Analysis of Green Building in The West Java Regional Police Main Buildings and Its Improvement Strategies

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Abstract

Green building is a building design concept aimed at improving quality of life and meeting the needs of future generations. A building can be classified as a green building if it meets the requirements and prossesses green building certification. The main building of the West Java Regional Police (Polda Jawa Barat) does not have a green building certificate. The purpose of this research is to evaluate, analye, and provide improvement solutions for the implementation of green building principles in the Main Building of Polda Jawa Barat. The research method used is a descriptive method with the EAC (Evaluative, Analysis, and Creating) approach. The EAC approach compares the existing condition of the Main Building of Polda Jawa Barat with the Greenship for New Building V1.2 assessment tool. Based on the results, the green building analysis and improvement strategy using the GBCI Greenship for New Building V1.2 assessment consists of six categories: Appropriate Site Development (ASD) with 6 points, Energy Efficiency and Conservation (EEC) with 10 points, Water Conservation (WAC) with 11 points, Material Resources and Cycle (MRC) with 5 points, Indoor Health and Comfort (IHC) with 8 points, and Building Environment Management (BEM) with 7 points. The evaluations shows a total score 47 points, placing the building at the silver rating. Proposed impovements include providing 4 bicycle parking spaces, replacing the vertical transportation system with a taction lift, using Solterra 550Wp solar panels, renting a luv meter for 3 days to measure room illumination, utilizing rainwater as an alternative water source, installing a 60m3 ground tank, installing 104 CO2 sensors, and serting dB meter for 3 days to measure noise levels. The cost to implement these improvements to achieve a gold rating with a total of 63 points is estimated at IDR 1.407.150.000,00

Keywords: Green Building, Office Building, Evaluation, Analysis

1. INTRODUCTION

In Indonesia, Frick & Suskiyanto (n.d.) stated that almost all buildings constructed since the 1950s do not meet the requirements of sustainable development. Therefore, it can be said that, overall, buildings have made a significant contribution to creating ecological imbalance, particularly in issues related to water resource scarcity. Various efforts have been made to exploit natural resources without paying attention to visible environmental changes, which eventually worsen the geological environment of the surrounding area.

Based on these considerations, a proper clean water management system and careful building management are urgently needed, with the aim of ensuring the continuity of resource availability to support sustainable development. In this regard, green building is an efficient technology for the utilization of natural resources (Anbarci et al., 2012). In other words, green building is one of the real components and solutions for supporting sustainable development.

The application of green building not only provides ecological benefits but also offers economic value, as it can reduce building operational and maintenance costs (Komalasari, 2013). The Main Building of the West Java Regional Police (POLDA Jawa Barat) does not yet comply with green building criteria.

Entering the 20th century, the demand for energy has increased significantly across various sectors. There is almost no sector that does not require energy to carry out its activities. However, the growing energy demand is not matched by sufficient energy supply. Most of the world's energy needs are met by non-renewable resources such as coal, petroleum, and natural gas. The availability of these energy sources will eventually be depleted if continuously extracted, as their formation requires thousands of years (Prasetyo et al., 2016).

Green building must be positioned at a level that can be understood or measured against a certain reference (standard). Therefore, it is necessary to have a measuring tool to assess the level of "greenness" of a building or area. In Indonesia, there is already a Greenship standard under the national certification body, the Green Building Council Indonesia (GBCI). A building is considered a green building if it has undergone the certification process and is declared to have passed by the GBCI. The Main Building of the West Java Regional Police (POLDA Jawa Barat) does not involve a Greenship Professional.

A green building must adopt the green building concept to enhance its assessment and implementation as a sustainable structure. Since the Main Building of the West Java Regional Police (POLDA Jawa Barat) has not yet applied green building principles, technical alternatives will be carried out to improve its implementation in alignment with the GBCI concept. These improvements will, of course, require funding. Many people assume that implementing a green building requires a large investment. Moreover, with improvements based on the GBCI concept, the use of resources such as electricity and water in the operation of the green building will be more efficient compared to other conventional buildings.

2. METHODS

The method used in this research is a descriptive method with an evaluative approach to describe and compare the existing condition of the building with the greenship assessment tool for new buildings v1.2 (Greenship Rating Tools For New Building Version 1.2). The GBCI greenship assessment for new buildings v1.2 consists of 6 categories, namely land use suitability, energy efficiency and conservation, water conservation, material sources and cycles, space health and comfort, and building environmental management. To support the GBCI greenship assessment, the data used are building shop drawings, Bill of Quantity (Boq), interview results and field observations. The analysis was conducted as follows:

a. Evaluation of the criteria in the categories in the Greenship Rating Tool for New Buildings Version 1.2. based on the actual building conditions.

b. Analysis of the assessment by accumulating the results based on the criteria and categories in the Greenship Assessment Tool for New Buildings Version 1.2. If the analysis results obtained a minimum rating value ≥ 35%, the predicate level will be determined and if the analysis results obtained ≤ 27 points or a percentage ≤ 35%, the benchmarks in each criterion do not meet the standard value or predicate level in Greenship.

c. The last stage is determining the level of greenship predicate. At this stage, the building is assessed thoroughly from both the design and construction aspects and is the final stage that determines the overall good performance of building planning. The value of each category can be seen in the Greenship Rating Tool for New Buildings Version 1.2. There are 4 (four) levels of Greenship rating, namely Platinum, Gold, Silver and Bronze. The rating given, reflects the efforts of the building planning owner and his team in implementing the Green Building concept based on GBCI.

2.1. Study Area

West Java Regional Police Main Buildings is located in Soekarno Hatta No. 748, Bandung City, West Java. West Java Regional Police Main Buildings stands on an area of 1878 m2 with 5 floors + rooftop with a total of 8192,81 m2 building area. Map of West Java Regiknal Police Main Buildings are shown in Figure 1.

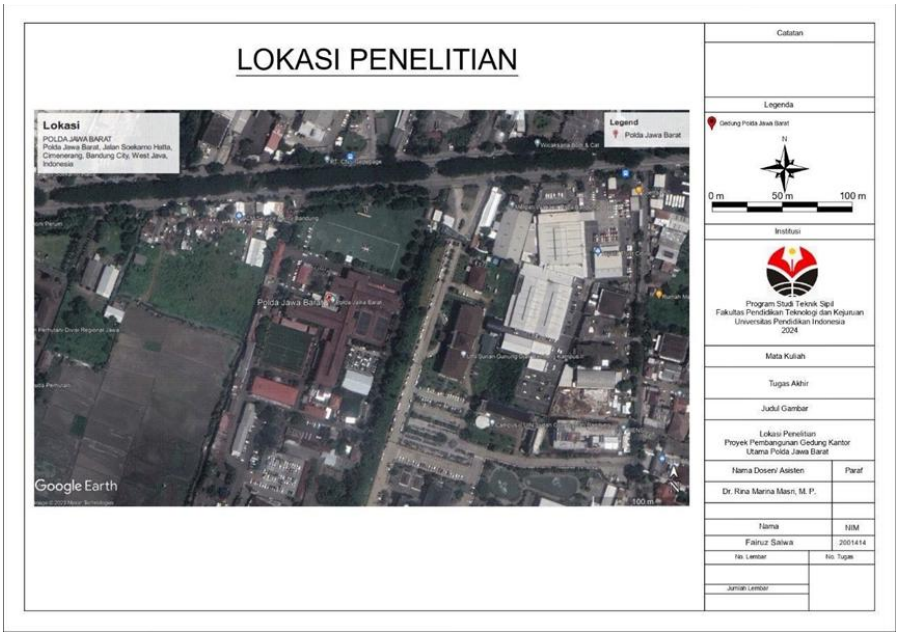

Figure 1. Map of West Java Regional Police Main Buildings

Source: Results of data processing (2025)

2.2. Green Building Concept

The concept of green building has emerged. This is important considering the phenomenon of global warming and the problems of environmental damage that afflict mankind. Based on data from the World Green Building Council, buildings around the world produce 33% of CO2 emissions, 17% of water supply, 25% of wood products, 30-40% of energy consumption, and 50% of construction and operational raw material consumption (Reztrie, Lubis, Kusuma, Koerniawan, & Budiarto, 2018; Wijayanigtyas & Lukiyanto, 2021). Therefore, the concept of green building is considered as a solution to reduce environmental damage and minimise carbon emissions that are the main cause of global warming from the construction sector. (Wijayaningtyas, Redjo, Handoko, Lukiyanto, & Jiram, 2021).

2.3. Greenship for New Building V1.2

Greenship for new building v1.2 is one of the assessment tools from Green Building Council Indonesia (GBCI) that can be used to evaluate the implementation of green building concepts on a building (GBCI, 2016). Greenship for new building v1.2 consist of eligibility, 6 categories, 8 pre-requisite criteria and 37 credit criteria.

2.3.1. Eligibity

Building eligibility requirements in the greenship for new building v1.2 before the assessment process is carried out (GBCI, 2016), are : (1) the minimum area of the building is 2500 m2, (2) the building function is in accordance with the land use based on the local neighbourhood, (3) ownership of environmental impact assessment (AMDAL) and/or environmental management effort (UKL) / environmental monitoring effort (UPL) plan documents, (4) compliance of the building with fire safety standards,(5) compliance of the building with earthquake standards, and (6) compliance of the building with disability accessibility standards.

2.3.2. Apropriate Site Development

The suitable site development category consists of 1 prerequisite criteria and 7 credit criteria comprising of criteria, Basic Green Area, Site Selection, Accessibility, Community, Public Transport, Bicycle Facilities, Site Landscaping, Microclimate, Rainwater Management. The appropriate site development category criteria get a total assessment score of 17 scores with an impact percentage of 16.8%. (Kurniawan, Moctar, & Simanjuntak, 2020).

2.3.3. Energy Efficiency and Conservation

The energy efficiency and conservation category consists of 2 prerequisite criteria, 4 credit criteria and 1 bonus criterion consisting of Electrical Sub Metering, OTTV Calculation, Energy Efficiency Measures, Ventilation Natural Lighting, Climate Change Impact, Onsite Renewable Energy as bonus criteria. The corresponding energy efficiency and conservation category criteria received a total assessment score of 26 scores with an impact percentage of 25.7%. (Mongan, Aditya, Jermias, Tisano, & Arsjad, 2019; Qiao & Liu, 2019).

2.3.4. Water Conservation

Water conservation category consists of 2 pre- requisite criteria and 6 credit criteria consisting of Water Metering, Water Calculation, Water Use Reduction, Water Fixtures, Water Recycling Alternative Water Resources, Rainwater Harvesting, Water Efficiency Landscaping and The criteria of water conservation received a total assessment score of 21 scores with impact percentage of 20,8 %, (Febrina, Buraida, & Febriyanti, 2020).

2.3.5. Material Resources and Cycle

Material resources and cycle category consists of 1 pre-requisite criteria and 6 credit criteria consisting of Fundamental Refrigerant, Building and Material Reuse, Environmentally Friendly Material, Non-ODS Usage, Certified Wood, Prefab Material, Regional Material. The criteria of material resources and cycle category criteria received a total assessment score of 13 scores with an impact percentage of 12.9%. (Fatmayati, Anita, & Luthfi, 2021; Burhan, Hanny, Dena, Henry, & Gembong, 2021; Cantika & Yudith, 2022).

2.3.6. Indoor Health and Comfort

Indoor health and comfort category consists of 1 pre-requisite criteria and 7 credit criteria and 1 bonus criteria with total 10 score with an impact percentage of 9.9%.

2.3.7. Building Environment Management

Building environment management category consists of 1 pre-requisite criteria and 6 credit criteria and 1 bonus criteria with total 13 score score with an impact percentage of 12.9%.

2.4. Greenship Rating Level

Greenship for new building v1.2 rating levels are shown in Table 1 (GBCI, 2016).

Table 1: Greenship Rating Level

Rating	Pencentage	Minimum Score
Platinum	73 %	74
Gold	57 %	58
Silver	46 %	47
Bronze	35 %	35

3. RESULTS AND DISCUSSION

3.1. Eligibity

In evaluating green buildings the first step that must be taken before using the greenship for new building v1.2 assessment tool is the eligibility requirements. The eligibility requirements for building buildings set by greenship are based on laws and regulations set by the government so that the eligibility requirements must be met by the building (Lerebulan, Sangadji, & Buyang, 2023). The analysis of building eligibility requirements covers six aspects, namely (1) the minimum building area is 2500 m2, (2) the building function is in accordance with land use based on the local environment, (3) ownership of environmental impact analysis (AMDAL) plan documents and / or environmental management efforts (UKL) / environmental monitoring efforts (UPL), (4) building compliance with fire safety standards, (5) building compliance with earthquake standards, and (6) building compliance with disability accessibility standards (Arlisyah, Sukmawati, & Triasiana, 2020). The results of the eligibility requirements of the West Java Regional Police Main Building based on greenship for new buildings v1.2 are shown in Table 2.

Table 2: Eligibility Results

No	Criteria	Checklist	
		Met	No
1	Minimum Building Area is 2500 m^2	✓	
2	Building Function in accordance with Land Use Based on Local Neighbourhood	✓	
3	Ownership of Environmental Impact Assessment (AMDAL) and/or Environmental Management Effort (UKL) / Environmental Monitoring Effort (UPL) plan documents	✓	
4	Compliance of the Building with Fire Safety Standards	✓	
5	Compliance of the Building with Earthquake Standards	✓	
6	Compliance of the Building with Disability Accessibility Standards	✓	

Source: Results of data processing (2025)

3.2. Appropriate Site Development (ASD)

The appropriate land use assessment category (ASD) consists of 1 prerequisite criteria and 7 main criteria. In the main criteria there are several indicators. Based on the results of the analysis, there are several indicators of the main criteria that are not met by West Jawa Regional Police Main Building. So that the score obtained in the appropriate land use category (ASD) is only 6 scores. The results of the analysis are listed in Table 3.

Table 3: Appropriate Site Development Results

Code and Criteria		Maximum Points for Evaluation Results	GBCI V1.2 Maximum Points
Appropriate Site Development-ASD			
ASD P	Basic Green Area	P	P
ASD 1	Site Selection	2	2
ASD 2	Community Accesibility	2	2
ASD 3	Public Transportation	0	2

ASD 4	Bicycle Facility	0	2
ASD 5	Site Landscaping	0	3
ASD 6	Micro Climate	2	3
ASD 7	Stormwater Management	0	3
Total Score		**8**	**17**

Source: Results of data processing (2025)

3.3. Energy Efficiency and Conservation (EEC)

The Energy Efficiency and Conservation (EEC) category consists of 2 pre- requisite criteria and 5 main criteria. In the main criteria there are several indicators. Based on the results of the analysis, there are several indicators of the main criteria that cannot be met by the West Java Regional Police Main Building. So that the score obtained in the efficiency and energy conservation category is only 10 scores out of the maximum value of 26 scores. The analysis results are listed in Table 4.

Table 4: Energy Efficiency and Conservation Results

Code and Criteria		**Maximum Points for Evaluation Results**	**GBCI V1.2 Maximum Points**
Energy Efficiency and Conservation-EEC			
EEC P1	Electrical Sub Metering	P	P
EEC P2	OTTV Calculation	P	P
EEC 1	Energy Efficiency Measures	8	20
EEC 2	Natural Lightning	0	3
EEC 3	Ventilation	1	1
EEC 4	Climate Change Impact	1	1
EEC 5	On Site Renewable Eenergy- Bonus	0	5
Total Score		**10**	**26**

Source: Results of data processing (2025)

3.4. Water Conservation (WAC)

Table 5: Water Conservation Results

Code and Criteria		**Maximum Points for Evaluation Results**	**GBCI V1.2 Maximum Points**
Water Conservation-WAC			
WAC P1	Water Metering	P	P
WAC P2	Water Calculation	P	P
WAC 1	Water Use Reduction	8	8
WAC 2	Water Fixtures	3	3
WAC 3	Water Recycling	0	3
WAC 4	Alternative Water Resources	0	2
WAC 5	Rainwater Harvesting	0	3
WAC 6	Water Efficiency Landscaping	0	2
Total Score		**11**	**21**

Source: Results of data processing (2025)

The water conservation category (WAC) consists of 2 prerequisite criteria and 6 main criteria with a maximum of 21 points that must be obtained. Based on the results of the analysis, there are several indicators of the main criteria for water conservation that cannot be met by the West Java Regional Police Main Building. So that the score obtained in the water conservation category is only 11 scores from the maximum value. The analysis results are listed in Table 5.

3.5. Material Resources and Cycle (MRC)

The material resources and cycle category (MRC) consists of 1 prerequisite criteria and 6 main criteria with a maximum of 14 points that must be obtained. Based on the results of the analysis, there are several indicators of the main criteria of the material resources and cycle category (MRC) that cannot be met by West Java Regional Police Main Building. So that the score obtained in the material resources and cycle category is only 5 scores from the maximum value. The analysis results are listed in Table 6.

Table 6: Material Resources and Cycle Results

Code and Criteria		Maximum Points for Evaluation Results	GBCI V1.2 Maximum Points
Material Resource Cycle-MRC			
MRC P	Fundamental Refrigerant	P	P
MRC 1	Building and Material Reuse	1	2
MRC 2	Environmental Friendly Material	0	3
MRC 3	Non ODS Usage	1	2
MRC 4	Certified Wood	1	2
MRC 5	Prefab Material	0	3
MRC 6	Regional Material	2	2
Total Score		**5**	**14**

Source: Results of data processing (2025)

3.6. Indoor Health and Comfort (IHC)

Table 7: Indoor Health and Comfort Results

Code and Criteria		Maximum Points for Evaluation Results	GBCI V1.2 Maximum Points
Indoor Health and Comfort-IHC			
IHC P	Outdoor Air Introduction	P	P
IHC 1	CO_2 Monitoring	0	1
IHC 2	Environmental Smoke Control	2	2
IHC 3	Checimal Pollutant	3	3
IHC 4	Outside View	1	1
IHC 5	Visual Comfort	1	1
IHC 6	Thermal Comfort	1	1
IHC 7	Acoustic Level	0	1
Total Score		**8**	**10**

Source: Results of data processing (2025)

The Health and Comfort category consists of 1 prerequisite criterion and 7 main criteria with a maximum of 10 points that must be obtained. Based on the results of the analysis, there are several indicators of the main criteria for health and comfort of space that cannot be met by the West Java Regional Police Main Building. So that the score obtained in the indoor health and comfot category is only 8 scores from the maximum value. The analysis results are listed in Table 7.

3.7. Building Environment Management (BEM)

The building environment management category consists of 1 prerequisite criterion and 7 main criteria with a maximum of 13 points that must be obtained. Based on the results of the analysis, there are several indicators of the main criteria for health and comfort of space that cannot be met by the West Java Regional Police Main Building. So that the score obtained in the building environment management category is only 7 scores from the maximum value. The analysis results are listed in the Table 8.

Table 8: Building Environment Management Results

Code and Criteria		Maximum Points for Evaluation Results	GBCI V1.2 Maximum Points
Building Environment Management-BEM			
BEM P	Basic Waste Management	P	P
BEM 1	GP as a Member of Project Team	0	1
BEM 2	Pollution of Construction Activity	2	2
BEM 3	Advanced Waste Management	2	2
BEM 4	Proper Commisioning	0	3
BEM 5	Green Building Submisson Data	2	2
BEM 6	Fit Out Management	1	1
BEM 7	Occupant Survey	0	1
Total Score		**7**	**13**

Source: Results of data processing (2025)

3.8. Greenship for New Building V1.2 Evaluation Results

Evaluation results of green building implementation at West Java Regional Police Main Building using greenship for new building v1.2 get 47 score with silver rank. Evaluation results are shown in Table 9.

Table 9: Greenship for New Building v1.2 Evaluation

Category	GBCI V1.2 Maximum Points	Evaluation Score
ASD	17	6
EEC	26	10
WAC	21	11
MRC	14	5
IHC	10	8
BEM	13	7
Total	**101**	**47**

Source: Results of data processing (2025)

3.9. Recommendations Plan

3.9.1. Bicycle Parking Plan

Bicycle parking calculations are carried out using a ratio of 1 bicycle parking for every 100 building employees (GBCI, 2016). West Java Regional Police Main Building employees consist of 403 employees. Bicycle parking spaces that must be met are 4. These results meet the requirements indicator of the ASD 4 criteria thus get an additional 1 point. The cost required to implement this solution is IDR 6.000.000,00.

3.9.2. Traction Elevator

Traction lifts, especially those using the latest technology, also tend to be more energy-efficient when in an idle state. Some models even consume only minimal power when not in use. These results meet the benchmark requirements for criterion EEC-1 *3, thereby earning an additional 1 point. The price of a traction lift is around IDR 350,000,000 for 2 floors. Since the Main Building of the West Java Regional Police has 5 floors and 1 rooftop, the estimated cost for a traction lift is approximately IDR 1,050,000,000.

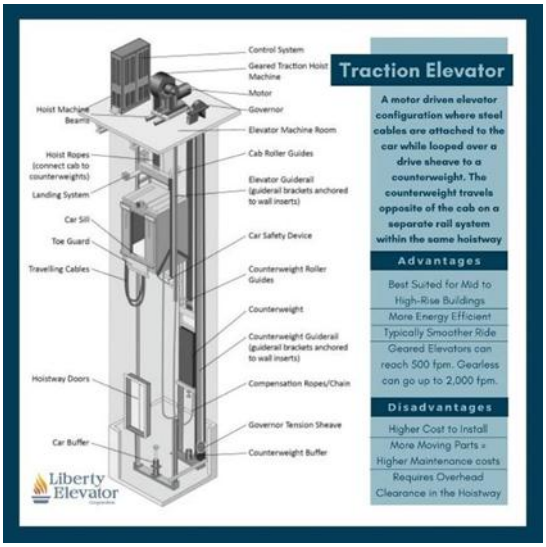

Figure 2. Traction Lift

Source: https://www-libertyelevator-com.translate.goog/blog/what-is-a-traction-elevator/?_x_tr_sl=en&_x_tr_tl=id&_x_tr_hl=id&_x_tr_pto=imgs

3.9.3. Lux Meter

A lux meter is used to measure the light intensity in a room. The minimum natural light intensity required for work is 300 lux. These results meet the benchmark requirements for criterion EEC 2, thereby earning an additional 2 points. The lux meter was rented for 3 days at a cost of IDR 60,000 per day. The total cost required to implement this improvement solution is IDR 120,000.

3.9.4. Solar Panel

The recommendation to use solar panels is to reduce electricity consumption in the West Java Regional Police Main Building. West Java Regional Police Main Building can save energy consumption by 1,98% or 36,792 MWh annually by using Solterra 550 watt peak solar panels with total 36 units. These results meet the requirements indicator of the EEC 5 criteria thus get an additional 5 point. The cost required to implement this solution is IDR 110.880.000,00.

3.9.5. Rainwater Harvesting

The recommendations to use ground tanks with a capacity of 60 m3 and a depth of 2 m are solution to reduce rainwater runoff from the roof and building grounds to the surrounding drainage network. The percentage of rainfall runoff water handling to the surrounding drainage is 70,41%. These results meet the requirements indicator of the WAC 4 get 1 point, WAC 5 get 3 points and WAC 6 get 1 point. The cost required to implement this solution is IDR 240.000.000,00.

3.9.6. CO_2 Sensor

The CO2 sensor ensures the amount of fresh air in the room and maintains the CO2 concentration below 600 ppm. The CO2 sensor is placed 30cm above the floor surface with a coverage radius of 78m2. These results meet the requirements indicator of the IHC 1 criteria thus get an additional 1 point. The cost required to implement this solution is IDR 239.200.000,00.

3.9.7. Sound Level Meter Tools

A decibel meter is used to measure sound pressure levels or noise by measuring sound pressure in decibels (dB). These results meet the benchmark requirements for criterion IHC 7, thereby earning an additional 1 point. The decibel meter was rented for 3 days at a cost of IDR 50,000 per day. The total cost required to implement this improvement solution is IDR 150,000.

4. CONCLUSIONS

The conclusion of this research is that the analysis of green building in the West Java Regional Police Main Building consists of 6 categories with acquisition points, namely Appropriate Land Use (ASD) 6 points, Energy Efficiency and Conservation (EEC) 10 points, Water Conservation (WAC) 11 points, Material Sources and Cycles (MRC) 5 points, Indoor Health and Comfort (IHC) 8 points, and Building Environmental Management (BEM) 7 points. So that the results of the analysis of green building in the West Java Regional Police Main Building get 47 points with a silver rating. To improve the green building rating to a gold rating with final points totaling 63 points,

this study provides improvement solutions that can be done including providing 4 bicycle parking lots for building employees, replacing the vertical transportation system with a taction lift, using Solterra 550Wp solar panels, renting a luv meter for 3 days to measure room illumination, utilizing rainwater as an alternative water source, installing a 60m3 ground tank, installing 104 CO2 sensors, and serting dB meter for 3 days to measure noise levels. The cost to implement these improvements to achieve a gold rating with a total of 63 points is estimated at IDR 1.407.150.000,00 (One Billion Four Hundred Seven Million One Hundred Fifty Thousand Rupiah).

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