

The Construction of Malang Creative Center (MCC) Building – Has It Met the Green Building Criteria?

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Abstract— *The objective of this study is to examine the implementation of the green building criteria on the ongoing construction of the Malang Creative Center (MCC) building based on the green ship rating tools criteria for new buildings version 1.2. This study uses quantitative methods by examining 6 variables that become indicators of green building, namely appropriate site development, energy efficiency and conservation, water conservation, material resources, and cycle, indoor health and comfort, and building environment management. As a public building that has a vital function, the MCC building requires proper assessment and input from green building experts to meet the criteria for green ship rating tools. The results of this study are included as one of the evaluation materials and considerations to improve the qualifications of the Malang Creative Center building.*

Keywords— *Green Building, Green Ship Rating Tools, Malang Creative Center.*

I. INTRODUCTION

The basic objective of infrastructure development is to enhance the welfare of society in all fields involving human life. In this case, every construction project and the design of the building must consider environmental sustainability so that it does not harm the environment and disrupts human activities. The environment is highly influential directly and has a crucial role for humans. Unfortunately, there are many cases of environmental damage due to development, such as floods, landslides, pollution of channels or water sources, damage to green areas or forests, and others. This problem requires broad and comprehensive attention in all fields, especially the construction sector to pay attention to every gap in the potential for environmental damage that can be caused. Good development is a development that does not damage the environment. Along with limited natural resources, infrastructure development is not only required to meet human needs for public facilities but also supports environmental sustainability.

Nowadays, the need for building and common infrastructures is getting higher thus construction procedures and criteria must also be tightened to minimize the negative impact on the environment. The construction of buildings that damage the environment will have a negative impact on human life, directly or indirectly. Moreover, a building is an infrastructure whose construction requires a lot of costs and is permanent in its existence in an area. If development violates the principles of natural and environmental sustainability, the negative impacts will also continue for years. For this reason, government regulations and awareness from building owners or

designers are needed to apply the green building concept. Ardiansyah (2020) explains green building as a building concept that is in the design stage, construction work until its operation can reduce or eliminate negative impacts that can damage the climate and environment.

Malang Creative Center (MCC) building is one of the ongoing construction projects in Malang City managed by the Department of Cooperatives, Industry, and Trade (Disperindag). The building is located in the center of Malang city. The MCC building will be used as a center for the development of creative industries for local communities. A rough estimate of the cost of constructing the MCC building is IDR 125 billion (CNBC Indonesia, 2020), with the building concept as shown in Figure 1 and 2. The construction of the MCC building is expected to be in accordance with the green building concept, so it must follow the development provisions regulated by the Green Building Council Indonesia.



Fig. 1. The concept of the Malang Creative Center (MCC) building
Source: radarmalang.jawapos.com (Article June 2021)

The reference standards for assessing green building criteria in Indonesia for new buildings version 1.2 include variables of land use accuracy, energy efficiency and conservation, water conservation, material sources and cycles, indoor health and comfort, and building environmental management (GBCI,

2013). Each aspect consists of values or points that contain standard standards and recommendations for achieving these standards (Kandita, 2017).



Fig. 2. The concept of the Malang Creative Center (MCC) building
Source: radarmalang.jawapos.com (Article June 2021)

This study will examine the suitability of the MCC building construction with the green building concept based on the standards regulated by the Green Building Council Indonesia. This study has great significance and relevance considering that the MCC building is included in a large development project, so the impact of the quality of the construction is broad. The results of the research can also be used as evaluation material for the owner and person in charge of the MCC building construction, regarding how the development journey and qualifications have progressed so far. If there is a discrepancy with the green building concept, the findings in the field can be considered as an early warning for the improvement of the MCC building construction process until it is completed.

II. METHOD

This research determines the study location in the Malang Creative Center (MMC) building construction project, located precisely at the main road of Jl. Ahmad Yani No.16, Blimbing District, Malang City, with the coordinates of 7°56'26" S; 112°38'31 "E (Figure 3). This study uses a quantitative approach to examine the application of green building principles in the construction of public buildings based on the Greenship new building version 1.2. Data were collected using observation techniques, interviews with experts and building managers, and documentation. The observed variables consist of six aspects that become green building criteria, namely appropriate land use, energy efficiency and conservation, water conservation, material sources and cycles, indoor health and comfort, and building environmental management. The research instrument is an observation and assessment sheet based on the greenship rating tools criteria. Data analysis was carried out by calculating the score of the green building criteria measurement results and presented in percent values.

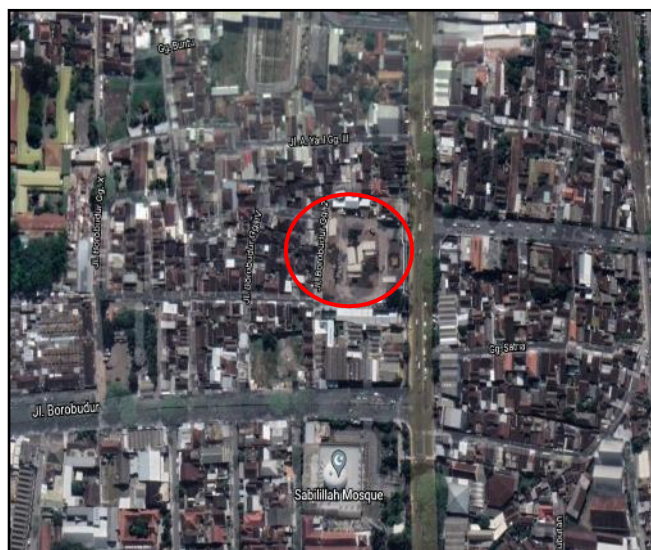


Fig. 3. Research location (7°56'26" S; 112°38'31 "E)
Source: Google Maps (2021)

III. RESULT AND DISCUSSION

This study evaluates the construction of the Malang Creative Center (MCC) building, namely the suitability of the building with the greenship rating tools criteria for new buildings version 1.2 as regulated by the Rating and Technology Division of the Green Building Council Indonesia in 2013. Evaluation of building specifications is carried out based on six criteria, namely appropriate land use, energy efficiency and conservation, water conservation, material sources and cycles, health and comfort in space, and building environmental management. The results of the analysis based on each criterion are described as follows:

TABLE I. Appropriate Site Development (ASD)

No.	Indicator	Maximum Score	Score	%
1	Green base area	P	P	
2	Site selection	2	2	
3	Public accessibility	2	2	
4	Public transportation	2	2	
5	Bicycle access and facility	2	2	12.8
6	Landscape	3	0	
7	Microclimate	3	2	
8	Surface Runoff management	3	3	
Total		17	13	12.8

Source: Data analysis (2022)

In general, the results of the evaluation of the Malang Creative Center (MCC) building in the appropriate land use category (Appropriate site development) based on the Greenship Rating Tools criteria for the new building version 1.2 show a less than optimum score. The main points of deficiency are landscape and microclimate. Based on the observation, it was identified that the MCC building has not complied with the provisions for landscape areas in the form of vegetation free from garden buildings located above ground level, with an area of less than 40% of the total land area. Regarding the microclimate, the landscape design of the MCC

building does not support pedestrian comfort, namely no protection from direct sunlight, or protection from wind.

TABLE II. Energy Efficiency and Conservation (ECC)

No.	Indicator	Maximum Score	Score	%
1	Sub-meter Installation	P	P1	
2	OTTV Calculation	P	P2	
3	Energy-saving strategy	1-20	2	
4	Natural light	4	2	4.95
5	Ventilation	1	1	
6	Climate change effect	1	0	
7	Local renewable energy	5	0	
Total		26	5	4.95

Source: Data analysis (2022)

The results of the evaluation of the Malang Creative Center (MCC) building in the category of energy efficiency and conservation (Energy Efficiency and Conservation) based on the Greenship Rating Tools criteria for the new building version 1.2 show a less than optimum score. Energy-saving measures are less than optimum because several criteria have not been included in the building construction, namely, there is no energy modeling software to calculate energy consumption in the baseline building and the designed building or using worksheet calculations. The software is also important to calculate every 2% saving from the difference between the designed building and the baseline, as well as savings calculated from a 10% decrease in energy from the baseline building (1), OTTV value management is not carried out properly (2), minimal use of efficient lighting energy, low-frequency ballast, and does not use lighting with motion sensors (3), and does not use AC equipment with a minimum COP of 10% greater than SNI 03-6390-2011.

TABLE III. Water Conservation (WAC)

No.	Indicator	Maximum Score	Score	%
1	Water meter	P	P1	
2	Calculation of water consumption	P	P2	
3	Reduction of water consumption	8	0	
4	Water features	3	2	4.95
5	Water recycle	3	2	
6	Alternative water source	2	0	
7	Rainwater reservoir	3	0	
8	The efficiency of surface water consumption	2	1	
Total		21	5	4.95

Source: Data analysis (2022)

Based on the Greenship Rating Tools criteria for the new building version 1.2, it can be seen that the Malang Creative Center (MCC) building in the Energy Efficiency and Conservation (Energy Efficiency and Conservation) category has a less than optimum score. Some of the factors that become points of weakness include the following:

1. Calculation of water consumption

The consumption of clean water with the highest amount has not covered 80% from primary sources without reducing the number of needs per person, in accordance with SNI 03-7065-2005.

2. Water features

The use of water features in accordance with the discharge capacity is still below the maximum standard of the tool's capability. In addition, water production in accordance with SNI has not yet reached the minimum capacity, which is 75% of the total procurement of water resources.

3. Water recycle

The MCC building does not have optimized graywater treatment system for flushing or cooling tower system.

TABLE IV. Material Resources and Cycle (MRC)

No.	Indicator	Maximum Score	Score	%
1	Fundamental refrigeration	P	P1	
2	Building and waste material use	2	0	
3	Environmentally friendly materials	3	0	6.93
4	ODP-free Refrigeration	2	2	
5	Certified wood	2	0	
6	Prefabricated materials	3	3	
7	Regional materials	2	2	
Total		14	7	6.93

Source: Data analysis (2022)

The results of the assessment of sources and material cycles (Material Resources and Cycle) based on the Greenship Rating Tools criteria for new buildings version 1.2 show that the MCC building has a less than optimum score. This is due to two main points that are lacking, namely the use of used buildings and materials, as well as environmentally friendly materials. The results of the field evaluation show that the MCC building has not implemented the reuse of used materials, both from old buildings and other places. For example, the main structural materials, facades, ceilings, floors, partitions, sills, and walls. The use of used materials should be equivalent to 10% or 20% of the total construction material costs. In addition, the use of materials that have an environmental management system certificate in the production process has not yet reached the minimum score, which is 30% of the total material costs. The use of materials from the recycling process has not reached the minimum limit, which is 5% of the total material costs. The construction of the MCC building also has not used materials with renewable raw materials, with a short-term harvest period (<10 years), where the use of these materials should be at least 2% of the total material costs.

TABLE V. Indoor Health and Comfort (IHC)

No.	Indicator	Maximum Score	Score	%
1	Outdoor aeration	P	P1	
2	CO ₂ level management	1	0	
3	Cigar smoke management	2	0	
4	Chemical pollution	3	1	2.9
5	Outside view	1	1	
6	Visual comfort	1	0	
7	Thermal comfort	1	1	
8	Noise level	1	0	
Total		10	3	2.97

Source: Data analysis (2022)

The results of the assessment of the indoor health and comfort aspects based on the Greenship Rating Tools criteria

for the new building version 1.2 show that the MCC building has a less than optimum score. This finding is related to the lack of monitoring of CO₂ levels and control of cigarette smoke in the building environment. The MCC building has a room with a high density, which is less than 2.3 2 per person, and has not been equipped with a carbon dioxide gas sensor installation that has a mechanism to regulate the amount of outside air ventilation. The sensor is important to ensure the CO₂ concentration in the room is not more than 1,000 ppm. In addition, the MCC building has not been accompanied by a "no smoking" warning sign in all areas.

TABLE VI. Building Environment Management (BEM)

No.	Indicator	Maximum Score	Score	%
1	Waste management	P	P1	
2	GP as a member of the project team	1	0	
3	Pollution from construction	2	1	
4	Advance waste management	2	1	
5	Good commissioning system	3	3	4.95
6	Green building data transparency	2	0	
7	Agreement on building fit-out process	1	0	
8	Survey of building users	2	0	
Total		13	5	4.95

Source: Data analysis (2022)

Based on the evaluation results of the Building Environment Management (BEM) aspects of the GreenShip Rating Tools criteria for the new building version 1.2, it can be seen that the MCC building has a less than optimum score. This finding is based on two points of deficiency. First, the construction of the MCC building has not yet involved experts who have been certified greenShip professionals (GP). The expert is at least one person, with the task of guiding the building construction process to get a greenShip certificate. Second, pollution from construction activities is still not managed properly. The MCC building does not yet have a construction waste management plan (liquid waste), so it is not certain that construction wastewater does not pollute the city's drainage.

The results of the evaluation of each green building aspect above can then be further analyzed to determine the greenShip rating for the construction of the MCC building. The recapitulation of the calculation results is explained as follows:

TABLE VII. Recapitulation of GreenShip Rating of The MCC Building

No.	Indicator	Maximum Score	Score	%
1.	Appropriate site development	17	13	
2.	Energy Efficiency and Conservation	26	5	
3.	Water conservation	21	5	
4.	Material Resources and Cycle	14	7	37.62
5.	Indoor health and comfort	10	3	
6.	Building Environment Management	13	5	
Total		101	38	37.62

Source: Data analysis (2022)

TABLE VIII. Final Scoring of Rating Tools

Category	%	Minimum Score
Platinum	73	73.73
Gold	57	57.57
Silver	46	46.46
Bronze	35	35.35

Source: Data analysis (2022)

Based on the calculation results of the greenShip rating tools for the new building version 1.2, the percentage of 37.62% makes the Malang Creative Center (MCC) building included in the "Bronze" rating. On the one hand, the MCC building has complied with the minimum standards to achieve the green building category, but the rating is still far from the highest rating (Platinum). The higher the rating of a building, the more feasible the building is and does not harm the environment and human life. In other words, a successful building provides many benefits to the community (according to its designation) with very minimal development impact. Common negative impacts of wrong building construction include environmental pollution, disruption of waterways, flooding, damage/loss of green areas, affecting mobility/traffic flow, and so forth.

Malang is one of the big cities in East Java, Indonesia with a high population, so land use is very important to pay attention to because it has an impact on many aspects of the environment that will be directly felt by the community. Considering that the MCC building is still at the bronze rank, the Cooperative, Industry and Trade Service (Disperindag) as the manager should coordinate with the developer to try to improve the building's qualifications to better apply the green building principle in accordance with the GreenShip rating tools version 1.2 criteria; land use, energy efficiency and conservation, water conservation, material sources and cycles, indoor health and comfort, and building environmental management.

IV. CONCLUSION

This study concludes that the Malang Creative Center (MCC) building has met the green building criteria, namely the "Bronze" rating. In other words, based on the six criteria of GreenShip rating tools version 1.2, the building has met the minimum requirements not to harm or disturb the surrounding environment. However, of course, this rating can be maximized while the development process is still ongoing, namely by reviewing the characteristics of local resources and the environment and adjusting the construction of some parts of the building that can still be pursued. The results of this study can be considered by building managers as evaluation material regarding the suitability of MCC building construction with green building principles, as well as the basis for recommendations for efforts to improve building qualifications. Further research needs to examine other buildings in the city of Malang whose construction projects are still ongoing, to see the suitability of buildings in general in the city of Malang as well as to examine their impact on the environment in a broad scope.

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