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# Green Building Assessment in Shopping Buildings

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## Abstract

Research on green building in terms of accounting science is still rare. This research aims to explore the benchmarks and criteria for green building in its application to multi-storey buildings and contribute to increasing the efficiency of building operational costs. The method used in this research explores data from questionnaires collected using simple arithmetic techniques and graphic techniques in summarizing the observational data. The number of respondents who responded to the questionnaire until this data was processed was 111.

The results of this study indicate that the application of green building benchmarks has been implemented. The implementation of green building criteria above 60% is appropriate site development, indoor health and comfort, and material resource and cycle; while the other three criteria are under 60%, the energy efficiency and conservation, water conservation, and building environmental management. The average percentage of the six criteria was 58.4% or ranking of gold. The study also shows that at least 32% of respondents said their buildings could manage the green criteria with a cost under Rp.100.000 per m2. The assumption that managing green buildings is expensive is not fully supported by the evidence from this study.

**Keywords: Green building, cost efficiency, sustainability**

**JEL Classification: Q54, Q56**

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## INTRODUCTION

The phenomenon of global warming or global warming is increasingly felt the impact on our lives. This phenomenon represents the law of human life, regardless of the environment, and even destroys the environment by exploiting non-renewable energy beyond the limits of typical environmental damage involved in macro. The spirit did go green or environmentally friendly is a concern of the forestry industry and agribusiness and concern for industrial property. Office buildings are now also promoting the concept of green building. Some property businesses have started to realize to apply the concept of green as a concern in creating an environmentally friendly building. Supporting the implementation of green building components through policies and plans to improve energy conservation, water conservation, and building materials and increase the utilization rate of low-carbon technologies. The application of environmentally friendly buildings provides ecological benefits and economic value because it can reduce costs of operations and care of buildings. There are six criteria for a building to be called a green building. The criteria are land use, energy efficiency and water conservation, environmentally friendly materials, air quality (indoor quality ), and waste management (Komalasari et al., 2013)

Green building provides many advantages benefits for the owners, users of the building, and the location. However, the relatively high cost of constructing a green building is becoming debated (WGBC, 2013). However, some people still have different opinions; they said that green building costs more expensive than usually building because most of them lack knowledge in making green design, lack experience, lack knowledge of the type of green material (Xie, Lu, & Gou, 2017). Not a few companies and property developers apply the idea of a green building due to the more significant initial costs required measure to the valuation of conventional or ordinary buildings. Chappell & Corps (2009) analyzed the difference in costs involved in applying the green building impression to conventional buildings. Information can not be accounted for saying that green building is expensive. However, the results of the 5 case studies state that the capital rate of green buildings is 5% cheaper than conventional building costs.

As a supplement to the above research results, some studies discussed the concept of green building and life cycle cost, the level of application of green building concept standards in conventional buildings,

and the analysis of investment decisions based on the impact of occupancy rate (Sinha et al., 2013). This study will test and provide empirical evidence that the utilization of the impression of the green building affects the increase in economic value in buildings that have not been done in previous studies. The background of the problems above underlies this research to examine the benefits of green building on cost efficiency for the property business, namely for building owners, building managers, and even building users or tenants. This cost efficiency is not only to improve the company's performance but also to calculate the contribution and positive impact on green buildings. The research questions of this study are: (a) Is there a green building index as an indicator of environmental achievement in property companies? (b) Is there any effect of using green buildings to increase cost efficiency?

The research is the development of the theory of Sustainability Accounting, namely the appraisal company does not currently just based on financial performance but began to focus on sustainability companies. The same thing is admitted by stakeholders, namely demanding that companies pay attention to the company's contribution to creating natural and human sustainability. The occurrence of an increasingly severe environmental crisis, one of the causes is that the financial statements do not present environmental, financial accounting information. Green accounting is one answer to overcoming the triple bottom line (planet, profit, and people). A qualitative analysis was carried out to utilize green buildings in this study. So far, the category of buildings considered to have implemented green buildings is if the building has implemented the green building benchmarks and criteria set by the Green Building Council Indonesia (GBCI). Benchmarks and criteria more attention to aspects of technical civil construction, engineering Architecture buildings and technical building mechanical or mechanical and electrical (GBCI, 2013)

This study intends to investigate the benchmark and criteria of green building in its application in building high-rise buildings and contributes to advancing the cost-effectiveness of the operational management building. The outcome of this research is expected to provide contributions for businesses in property, education, government, and the financial industry, and other parties involved in the utilization of green buildings. For businesses in the property sector, it is expected that the implementation of green building can run well without significant obstacles. Green building is expected to be preferred for buyers and

property users before buying a property unit. Likewise, when renovating and renting a unit or space property, the value of the building with the criteria of green building will be a higher return of investment compared to building ordinary, in belonging to the criteria of green building. For the government, expected objectives to realize the application of the buildings sustainable efficient and contribute to decreasing greenhouse gas emissions, efficient energy-saving, water-saving, more healthy, comfortable, and following the environment's carrying capacity can be achieved.

This research was conducted in high-rise buildings that have implemented green buildings or not. The building under study is an existing building and the studied type. Multi-shop and multi-shop buildings contribute higher to the benchmarks and standards of green building utilization, such as electricity consumption, clean water, and resource utilization: power and greenhouse gas contribution. The high-rise buildings studied were the mall (shopping center), the apartment, and the office building. Research is clicking calculate the efficiency of charge of operational management of the building due to the company's concern about the price of the environment. There are four types of environmental costs: environmental prevention cost, environmental evaluation cost, environmental internal failure cost, and environmental external failure cost obtained by applying green buildings. However, only one of the four environmental costs is environmental prevention costs, considering that the green buildings studied are existing buildings or those still in use. The building is in operation.

## LITERATURE REVIEW

A new accounting paradigm states that the recognition, measurement, recording, summarizing, reporting, disclosure, accountability, and transparency is not only focused on transactions or financial information, but also on transactions or social events (people) and the location (planet) that underlies financial information (Nicoletti et al., 2018). Accounting sustainability focuses on transactions or financial events, social and environmental, so the output of reporting unbiased financial information, social and environmental (Bebbington & Larrinaga, 2014). The general objective of sustainable accounting is that stakeholders can find complete information about the quality of management and the company in managing environmentally friendly businesses (Yook et al., 2017).

Reporting that only focuses on financial performance is considered insufficient because it only reflects the short-term achievement of the company. The main difficulty in applying this concept is preparing a report that can combine people (human), planet (environment), and profit (Gimenez et al., 2012).

The specific objectives of sustainable accounting are competent to know and assess the achievement and value of the corporation as well as the risks and prospects of a corporation as a whole before making a decision, profit sustainability, social sustainability, and environmental sustainability as an ecosystem (Ahi & Searcy, 2015).

The foundation of managing environmental costs is the same as the principle of managing quality costs. Companies' most significant environmental cost is environmental costs due to external failures (Atkinson & Mourato, 2008). These costs do not occur often, but they will burden the company if these costs arise. An example is the Lapindo mud case. Therefore, to manage or reduce costs associated with the environment, the company must increase preventive costs and inspection (Atkinson & Mourato, 2008).

A green building is a space for living, working, healthy, and comfortable, and a building that is energy efficient from the point of the concept, construction, and use of which the impact on the environment is minimal (Gou & Xie, 2017). The community understands the green building as a building integrated with nature, pays attention to local ecosystems with long-term planning, the product of human action by considering environmental quality, both physical and social (Hamilton, 2015). There are building benefits: increase sales by 40 percent; worker productivity can be developed by 15 percent with increased monitoring of overall temperature; control of the source of the disease can eradicate asthma and allergic sources for residents up to 60 percent.

The benefits of green building ownership are as follows: low operational costs, as a result of efficiency in the utilization of energy and water; more comfortable, because the temperature and humidity of the room are maintained; development must pay attention to the choice of materials which contain relatively few chemicals; air circulation system that can create an environment in a healthy space; and easy and inexpensive to replace various building components. The maintenance and repair costs are relatively low (Ojo-Fafore et al ., 2018).

The concept of green building is expected to decrease energy use and the impact of pollution and make building designs environmentally friendly. In designing intelligent and green buildings, must pay attention to the building materials utilization or sustainable materials, which linkage with ecology local, energy conservation, savings on water usage, waste management, strengthen the connection with nature, reuse, and renovation of buildings (Ding et al., 2018).

Step rating greenship and benchmarking criteria of green building version 1.1 consist of Design Recognition (DR) and Final Assessment (FA). Ranking on Greenship Version 1.1 DR stage, consisting of Platinum, the minimum percentage of 73% with 56 points, Gold, the minimum percentage is 57% with 43 points, Silver, a minimum percentage of 46% with 35 points, Bronze, a minimum percentage of 35% with 27 points. Ranking on GREENSHIP Version 1.1 FA stage, consisting of Platinum, a minimum percentage of 73% with 74 points; Gold, a minimum percentage of 57% with 58 points; Silver, a minimum percentage of 46% with 47 points; and Bronze, a minimum percentage of 35% with 35 points (GBCI, 2013).

Before measuring the greenship rating, some requirements must be met by the project; namely, the project must meet the eligibility of the GBCI, which is as follows: The minimum building area is 2,500 m2; The function of the building is to follow the allotment of land according to the local area; Ownership of Environmental Management Efforts/ Environmental Monitoring Plans; Suitability buildings against earthquake resistance standards; Conformity of building to safety standards for fire; Conformity of the building to the accessibility standard of persons with disabilities; and The willingness of building data to be accessed by GBC Indonesia about the Certification process (GBCI, 2013).

Material-appropriate construction materials play a significant role in producing environmentally friendly quality buildings. Several types of building materials have a level of quality that affects the price. Determination of the budget should be following the available budget and carried out since the beginning of the planning before the construction to manage the expenditure so that the buildings remain of high quality (Bianchini & Hewage, 2012).

Efforts to get the correct type of material or environmentally friendly building materials should be carried out by research and surveillance first. Some of the research and investigation phases that need

to be carried out are the length of the work process, the level of practicality, and the results obtained. So expect buildings will use building materials that are friendly to the environment. Technologies and innovations are used in the production process by reducing the use of non-renewable natural resources, using a raw material alternative that is more precise and efficient of the overall energy (Kubba, 2017).

Materials or environmentally friendly raw materials contribute positively to preserving nature (planet). Various efforts and technological innovations in the production process continue to be made to make the production process of building raw materials friendly to nature (Xue & Shinozuka, 2013).

In addition to the production of building materials, building instructions are also sustainable with alternative raw materials and fuels that can reduce $CO_2$ emissions so that they are smaller than the normal levels of previously produced raw materials. Alternative raw materials used are also varied. Building materials have a positive correlation with energy consumption in each building. Since the building was erected, the amount of energy consumed was 5-13 percent, and the next is the amount of energy consumed during the life span of the building amounting to 87 - 95 percent (Berardi, 2013).

One environmentally-friendly material is the roof Onduline made of cellulose bitumen and organic fibers. The roof is in a lightweight board made of a mixture of essential ingredients, asphalt, and organic fibers. Therefore, the product is rated as environmentally friendly product. The remaining use can also be decomposed naturally. In addition to environmentally friendly products, Onduline can also reduce heat and noise, provide comfort for the office or home, and prevent rust. Therefore, Onduline is also widely used in palm oil plants and chemical fertilizers (urea), warehouse storage, and other production processes. Material composition The building is very easy to rust; it is safe for health (without harmful substances). It even has a certificate from the World Health Organization, which shows that the roof water Onduline is still drink*able.*

Cement, ceramics, bricks, aluminum, glass, and steel as the primary raw materials in making a building play an essential role in realizing the concept of environmentally friendly buildings. For the main building frame and roof, now wood materials have begun to be replaced by mild steel materials. The issue of illegal logging due to uncontrolled wood, the building made of wood began to diminish as a form of priority and concern

for logging and preservation of the earth. The role of wood was slowly being replaced by mild steel and aluminum. Mild steel can be chosen based on several levels of quality depending on the raw material. Steel roof and building frames have the advantage of being stronger, stainless, anti-porous, anti-crawl, flexible, easy to install, and lighter so that they do not support overload construction and foundation, and can be installed with architectural design calculations and civil engineering calculations (Milani, 2005)

Manufacture windows and doors have begun to use the aluminum material. The benefit of using aluminum is: can be recycled (reused), does not contain toxins that can trigger the disease of cancer, free of charge care and appropriate lifestyle of the people of modern and practical, can reduce heat transmission and noisy (energy-efficient, cost-effective), stronger and durable, stainless, no need to be replaced at all, only rubber booster is available in an alternative of colors, shapes, and sizes with texture variations of classic, or wood (Bianchini & Hewage, 2012).

Making environmentally friendly building walls or green buildings uses raw materials to receive the sun's heat. The raw materials used to make natural bricks or fabrication of lightweight bricks are a mixture of sand, lime, cement, and other materials that have fire-resistant characteristics. The characteristics are strong against high pressure, low water absorption, soundproof, and significantly absorb the sun's heat (Esposito & Antonietti, 2015).

The use of ceramic floors on the walls to move the wallpaper is one form of innovative design. Ceramic walls have ease in maintenance, cleaning walls, so they do not need to be repainted and simply wiped, diverse motifs with exclusive and elegant color choices, and presenting a varied atmosphere of space. Such room late in the building is different from making design and materials into various floorings, such as marble, granite, ceramic, terrazzo, and parquet. It does not need expensive materials to look artistic in arranging the floor. The choice of floor color can be dark gray and yellow; although it seems antic and straightforward, if it could be exposed and done well and neatly, it would feel unique.

Indonesia is a tropical climate area with high humidity to encourage Indonesian people to use electronic equipment, for example, air conditioning (AC) in residential areas. The use of AC increases energy utilization in occupancy and damages the environment due to using

freon. Freon is a substance that can damage the atmosphere, so it is not environmentally friendly (Syahriyah, 2018).

To use the concept of the green building does not need to sacrifice comfort and productivity due to the use of energy-efficient materials. Energy consumption was low, the environment was healthy, and it remained profitable. Green building implements the triple bottom line concept concerned with profit, the planet, and people. Green Building is not only energy-saving but can also save water, conserve the resources of nature, and improve air quality, so users building a green building can be healthier and productivity increases (Yoshida et al ., 2018).

Through this green building idea, air conditioning (AC) and lighting will be limited in each building to reduce air pollution, affecting the greenhouse effect. Home and building owners are needed to 'green' the building roof. In addition to greening, the green building also reduces carbon emissions. When hearing the word green building, most people in Indonesia still consider it an expensive and inefficient investment. In fact, with the green building rating using local materials, the results obtained are also more efficient. Besides the ability to save water and electricity, materials can be recycled and designed that support the health of their inhabitants. Green building is a profitable long-term investment. The sustainability of green buildings must follow specific standards, and materials within 50 kilometers of the building site should be used in the development process. The goal is to minimize energy waste. For example, when manufactured, the use of marble already uses energy. Furthermore, when distributed to the building site, requiring tool transportation energy use. Therefore, the further away from the purchased materials and the construction site, the more wasted energy (Parris, 2007).

Suppose a company has to import ceramics from Italy, how much energy is spent. It is certainly not appropriate to call the building a green building because it requires much energy that is only used to attach marble to the wall. Green building sustainability in Indonesia is still relatively rare. Many people do not understand the concept and consider it negative. Australia, Singapore, and Malaysia have self-proclaimed developing green buildings (Prum, 2012).

Green building is one solution to minimize the impact of global warming. Many illnesses from asthma to other respiratory diseases arise because the building or work environment is unhealthy. The buildings in Jakarta do not yet have a green building paradigm because no buildings

utilize the roof as a green open space and public space. The rooftop gardens will help reduce carbon emissions and absorb heat in Jakarta. The use of solar cell panels can also ease the building's electrical energy needs and provide profitability such as not having to fear fire, short-circuiting, pollution-free, and saving electricity. Solar cell panels are placed on the roof, located right in the path of sunlight from east to west in an oblique position. The capacity of solar cell panels must continue to be increased so that later they can meet the electrical energy needs of each building (Rizki et al ., 2014).

The concept of environmental protection has also penetrated the sanitation world today. For example, a septic tank made of glass fiber with a biological filter is designed with special technology and does not pollute the environment. It has a system that is gradually broken down and equipped. The disinfection system saves land, is leak-proof, water-proof, corrosion-resistant, easy to install, and requires no special maintenance. Impurities are processed by biological decomposition and gradually filtering through three compartments. Specially designed contact media and disinfecting systems used as a means of washing disinfectants make waste sewage does not cause pollution in groundwater and the environment. Some architects have begun to develop clean wastewater treatment systems that can recycle daily wastewater (handwashing, tableware, vehicles, washing) and wastewater used for car washing, toilet flushing, and watering (bathroom wastewater). Garden and make seepage wells (100 x 100 x 200 cm) and biological holes (10 x 100 cm) as needed.

Financial statements focusing solely on financial performance are considered inadequate since it only reflects their short-term performance. The main difficulty is preparing a report that can connect from three sides, namely people (people), planet (environment), and profit (profit) (Georg & Justesen, 2017).

Appropriate land or Appropriate Site Development (ASD) is one of the six criteria for measuring building is included criteria green or not. Some criteria included in the ASD measurement are Area Green Basic or Basic Green Area; Selection of Site or Site Selection; Accessibility Community or Community Accessibility; Public transportation or Public Transportation; Bicycle parking; The landscape on land or Site Landscaping; Microclimate or Micro Climate; and Rainwater Management or Storm Water Management (GBCI, 2013).

Efficiency and Energy Conservation (EEC) is one of six criteria to measure whether the building includes green criteria or not. Some criteria included in the EEC measurements are Installation of sub-meters or Electrical Sub Metering; OTTV Calculation or OTTV Calculation; Energy-saving steps or Efficiency for Energy; Natural lighting or Natural Lighting; Ventilation or Ventilation; The effect of climate change or Climate Change Impact; and Renewable energy on-site or On-Site Renewable Energy (GBCI, 2013).

Water Conservation or Water Conservation (WAC) is one of the six criteria to measure the building, whether it includes the criteria of green or not. Some of the criteria are included in the measurement of WAC is Water meter or Water Metering; Calculation of water usage or Water Calculation; Reduction of water use or water use reduction; Water features or water fixtures; Water Recycling or Water Recycling; Alternative water sources or Alternative Water Resources; Rainwater or Rainwater Harvesting; and Efficient use of landscape water or water efficiency (GBCI, 2013).

Cycle Source Material or Material Resource and Cycle (MRC) is one of six criteria to measure whether the terminal building is in green criteria or not. Some criteria included in the measurement of the MRC are Fundamental refrigerant or Fundamental Refrigerant; Use of buildings and used materials or Building and Material Reuse; Or environmentally-friendly materials Environmentally Friendly Materials; The use of refrigerant without ODP or Non-ODS Usage; Certified timber or Certified Wood; Prefab Material or Prefab Material; and Regional Material or Regional Material (GBCI, 2013).

Health and Comfort in Space or Indoor Health and Comfort (IHC) are one of the six criteria for measuring buildings, whether included as green criteria or not. Some of the criteria included in the measurement of IHC are Introduction to outdoor air or Outdoor Air Introduction; Monitoring CO2 levels or CO2 Monitoring; Control environmental cigarette Smoke or Environmental Tobacco Smoke Control; Chemical pollutants or Chemical Pollutants; The view outside the building or View; Visual comfort or visual comfort; Thermal Comfort or Thermal Comfort; and Noise level or Acoustic Level (GBCI, 2013).

Environmental Management Building or Building Environmental Management (BEM ) is one of six criteria to measure whether the building includes green criteria or not. BEM criteria consist of Basic Waste Management, GP as a member of the project team, Advanced

Waste Management, Pollution from construction activities, Proper commissioning system, Submission of green building data, Agreement in following the fit-out capacity, and Building a user survey or Occupant Survey (GBCI, 2013).

## METHOD

The research method used is simple arithmetic and graphing techniques to summarize observation data and collect data from questionnaires. The population in this study are property business actors. The method used is a qualitative method by digging up data and collecting information from a questionnaire. The sampling method in this research is to use purposive sampling.

The reason for selecting this method is that this method represents a sample and is selected on the essential characteristics of the sample with criteria sample selection (Ramos, 2012). The sample criteria used are: employees at the building manager at a minimum level of senior staff; building users or building tenants, including property unit owners and traders who have a good level of education (university graduates); consultants and contractors in the property sector; and association Real Estate Indonesia membership. Researchers send questionnaires to known respondents and maximize the qualifications and minimum standards for staff managers of shopping complexes in Jakarta.

The distribution of questionnaires is done online or paperless; the aim is that the questionnaire can be collected and further processed following the target time of collection of rigorous tasks. A questionnaire is a google form made using google's existing facilities. The respondents' answers are expected to complete yes or no during the monitoring and follow-up of the author's questionnaire development via electronic communications, including telephone, WhatsApp, and e-mail.

To examine the data collected from questionnaires, the study use methods of exploration of data and analysis approach. There are six building criteria to be explored, which are as follows: Appropriate land development or Appropriate Site Development (ASD); Energy efficiency and conservation ( Energy Efficiency and Conservation, EEC); Water Conservation or Water Conservation (WAC); Material and cycle resources or Material Resources and Cycle (MRC); Health and comfort of the room

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or Indoor Health and Comfort (IHC); Management of the space environment or Building Environment Management (BEM).

The data processing results are continued by measuring the greenship rating based on the ratings from the GBCI. The stage measurement rating greenship uses the final evaluation (FA) stage. In contrast, the stage design approval (DR) ignores or considers that the data that has been explored in the research respondent data comes from the manager's house, the user, or the tenant of the building is different. Consultants and construction contractors are also different. Likewise, feasibility aspects of the building are also ignored or considered feasible because the processed data is the respondents of various buildings where the building is already finished building or a building that already exists or building existing.

## RESULT

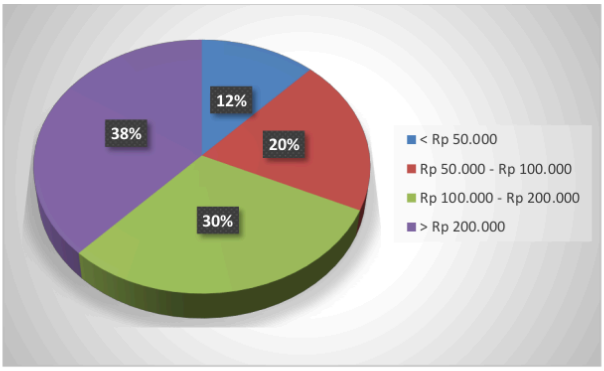
### *Percentage of Green Building Maintenance Costs*

The author's question in the questionnaire was, have the respondents completed or applied the six criteria that became the GBCI-identified green building benchmarks? 111 respondents provided feedback on the questionnaire run before the data were processed. Based on a field survey, the cost of building management that applies the green building concept is below Rp. 100,000 per square meter. This value is more efficient than the cost of buildings that have not implemented green building, which is more than Rp. 100,000 - per square meter, mainly for electricity and clean water usage. 34.9 % of respondents chose the cost of building maintenance as a maximum of Rp 100,000 per square meter.

Benchmarks or rating standard greenship used in this research uses stages of the FA (Final Assessment) ratings with the benchmark rating Gold, where the terms minimum percentage ratings gold is 57% with 58 points. Consideration uses standardized gold because respondents targeted charging are those who manage or are associated with and involved in building the middle class to the top. The information and insights on the application of green building are not something new.

**Chart 1**

**Percentage of Green Building Maintenance Costs (Rp/m²)**



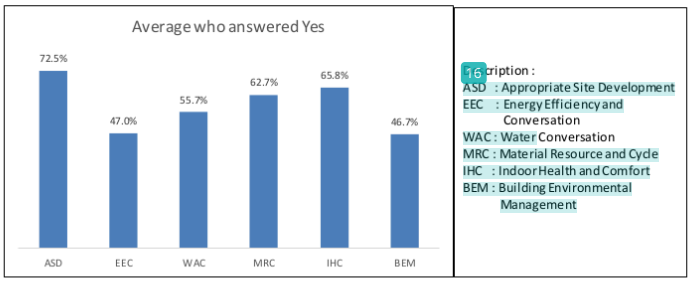

***The Implementation of the Six Green Building Criteria***

Because respondents who filled out a questionnaire from or representatives from different buildings, the percentage of the average response of the respondents was unable to reflect the rank greenship of one building alone. So that the benchmark of the gold rating given is the ranking of the respondent's side, in other words, if the green building rating of a building is gold, it can be assumed that employees working in that building have abilities and qualifications equivalent to the gold rating. Because the results will not be maximal if employees with qualifications or ranks below gold (silver or bronze) manage the building with a green building equivalent to gold.

The implementation of green building criteria above 60% is appropriate site development 72.5%, indoor health and comfort 65,8%, and material resource and cycle 62,7%; while the other five criteria are under 60%, the energy efficiency and conservation 47%, water conservation 55.7%, and building environmental management 46.7%. So, the average percentage of the six criteria was 58.4%, greater than 57%, or ranking of gold. The criteria have been executed. The implementation can be seen in Graph 1.

**Graph 1**

**The Implementation of Six Green Building Criteria**




Obstacles are encountered in the implementation process because society still views green buildings as expensive. It also needs to be willing to change the existing habits so far.

Four of these criteria measure the criteria with high chances of implementation because it is still easier to explain to the user. The criteria application of land use such as area of the green base, public transportation, and facilities bicycle users; water conservation such as meter water, calculation of water usage and rainwater collection; source of material cycles such as use of buildings and used materials, environmentally friendly materials and fabricated materials; and health and comfort in the room such as view outside the building, control of cigarette smoke in the environment, and noise level.

Conclusion: two criteria have a percentage benchmark almost equally between them and not. The answer is EEC's criteria (Energy efficiency and conservation) and BEM (Building Environmental Management). There are 6 EEC green building criteria: sub-meter installation, OTV calculation, energy-saving measures, natural lighting, ventilation, climate change effects, renewable energy on-site. There are 8 BEM green building criteria: Basic waste management, GP as a member of the project team, pollution from construction activities, advanced waste management, excellent and correct commissioning system, submission of green building data, agreement on fit activities, and survey of building users. The level of difficulty of applying EEC and BEM criteria can be said to be similar. This similarity is related to the limited knowledge, ability, and experience of building managers and owners of the benefits of green building. There is still an assumption from building managers and owners

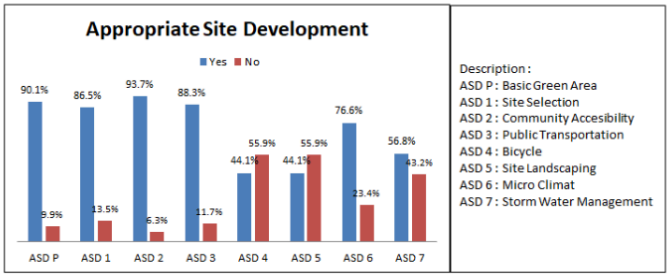
that investing in green buildings is expensive and not to mention efforts to change the habits of workers and users or tenants of the building and contractors and consultants. This assumption makes the implementation of green building somewhat hampered.

***Implementation of Appropriate Site Development (ASD)***

The average percentage of answers from the eight ASD green building criteria is 72.5%, greater than 57% (gold rank), so the ASD criteria have been applied or implemented. The criteria above 70% are basic green area 90.1%, site selection 86.5%, community accessibility 93.7%, public transportation 88.3%, and microclimate 76.5%; whilst the criteria implemented under 60% are bicycle 44.1%, site landscaping 44.1%, and stormwater management 56.8%. The implementation showed in Graph 2.

**Graph 2**

**Implementation of Appropriate Site Development**




Based on these data, it can be said that the access facility and a parking area for bicycles percentage are minor, or it can be said is still sparse buildings set up such facilities. While the bicycle infrastructure facilities are this measure in sub-criteria, namely availability of bike parking 1 unit per 20 users. It is also a green area that has not been set as benchmarks measuring sub-criteria, namely the area of landscape form of vegetation that is free of buildings garden (hardscape) located on the surface of the land area of at least 40% of the total land.

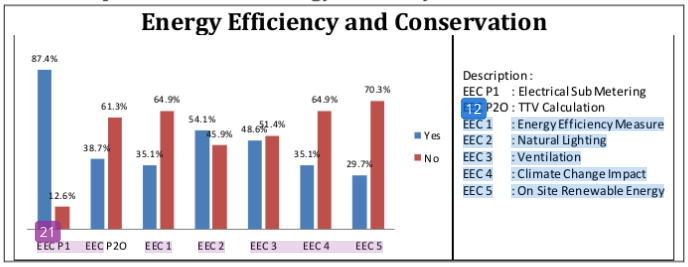
### *Implementation of Energy Efficiency and Conservation (EEC)*

From a total of 111 respondents, the average percentage of Yes answers given by respondents was 47% smaller than 57% (gold rank), so it can be assumed that the EEC has not been implemented, as illustrated in Graph 6

Criteria or benchmarks of implementation of Energy Efficiency and Conservation or Efficiency and Conservation (EEC) most significant percentage is Installation sub-meter or Electrical Sub-Metering, which amounted to 87.4%. The other six criteria with an average percentage of 40%, also illustrated in Graph 3.

**Graph 3**

**Implementation of Energy Efficiency and Conservation**




Obstacles faced to run it is because of the limited knowledge of owner's buildings. So they are not yet convinced that applying Efficiency and Conservation Energy or Energy Efficiency and Conservation (EEC) will 'bring the benefits of building operating cost efficiency.

### *Implementation of Material Resource and Cycle (MRC)*

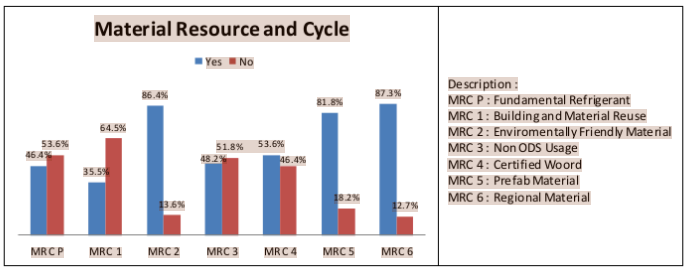
Of the total 111 respondents, the percentage of average who answered yes to the criteria or benchmarks green building Application of Cycle Material or Material Resource and Cycle (MRC) is at 62.7%, on top of 57% (rated gold). The MRC criteria have already been implemented or implemented, as illustrated in Graph 4.

Three criteria have been implemented from the seven criteria for MRC criteria, namely environment-friendly material, prefab material, and regional material because the average respondent's answer in the criteria is above 57 %. In comparison, four other criteria have not been applied because the percentage of respondents' answers answering Yes is below 57 % on average. Constraints faced in applying these criteria are related to the limited knowledge and experience of building managers and

owners, and there is still an assumption that the application of these criteria is something expensive.

**Graph 4**

**Implementation of Material Resource and Cycle**



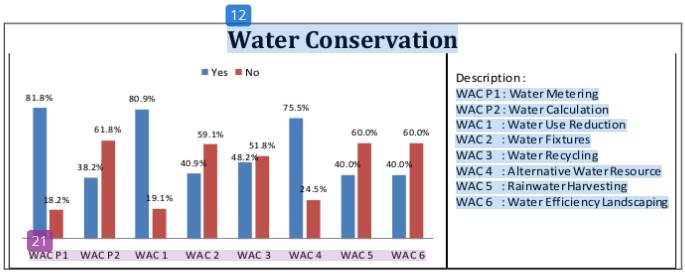

***Implementation of Water Conservation (WAC)***

Of the 111 respondents, criteria, or benchmarks, green building application of WAC is considered not applicable. The percentage of respondents who answered yes amounted to 55.7% or still below 60%, as shown in Graph 6. The so effectivity of the application of green building has not contributed to the increase in operational cost-efficiency.

Three criteria for WAC have been applied from eight benchmark criteria, and the 5 five have not been applied. Three criteria were considered to have been applied because the percentage of respondents 'answers averaged close to 80%. Five other criteria were deemed not implemented because the percentage of respondents' answers was below 50%, as illustrated in Graph 9. 3 criteria that have been applied are because these criteria are easy to do and do not require high costs. In comparison, the five criteria that cannot be applied are related to the limited knowledge of building owners and managers and the presumption that implementing the criteria requires expensive costs.

**Graph 5**

**Implementation of Water Conservation**



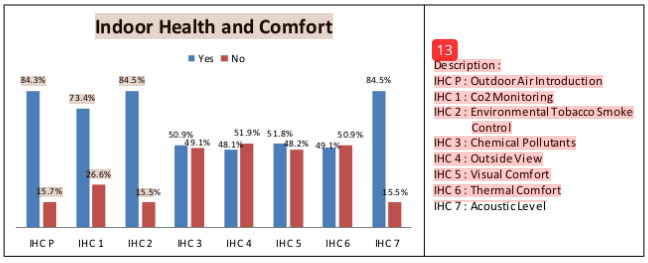

***Implementation of Indoor Health and Comfort (IHC)***

Of the total 111 respondents, the percentage of the average answer Yes to the criteria or benchmarks green building for implementation Implementation of Health and Comfort in the room or the IHC amounted to 65.8% in the top 57% (rated gold), can be assumed to be run because as shown in Graph 6.

From 8 benchmark criteria for application of Health and Comfort in the room or the IHC, there are four criteria for the percentage answered Yes average above 57 %, while four benchmark criteria others average result answer Yes below 57 %, as seen in Graph 6.

**Graph 6**

**Implementation of Indoor Health and Comfort**




**Implementation of Building Environmental Management (BEM)**

The average percentage of respondents' answers to the green building BEM criteria is 46.7% smaller than 57% (gold rank). So, the green

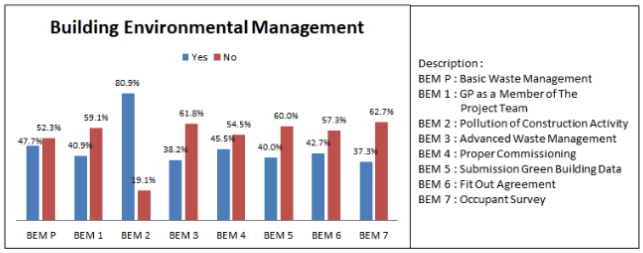
building BEM criteria have not been implemented or applied yet; an explanation can be seen in Graph 4. Only 1 criterion received a low percentage from the eight criteria benchmarks, namely BEM 2 (Pollution of Construction Activity) with 19.1%. Seven other criteria benchmarks received an average percentage above 50%, as shown in Graph 7.

The Pollution of Construction Activity benchmark intends to encourage the reduction of waste brought to landfills and pollution from the construction process. The building is expected to have a construction waste management plan consisting of (1) Solid waste by providing an area for collection, separation, and recording systems. The recording is differentiated based on solid waste thrown into the landfill, reused, and recycled by third parties, and (2) Liquid waste by maintaining the grade of all water discharges arising from construction activities not to pollute the city drainage.

They still lack application of Pollution of Construction Activity is related to the view of the building owner or manager that the initial investment from the construction of the equipment requires a considerable cost. However, the investment will be returned or payback through efficient waste management operational costs. For this reason, it is necessary to conduct socialization and education to building owners and managers so that facilities from the Pollution of Construction Activity begin to be prepared in buildings, especially in high-rise buildings that have a more significant contribution to waste management.

**Graph 7**

**Implementation of Building Environmental Management**



## DISCUSSION

Shopping building managers generally still prioritize profits and occupancy rates for visitors so that the management of standardized green buildings has not become a top priority. It can be seen that The disagree answers dominate more than the agreed answers.

The highest respondent's answer is on the appropriate site development indicator. Understandably, shopping building developers prefer strategic locations that are easily accessible to visitors. In the second place, the high respondent's answer is the Indoor Health and Comfort indicator. Understandably, the developer prioritizes building comfort to maximize the number of visitors to the shopping building. The highest respondent's answer in the third place is the Material Resource and Cycle indicator. Understandably, building developers and managers who prioritize building comfort pay excellent attention to cost efficiency when building and managing the building. With cost-efficiency, it can be expected to achieve more optimal profits. Respondents' high answers in fourth place are on the Water Conservation indicator. Understandably, building developers and managers prioritize cost-efficiency in water use, namely the use of water for visitors in toilets, food court areas, and water use for building maintenance and garden maintenance. The bigger the building, the higher the water usage, and so the more visitors, the more the water usage.

The disagreeing answer is dominant in energy efficiency indicators because building comfort is cold but not hot buildings. The use of electricity to run the cooling equipment contributes to high costs. The answer to disagree is also dominant in the Building Environment Management indicator. This answer is a contradiction between profit-oriented building managers in increasing the number of visitors by providing a level of comfort to visitors, any of which is to prepare cold and not hot buildings. Likewise, the sale of space for advertisements with lights requires a large amount of electric power. It causes the environment around the advertisement to be uncomfortable because the light has a hot impact.

Based on the research results of the six benchmarks of green building criteria, the application of green building benchmarks can be said to have been implemented or implemented. The average percentage of respondents who answered Yes was 58.4% or above the standard used in this study, 57% (gold value).

Based on field data, the cost of building maintenance per square meter for buildings that have implemented green buildings is under Rp. 100,000 per square meter. Results from respondents answered - average percentage of answers using building maintenance costs that cost under $ 100,000 - is as much as 34.9%.

It can be said that the buildings managed, owned, used, or rented by respondents as much as 34.9% have implemented or run a green building.

## CONCLUSION

The results of exploring the six green building criteria were that not all criteria had been implemented. This result is related to limited knowledge, experience in green building design, and experience in using green building materials from building managers, building owners, building tenants, consultants, and contractors regarding the green building. Likewise, there is also an assumption that green building is expensive.

Theoretically, the results of this study strengthen the theory of accounting accountability. One of them is green accounting, the triple bottom line (planet, people, and profit). So implementation green building has been applied only from the aspect of technical civil buildings, art architecture of the building and the building of electrical engineering theta pi today has begun to be measured and calculated in terms of advantages and disadvantages as well as the value of building a green building.

From a micro (organizational) point of view, this research contributes to educating property companies and stakeholders that green building is not something expensive but is a solution for cost-efficiency. So that the community can distinguish the value of green buildings and ordinary buildings

**Limitation** - The quality of respondents both individual targets, the quality of filling out questionnaires, the method of making questionnaires, and the number of respondents and the target time of proposal submission are limitations in this study related to the short time and lack of experience of researchers in the preparation and completion of this research task.

**Recommendation -** The selection of data collection methods can be made with different methods in future research to increase the number of research responses that are more representative. Thus, future research can strengthen the results of this study.

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# Questionnaire

## Green Building Assessment:
## An Environmental Accounting Review

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### Appropriate Site Development (ASD)

| | | |
|---|---|---|
| **ASD P - Basic Green Area**<br>Does the building that you manage have a landscape area in the form of vegetation (softscape) which is free from simple structures and garden structures (hardscape) on ground or underground? | Yes | No |
| **ASD 1 - Site Selection**<br>Is the building that you manage to be built in an urban area with at least city infrastructure and facilities? | Yes | No |
| **ASD 2 - Community AccessibilityUntitled Title**<br>Does the building that you manage encourage development in an area that already has a connective network and increase the achievement of building use that makes it easier for people to carry out their daily activities and avoid using motor vehicles? | Yes | No |
| **ASD 3 - Public Transportation**<br>Does the building that you manage have a public transportation stop or station within 300m (walking distance) from the gate of the building location regardless of the length of the pedestrian bridge and ramp? | Yes | No |
| **ASD 4 - Bicycle**<br>Does the building that you manage have a secure bicycle parking lot of 1 parking unit per 20 building users up to a maximum of 100 bicycle parking units? | Yes | No |
| **ASD 5 - Site Landscaping**<br>Does the building that you manage have a landscape area in the form of vegetation (softscape) that is free from garden buildings (hardscape)? | Yes | No |
| **ASD 6 - Micro Climate**<br>Does the building that you manage use various materials to avoid the heat island effect on the roof area of the building so that the albedo value (solar thermal reflection power) is at least 0.3? | Yes | No |
| **ASD 7 - Storm Water Management**<br>Does the building that you manage reduce the volume load of rainwater runoff to the city drainage network from the building site? | Yes | No |

**Energy Efficiency and Conservation (EEC)**

| | | |
|---|---|---|
| **EEC P1- Electrical Sub Metering**<br>Does the building you manage use kWh to measure electricity used for each load group and equipment system? | Yes | No |
| **EEC P2O - TTV Calculation**<br>Do you calculate the OTTV in Buildings? | Yes | No |
| **EEC 1 - Energy Efficiency Measure Untitled Title**<br>Does the building you manage have energy modeling software? | Yes | No |
| **EEC 2 - Natural Lighting**<br>Does the building that you manage use natural light optimally? | Yes | No |
| **EEC 3 - Ventilation**<br>Does the building that you manage do not provide air conditioning in toilets, stairs, corridors and elevator lobbies, and equip these rooms with natural or mechanical ventilation? | Yes | No |
| **EEC 4 - Climate Change Impact**<br>Does the building you manage submit a $CO_2$ emission reduction calculation? | Yes | No |
| **EEC 5 - On Site Renewable Energy**<br>Does the building that you manage use new and renewable energy sources? | Yes | No |

**Water Conservation (WAC)**

| | | |
|---|---|---|
| **WAC P1- Water Metering**<br>Does the building that you manage have a water meter placed in certain locations in the water distribution system? | Yes | No |
| **WAC P2 - Water Calculation**<br>Does the building that you manage fill out the GBCI (Green Building Consultant Indonesia) standard water worksheet provided? | Yes | No |
| **WAC 1 - Water Use Reduction**<br>Does the building that you manage regulate water usage? | Yes | No |
| **WAC 2 - Water Fixtures**<br>Does the building that you manage use a water fixture? | Yes | No |
| **WAC 3 - Water Recycling**<br>Does the building that you manage use a water recycling plant? | Yes | No |
| **WAC 4 - Alternative Water Resource**<br>Does the building that you manage use one of the three alternatives as follows: AC condensation water, water from wudhu, or rainwater? | Yes | No |

| | | |
|---|---|---|
| **WAC 5 - Rainwater Harvesting** Does the building that you manage use rainwater storage tanks? | Yes | No |
| **WAC 6 - Water Efficiency Landscaping** Doesn't all water utilized for building irrigation in the building that you manage come from groundwater and / or PDAM? | Yes | No |

**Material Resource and Cycle (MRC)**

| | | |
|---|---|---|
| **MRC P - Fundamental Refrigerant** Does the building that you manage use chloro fluoro carbon (CFC) as refrigerant and halon as a fire extinguisher? | Yes | No |
| **MRC 1- Building and Material Reuse** Does the building that you manage reuse all good used materials from buildings? | Yes | No |
| **MRC 2 – Environmentally Friendly Processed Material** Does the building that you manage use materials that have an environmental management system certificate? | Yes | No |
| **MRC 3 - Non ODS Usage** Does the building that you manage do not use ozone-depleting substances in the entire building system? | Yes | No |
| **MRC 4 - Certified Wood** Does the building that you manage use certified wood materials in accordance with government regulations? | Yes | No |
| **MRC 5 – Prefab Material** Is the building you manage designed using modular materials? | Yes | No |
| **MRC 6 - Regional Material** Does the building that you manage use materials which the main raw materials obtained from the factory within a 1,000 km radius from the project location? | Yes | No |

**Indoor Health and Comfort (IHC)**

| | | |
|---|---|---|
| **IHC P - Outdoor Air Introduction** Does the building that you manage use a room design that showing potential for the introduction of outdoor air? | Yes | No |
| **IHC 1 - CO2 Monitoring** Is the building you manage equipped with a carbon dioxide gas ($CO_2$) sensor? | Yes | No |
| **IHC 2 - Environmental Tobacco Smoke Control** | Yes | No |

| | | |
|---|---|---|
| Does the building that you manage have a sign "No Smoking in All Areas of the Building" and do not provide a smoking area in the building? | | |
| **IHC 3 - Chemical Pollutants** Does the building that you manage use paints and coatings containing low levels of volatile organic compounds (VOCs)? | Yes | No |
| **IHC 4 - Outside View** Does the building that you manage control the net lettable area (NLA) facing directly to the outside view which is bordered by transparent openings when drawn in a straight line? | Yes | No |
| **IHC 5 - Visual Comfort** Does the building you manage use illuminated lights (lighting levels)? | Yes | No |
| **IHC 6 - Thermal Comfort** Does the building that you manage determine the general thermal condition of the room at a temperature of 25 degrees Celsius and a relative humidity of 60%? | Yes | No |
| **IHC 7 - Acoustic Level** Does the building that you manage regulate the stories in the building (based the recommended criteria)? | Yes | No |

**Building Environmental Management (BEM)**

| | | |
|---|---|---|
| **BEM P - Basic Waste Management** Does the building that you manage have a facility to sort and collect waste (Law No. 18 of 2008) based on organic and inorganic types? | Yes | No |
| **BEM 1 - GP as a Member of The Project Team** Does the building that you manage involve an expert who has been certified GREENSHIP Professional (GP) to direct the project's progress since the design planning stage and before certification registration? | Yes | No |
| **BEM 2 - Pollution of Construction Activity** Does the building you manage manages solid waste, by providing a collection area, sorting and recording system. Records are categorized based on solid waste disposed to the landfill, reused, and recycled by third parties? | Yes | No |
| **BEM 3 - Advanced Waste Management** Does the building that you manage have an organic waste treatment plant inside the building site or provide a statement and cooperation plan for organic waste management with third parties outside the city solid waste network system? | Yes | No |

| | | |
|---|---|---|
| **BEM 4 - Proper Commissioning**<br>Does the building that you manage carry out testing-commissioning procedures to optimize the suitability of the function and performance of the equipment/system with the planning and references? | Yes | No |
| **BEM 5 - Submission Green Building Data**<br>Does the building you manage submit green building implementation data according to the form from GBCI? | Yes | No |
| **BEM 6 - Fit Out Agreement**<br>Does the building that you manage have a letter of agreement with the tenant for the building that is leased for the use of certified wood? | Yes | No |
| **BEM 7 - Occupant Survey**<br>Does the building that you manage state that the building owner will conduct a temperature and humidity survey? | Yes | No |

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