrant 3: Large standard deviation score with small mean
- Small mean: Respondents less valued the factor
- Large standard deviation: Respondents disagreed with the statement
- Quadrant 4: Large standard deviation and mean scores
- Large mean: Respondents valued the factor greatly
- Large standard deviation: Respondents disagreed with the statement

D. Data Collection and Types

The study utilized primary and secondary data. Primary data were obtained from field observations using the five human senses and interviews with the head of the construction management team. Secondary data used were Greenship New Building Version 1.2 with the construction stage and the cost budget plan of the construction as subparameters. Cost efficiency was calculated based on a cost comparison between the Green Construction (GC) and the conventional concepts.

E. Data Analysis

The data used were obtained from Greenship New Building Version 1.2, including the 12 GC categories. A preliminary survey was conducted by completing questionnaires to parties who understood the GC concept. The survey aimed to obtain the most applicable categories in the construction project of the Public Service Mall in Tegal City. After obtaining the most applicable categories, observations and interviews were conducted to obtain results per the project conditions. At the observation stage, the researcher used notes or recordings to collect data [15]. Then, an assessment was carried out on the GC category. The assessment results were assessed using an assessment weight that refers to the greenship evaluation criteria and the GC category assessment according to the Greenship standard. The next stage was to analyze the cost efficiency. The analysis was carried out by comparing the costs in the cost budget plan of upper structure work using the green construction concept with the conventional method.

IV. RESULTS AND DISCUSSIONS

A. Preliminary Survey Results

Based on the questionnaire results in Table 1 and the GC concept mapping in Figure 3, the most applicable GC categories were the categories in quadrant 1: the use of refrigerants without Ozone Depleting Potential (ODP), regional materials, environmental control over cigarette smoke, and pollutions due to construction activities.

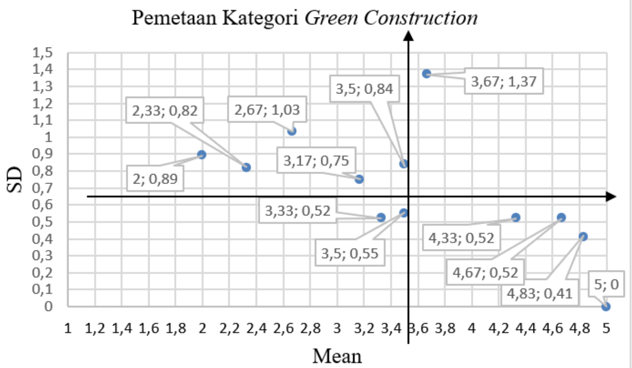

Figure 3. Green construction concept mapping

B. Instrumentation and Measurement Results of GC Categories

1. Instrumentations

- Use of refrigerants without Ozone Depleting Potential (ODP): The assessment was conducted by interviewing the head of the construction management team regarding the use of materials used in all cooling systems in the building, which were required not to be ozone-depleting materials.
- Regional Material: The assessment was conducted by interviewing the head of the construction management team regarding materials originating from the main raw material location for the factory, which was located approximately 1,000 km from the project site, which was at least half of the total material costs.
- Environmental control of cigarette smoke: The assessment was conducted by interviewing the head of the construction management team and conducting direct observations regarding the importance of installing the "No Smoking in All Building Areas" regulation and the unavailability of smoking areas inside the building. If smoking areas are outdoors, the area must be at least five meters from the entrance, and there must be air duct ventilation and windows so that air from the outside may enter.
- Pollution due to construction activities: The assessment was carried out by interviewing the head of the construction management team and conducting direct observations regarding the processing of solid and liquid waste so as not to pollute the project environment or the city.

2. Measurement Results

- Use of refrigerants without Ozone Depleting Potential (ODP): Based on an interview conducted by the researcher with the head of the construction management team, the Tegal City Public Service Mall Building Construction project uses an air conditioning installation with the Daikin Arkema brand with an R410A condenser unit in Figure 4. The use of R410A refrigerant benefits with no potential of damaging the ozone.

Figure 4. Refrigerant R410A

- Regional Material: Based on interviews with the head of the construction management team and direct observations conducted by researchers, the materials used in the Tegal City Public Service Mall Building Construction project were mainly sent from Java Island, namely from Surabaya, for Hebel mortar materials, plastering, and light steel adhesives. Several other materials came from Semarang, Jakarta, Bekasi, and Tangerang. This was done to reduce gas emissions from transportation and distribution of materials and to support domestic economic development. Grand elephant plastering shown in Figure 5.

Figure 5. Grand elephant plastering

- Environmental control of cigarette smoke: Based on interviews with the head of the construction management team and direct observations conducted by researchers, the Tegal City Public Service Mall Building Construction project had warning signs, "No Smoking in All Building Areas". However, when researchers conducted direct observations, the signs had been removed. The removal was mainly because the building was already in the painting stage. The smoking area installed outside the building was located ± 7 meters from the entrance. Smoking area shown in Figure 6.

Figure 6. Smoking area

- Pollution due to construction activities: Based on interviews with the head of the construction management team and direct observation, the construction project of the Tegal City Public Service Mall has carried out good building environmental management. This can be seen in the process of managing solid waste from construction. However, liquid waste produced by the construction project has not been managed properly.

Waste from construction activities includes leftover food, drinks, and sacks or material packaging. Waste from construction activities was collected and then disposed of at the final disposal site in Muarareja, West Tegal. By-product waste was comprised of iron, wood, and material chips from coarse and fine aggregates. Solid waste from construction activities had been collected and separated by type. Wood and iron waste was classified between those still suitable and those not suitable for reuse. The remaining wood and iron that are reusable are stored to be used for other projects, while third parties recycle the remaining wood and iron that are not suitable for reuse. The solid waste generated from the remaining Gragal material was given to the party collaborating with the project.

The liquid waste produced was comprised of the washing bay, casting activities, and toilet wastewater. Waste from the washing bay was channeled into the river next to the building. Casting activity waste was channeled along the work road to help harden the road. Wastewater from the toilet was channeled into existing gutters. Liquid waste had not been utilized optimally. Its waste disposal may pollute city drainage. Separation of construction waste shown in Figure 7.

Figure 7. Separation of Construction Waste

3. Evaluation of Measurement Results

- Use of refrigerants without Ozone Depleting Potential (ODP): The assessment of the use of refrigerants without Ozone Depleting Potential (ODP) in the category received a score of 2 points from a total score of 2 points, which means that the level of implementation of this category has reached 100% of the Greenship benchmark. Assessment of refrigerant use category without ozone depleting potential (ODP) shown in Table 2.
- Regional Material: The implementation rate of the regional material category reached 100% of the Greenship benchmark because the assessment obtained a 2 out of a total score of 2, indicating that the category received 2 points out of a total of 2 points. Regional material category assessment shwon in Table 3.
- Cigarette Smoke Control: The evaluation of the environmental control category of cigarette smoke

received a score of 2 out of a total score of 2, indicating that the implementation level reached 100% of the Greenship benchmark. Environmental control category assessment of cigarette smoke shown in Table 4.

- Pollutions from construction activities: The evaluation of the pollution category from construction activities achieved a score of 1 out of a total score of 2, indicating that the implementation level of this category reached 50% of the Greenship benchmark. Pollution category assessment from construction activities shown in Table 5.

C. Budget Plans of Upper Structure of Green Construction and Conventional Projects

Table 6 and Table 7 show upper structure work costs using the green construction (GC) concept and the conventional concept used for comparison.

Table 1. Preliminary survey results

Number	Green Construction Category	Respondent						Total	Mean	SD
		1	2	3	4	5	6			
1	Reusing used buildings and materials	1	2	2	3	3	1	12	2.00	0.89
2	Use of environmentally friendly materials	4	3	3	4	4	3	21	3.50	0.55
3	Use of refrigerants without Ozone Depleting Potential (ODP)	5	5	4	5	5	5	29	4.83	0.41
4	Use of certified wood	4	4	4	4	1	5	22	3.67	1.37
5	Regional Material	5	5	5	5	5	5	30	5.00	0.00
6	Monitoring of CO_2 concentration	4	3	1	3	2	3	16	2.67	1.03
7	Environmental control of cigarette smoke	5	5	4	4	5	5	28	4.67	0.52
8	Environmental control of chemical pollutants	3	4	3	4	3	3	20	3.33	0.52
9	Visual comfortability	3	3	3	4	4	2	19	3.17	0.75
10	Noise level control	4	4	4	3	4	2	21	3.50	0.84
11	GP as a project member	2	3	3	1	2	3	14	2.33	0.82
12	Pollution control from construction activities	4	5	4	4	4	5	26	4.33	0.52
Total									**43.00**	**7.69**
Total Average									**3.58**	**0.64**

Table 2. Assessment of refrigerant use category without ozone depleting potential (ODP)

Number	Green Construction Parameter	Greenship Assessment	Observation Result	Researcher's Assessment
1	All materials used in all cooling systems of the building did not damage the ozone layer	2	All cooling systems installed in the building used refrigerant R410A, which potentially did not damage the ozone layer	2

Table 3. Regional material category assessment

Number	Green Construction Parameter	Greenship Assessment	Observation Result	Researcher's Assessment
1	Materials used were from their origin locations and fabricated within the radius of 1,000 km of the project location, with minimum amounts being 50% of the total material costs	1	Most materials used were from their main raw origin locations and fabricated or delivered from Central and East Java areas, which distanced ±500 km from the project location	1
2	Materials used were originated and fabricated within the areas of the Republic of Indonesia, and valued at a minimum of 80% of the total material costs	1	88.8% of materials used were originated and fabricated within the Java areas.	1

Table 4. Environmental control category assessment of cigarette smoke

Number	Green Construction Parameter	Greenship Assessment	Observation Result	Researcher's Assessment
1	"No Smoking" signs are being put on all building areas, and indoor smoking areas are unavailable. If available, smoking areas are outdoors, with a minimum distance of 5 m from the entrance, and have outdoor air intake and window ventilation	2	1.No Smoking Sign is not present in all building areas of the Public Service Mall in Tegal City. The sign has been put on during construction but later was put off.	1
			2. An area designed specifically for smoking is present at a distance of ±7 from the entrance of the Public Service Mall construction area in Tegal.	1

Table 5. Pollution category assessment from construction activities

Number	Green Construction Parameter	Greenship Assessment	Observation Result	Researcher's Assessment
1	Collection, separation, and record systems for solid waste are provided. The record of the solid waste disposal is divided into disposal at the final disposal site, reuse, and recycling by third parties.	1	Solid waste in the form of construction by-products had areas for collection, separation, and disposal at the final disposal site. Solid construction by-products, such as wood pieces and iron leftovers, were reusable or recyclable by a third party.	1
2	Liquid waste is maintained for its quality so that the resulting wastewater during construction does not pollute the city's drainage.	1	Liquid waste resulting from the washing bay was channeled to the river. Waste due to the molding activities was used to harden the road. Wastewater from the toilet was channeled to the gutters.	0

Table 6. Work costs of the upper structure of the green construction project

Task Description	Volume	Unit	Unit Cost		Total Cost	
Column						
Semi system formwork	935.7	m2	Rp	144.045,93	Rp	134.783.776,70
Rebar	63831.07	kg	Rp	13.037,50	Rp	832.197.575,13
Concrete	165.88	m3	Rp	1.1166950,00	Rp	185.229.902,00
Block						
Semi system formwork	2805.35	m2	Rp	144.045,93	Rp	404.099.249,73
Rebar	78976.45	kg	Rp	13.037,50	Rp	1.029.625.466,88
Concrete	344.39	m3	Rp	1.116.650,00	Rp	384.563.093,50
Plate						
Semi system formwork	2640.08	m2	Rp	144.045,93	Rp	380.292.778,87
Rebar	38342.36	kg	Rp	13.037,50	Rp	499.888.518,50
Concrete	409.44	m3	Rp	1.116.650,00	Rp	457.201.176,00
Total					**Rp**	**4.307.911.537,30**

Table 7. Work costs of the upper structure of the conventional project

Task Description	Volume	Unit	Unit Cost	Total Cost
Column				
Formwork	935.7	m2	Rp 212.828,70	Rp 199.143.814,59
Rebar	63831.07	kg	Rp 13.037,50	Rp 832.197.575,13
Concrete	165.88	m3	Rp 1.1166950,00	Rp 185.229.902,00
Block				
Formwork	2805.35	m2	Rp 212.828,70	Rp 597.058.993,55
Rebar	78976.45	kg	Rp 13.037,50	Rp 1.029.625.466,88
Concrete	344.39	m3	Rp 1.116.650,00	Rp 384.563.093,50
Plate				
Formwork	2640.08	m2	Rp 212.828,70	Rp 561.884.794,30
Rebar	38342.36	kg	Rp 13.037,50	Rp 499.888.518,50
Concrete	409.44	m3	Rp 1.116.650,00	Rp 457.201.176,00
Total				**Rp 4.746.823.334,43**

D. Cost Efficiency of Green Construction Costs

Table 8 presents the cost differences of upper structure development using green construction and conventional concepts.

Table 8. Cost difference and efficiency of using green construction and conventional concepts

Description	Amount
GC costs	Rp 4.307.911.537,30
Conventional costs	Rp 4.746.823.334,43
Difference	Rp 438.911.797,13
Percentage of efficiency	$\frac{438.911.797,13}{4.746.823.334,43} \times 100\%$ = 9.25%

Based on the comparison of cost usage in Table 8, the use of the GC concept is more efficient by Rp 438.911.797,13 or 9.25%. This is due to the difference in the use of formwork. The GC concept uses hollow formwork, while the conventional concept uses conventional formwork. This is because the GC concept uses hollow formwork, which can save the use of wood.

Hollow formwork is also called semi-system formwork. It is called hollow formwork because it is made of hollow iron or steel plates. The formwork is more durable and long-lasting compared to conventional formwork. Hollow formwork can be reused up to 5 times on a project, so this formwork system is more efficient than the common formwork. The cost required for formwork ranges from 40-60% of the cost of concrete work or around 10% of the total construction of the building. Hollow formwork has a disadvantage; its usage needs an area for formwork fabrication [16]. Hollow formwork can be reused if used on structures of the same size and shape. The supporting scaffolding is made of fabricated steel, while the hollow formwork is made of plywood or plate [17]. In the construction project of the Tegal City Public Service Mall building, the hollow formwork was made of polyfilm plywood and hollow iron.

V. CONCLUSIONS

The most widely implemented GC is refrigerants without Ozone Depleting Potential (ODP), regional materials, environmental control of cigarette smoke, and pollution due to construction activities. The results of GC benchmark measurements revealed that the use of refrigerants without Ozone Depleting Potential (ODP), regional materials, and environmental control of cigarette smoke has achieved 100%, which means it is in accordance with the benchmark. However, the results of GC benchmark measurements for pollution due to construction activities have achieved 50%. Based on the cost analysis results in constructing the upper structure of the Public Service Mall building in Tegal City, the use of GC concept costs was more efficient by Rp 438.911.797,13 or 9.25% than the conventional concept. Cost efficiency in the GC concept resulted from using hollow formwork that was cheaper, more durable, reusable, and long-lasting.

The study was conducted based on the most applicable category among other categories, so further research was needed related to the application of other categories that cannot be done in this study, such as monitoring CO2 levels, noise levels, and chemical pollutants. In this study, cost efficiency analysis was only carried out on the upper structure work, highlighting the need for further research on the analysis of other work.

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