

# The benefit of green building for cost efficiency

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## Abstract

**Purpose:** The Study seeks to implement the green building concept especially in office buildings and malls. Further, this research also investigates the measurement of the green building efficiency that conforms with accounting theories.

**Research methodology:** This study used a mixed method for collecting data by sending questionnaire to the number of respondents of this study. The data from the questionnaires were collected by using simple arithmetic techniques and graphics techniques.

**Results:** This study found that most buildings having already implemented the concept of green buildings gained efficiency benefits from both environmental and operational cost. The respondents' knowledge and experience influence the success in implementing 6 criteria of green building including Appropriate Site Development (ASD), Energy Efficiency and Conservation (EEC), Water Conservation (WAC), Material Resources and Cycle (MRC), and Indoor Health and Comfort (IHC).

**Limitations:** This study indicates weaknesses for further improvements especially in terms of the quantity of respondents, the respondents' willingness to complete the questionnaire

**Contribution:** Green building is one of the solutions to minimize the impact of global warming or unhealthy workplace environment.

**Keywords:** *Green buildings, Sustainability, Energy efficiency, Energy conservation*

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## 1. Introduction

Climate change and global warming or environmental damage and degradation have caused various natural disasters, social disasters and serious economic disasters. Global warming has increasingly affected not only our daily life but also business activities. However, human life and business activities have not paid sufficient attention to this environmental issue. Excessive exploitation of non-renewable energy beyond normal limits also damages the environment. In this respect, buildings are a contributor of global warming. Data from the World Green Building Council of Indonesia suggests that each building unit gives 33% CO<sub>2</sub> emissions and consumes 17% clean water, 25% wood products, 30-40% raw material use and 40% -50 % energy use for development and operation.

In addition to climate change issue, the population of the world is projected to achieve around 9 billion by 2050. It means that the consumption of energy and other resources will increase following the increasing number of population. An international agreement on global warming was obtained at the Kyoto Conventions of the Protocol on the United Nations Framework Convention on Climate

Change (UNFCCC). The agreement also covers developing countries, where industrialization is growing rapidly and therefore produces large amounts of greenhouse gases. The Kyoto Protocol encourages the development of environmentally sound emissions trading, enabling countries to fulfill quotas to sell credits to countries facing difficulties, such as, the Republic of Indonesia ([Luo et al., 2013](#)).

It is not only the International World that pays attention to environment and climate change, but the country of Indonesia that has already governed environment and several regulations. For example, Bank Indonesia and Financial services authority have developed a green banking governance roadmap for banking corruption. Another example, the Ministry of State Owned Enterprises compiles a green roadmap for State Owned Enterprise. Increasing government pressure and stakeholder awareness will force companies to respond and adopt green business practices. To make this happen, the government and legislature need to design a roadmap for the Indonesian green economy.

Indonesia's serious attitude towards environmental sustainability is evidenced by the existence of law number 28 year 2002 concerning building construction ([Indonesia, 2002](#)). The practice of sustainability is still far from minimalizing the impacts of building construction, on the other hand, Indonesia needs to promote better environment for the society. On the other hand, the businesses should share their profits to promote genuine sustainability. Building or construction sector is the key to be embraced in sustainability and this sector is the main driving sector for sustainable development and green buildings. The consensus as evidenced in several literatures indicate that green buildings are more efficient than conventional buildings because it requires lower energy and water consumption, better indoor air quality, higher levels of health quality and productivity and better property values. Green buildings are the buildings applying environmental principles in the design, construction, operation and maintenance, which is important for climate change ([Yudelson, 2008](#)). Sustainability is currently one of the world's most focal issues. Considering pressure from environmental concerns about the changing global climate, natural pollution, and scarcer resources, the concept of sustainability is not only about good will, but also a necessity for everyone.

#### *Research Problem*

The background to the problems listed above underlies this research to test the benefit of green building for cost efficiency. Some problems in this study are stated below:

1. Does Green Building affect Operational Cost ?
2. Does Green Building affect Environmental Cost ?
3. Does Operational cost affect the environmental costs ?

#### *Research Purposes*

This study aims to test the benefit of green building to cost efficiency. The aim of this study is to investigate:

1. The effects of green building on operational costs
2. The effects of green building on environmental costs
3. The effects of operational costs on the environmental costs

#### *Research Contributions*

This research contributes to the Indonesian government and property company on the continuity of energy and other resources.

#### *Research Significance*

This research is new because it examines green building in terms of accountability, which can address other issues such as architectural, civil and electrical engineering.

## **2. Literature review and hypotheses development**

### *2.1 The concept of green building*

In recent decades, there has been a growing concern regarding environmental issues, and consumption of energy resources in the building sector. Green buildings or sustainable developments are a response

to growing environmental concerns. Green building is defined as “a high-performance property that considers and reduces its impact on the environment and human health”. Yet, green architecture developments seem to encounter several impediments and barriers.

Nowadays, studies about modern energy efficient buildings have given mixed results. Some buildings perform according to expectations, while energy consumption in other buildings is higher than calculated, and in some cases also higher than in conventional buildings. This has led to discussions on whether design and technical solutions have had inappropriate effects on the users so that energy performance is overturned by the occupants’ behaviors. These discussions remind us that the entire performance system of energy efficient buildings is dependent on the actual use and not only the construction of the building.

Green business and some efforts to make green companies should be attached to the triple bottom line context. Only in this way can continuity and enterprise be achieved with continued sustainability business (planet, people and profit). Sustainability is also relevant for organizations that employ buildings for their activities. While public regulations focus on the environmental impacts when claiming for increasingly more energy efficient buildings, the users have to consider the triple bottom line for the usability for the present purpose and the long-term viability of their organization. ([Elkington, 1998](#)).

For an organization dealing with energy efficiency in building, the primary concern will be on the implications for employees, customers and other users. The potential for energy saving will not be the only incentive for choosing energy efficient buildings, as the possibilities to improve working conditions in general might be just as important. However, buildings with outstanding performance and design may be considered a competitive advantage for the organization. Sustainability for an organization therefore relates to how the building facilities support all aspects of the triple bottom line. The purpose of the study presented in this paper is to explore how the interaction between buildings and users has implications for the total values being created by the organizations occupying the buildings for long-term sustainability. The analysis focused on the usability of the buildings in relation to the core activities of the organizations, that is, how energy efficiency is integrated into the strategic development plans embracing the construction projects.

The interaction between building and people occupying it is the essence of usability, as buildings are seldom an end in themselves. Instead, they are tools to support the activities taking place within them. The concept of usability deals with the ability of buildings in supporting the organization’s professional and economical goals, i.e. creating value in a broader sense. Greening business is an effort to make corporate management think again so that the company becomes friendlier, more caring and committed to environmental sustainability. In recent years, green business has become a central and crucial issue. The issue of green business has received wide attention from the government and various countries.

By planning and designing green building, the energy consumption and the effect of contamination as well as building design will be environmentally friendly. Indonesia currently has a Green Building Certification body called Green Building Council Indonesia (GBCI). It was stated that designing "Intelligent and Green building" should pay attention to:

1. Appropriate Site Development (ASD) is one of the criteria of green building, which is built on suggested land and gets permission from the local government. The building must have several facilities and important things needed by visitors and the surrounding community, such as, the building has green open space, visitor easily guards the building, it is accessible by public transportation and has a bicycle parking lot.
2. Energy Efficiency and Conservation (EEC) is one of the criteria of green building which includes: The building is equipped with energy savings, both to control the energy usage of machines and equipment and energy use from visitors use and also from building maintenance.

3. Water Conservation or Water Conservation (WAC) ) is one of the criteria of green building that must be owned by the building in order to achieve savings in the use of clean water. Other than that, the building must use water from the recycle process and from the rainwater tanks built on the roof of the building.
4. Material Cycle Source or Material Resource and Cycle (MRC) is one of the criteria of green building prioritizing the use of raw materials and environmentally friendly materials. The material used must have the recommended certification for green building. The distance between material fabrication location and the location of the building must be considered and the closest distance is preferred.
5. Health and Leisure in the Room or Indoor Health and Comfort (IHC) ) is one of the criteria of green building that must be comfortable and healthy for visitors, residents, building managements and the surrounding community. The building is not polluted, the maintenance of the building uses environmentally friendly materials. There is warning smoking in the area of the building and prepares smoking room.
6. Building Environment Management (BEM) is one of the criteria of green building that the building is managed by green building management standards. Waste management is carried out with green building standard. Building management standards are assessed through visitors surveys.

[\(Green Building Council Indonesia \(GBCI\), 2011\)](#)

While green building projects have become much more prevalent in recent years, there is still a perception that they are expensive and that green technologies are not sufficiently proven. Generally, these perceptions result from a lack of understanding about the costs of buildings that do not incorporate green design principles. Successful demonstration projects accept such perceptions and bring new technologies into the mainstream by showing a commitment to long-term return on investment through reduced operating and maintenance costs.

Traditional buildings were made of natural materials such as; bamboo, rattan and vetiver, which can be found in the region, and produced with handcrafting. The natural building materials that were used in traditional construction were mostly from the surrounding area or near the construction sites. The regional building materials also have relatively high shares of handwork positively affecting the local labour market. These are generally user-friendly and easy-to-use materials and avoid damage to historic buildings by using existing technologies and materials. These materials adapt to most adverse conditions and enhance the value of the building. Green roofs or living roofs are partially or completely covered with vegetation and a growing medium and planted over a waterproofing membrane. Green roofs absorb rainwater, provide insulation, create a habitat for wildlife, and help lower urban air temperatures by mitigating the heat island effect. Because of their visibility, they are excellent candidates for demonstration projects.

Stormwater management is an important consideration for any building project. Permeable/pervious pavement and grid pavers assist with management of stormwater runoff, particularly in parking lots. Rain gardens, vegetated swales, and constructed wetlands reduce imperviousness and allow rainwater to reabsorb into the ground. Rainwater can also be collected for landscape irrigation, toilet and urinal flushing, and custodial uses. These features can also be highlighted in education campaigns because they are easily scalable and transferable to residential, commercial, and public properties. The definition of natural materials is simple; anything that is available in the nature could be identified as natural materials. However, in the domain of sustainability, 'natural materials' means an organic natural resource which could be renewable through natural farming or plantation to overcome usage and consumption.

### *2.2 The benefit of green building*

Green building is one component in supporting low carbon development namely through policies and programs to improve energy, water and building material efficiency and increase the use of low carbon. Green building is environmentally friendly building that contributes to energy efficiency with subtraction of energy and water usage compared to ordinary building. The application of green

building not only provides ecological benefits, but also value economical, because it can reduce operational and building maintenance costs. The impact on energy and water usage is an equation outcome of tenants' usage behavior ([Yoshida et al., 2018](#)).

The adequacy of energy for future generations is our shared responsibility, So It's time that the company doesn't prioritize profit but must pay attention to people and planet. In conservative financial reporting companies, usually there is only report profit or profit generated. But the company does not pay attention to the magnitude of the risk of damage to environmental costs ([Bebbington & Larrinaga, 2014](#)). Operational cost and green building performance do not only depend on energy efficiency but also are influenced by environmental awareness ([Vyas & Jha, 2017](#)) Indonesia is a tropical climate and has high humidity which encourages Indonesian people to use electronic equipment, for example: air conditioner (AC) in the dwelling. The use of air conditioning (AC) results in increased energy consumption in the occupancy and damages to the environment ([Chou & Yeh, 2015](#)).

Cost-benefit analysis is a quantitative economic analysis method which evaluates profitability and return of investments for alternative design options. Similar to traditional financial strategy and performance measurements, green cost-benefit studies examine the correlations between green strategies and green performances to discover relationships between costs and benefits for decision making. In green building studies, the relationships between green strategies and building performances are examined to verify the existence and strength of the link among certain variables, such as natural ventilation strategies and thermal comfort performances. Cost-benefit studies, though, aim to identify the relationships among green costs as a consequence of green strategies and benefits as a consequence of green performances. In other words, the extra costs of green buildings are evaluated against the extra financial benefits. Figure 1 illustrates both the relationships between strategies and performances found in green research studies, and the relationships between costs and benefits resulting from cost-benefit research studies. An example of the mentioned relationship studies is the cost-benefit analysis of indoor environmental qualities (IEQ) and employee productivity ([Mudarri & Fisk, 2007](#)).

In general, costs of green buildings can be divided into two categories: pre-construction costs and postconstruction costs. Pre-construction costs include soft costs and hard costs. Soft costs are the costs related to design, commissioning, and documentation fees . Hard costs are construction, materials, and building services costs. Post-construction costs are building operating costs of energy consumption, water use, maintenance, and management. The benefits include differing savings and financial gains during the building construction and post-construction phases such as higher property market value, higher rents, fewer vacancies, marketing opportunities resulting from social benefits, lower carbon taxes, higher energy savings, less sick leave, and higher productivity. However, it is important for a researcher to identify the link between interests of stakeholders and cost-benefit evaluations ([Bordass, 2000](#)).

As reported on the different interests of stakeholders with regard to cost variables during the whole life cycle (WLC) of green buildings, he indicated that for developers, who pay for land, design and construction costs, only the market value at the time of the project completion is important. In addition, green building labelling matters for developers since it raises the marketing opportunities. Institutional investors, on the other hand, are interested in all cost variables except the running costs. However, Bordass also showed that many institutional investors care about energy savings to have longer leases and keep good tenants happy. For owner occupiers, all the related costs are important, including the market value at the time of the purchase and in the future. Tenants, though, are only interested in running costs and benefits such as energy savings, maintenance and management costs, productivity, health and social benefits such as public relations. The interesting point here is that energy savings, health and productivity gains are not directly important for the initial investors. Overall, it could be said that the accumulation of diverse cost-benefit variables is imperative for a full package of economic evaluations and that it should be communicated to various stakeholders in the green building industry.

The user organizations in their respective buildings report that the quality of the output has improved. Efficiency results are determined by comparing changes in production (banking, teaching and research) to the investments costs, operational costs and intensified use. In both case buildings, this results from a combination of high-quality facilities and efficient working space. The sharing of high-quality facilities and a high intensity of use has proven crucial to improving efficiency for the user organizations. The conference facilities at the bank headquarters and highly specialized laboratories at the Knowledge and Innovation Center add to quality at an acceptable cost level. For the university colleges to be able to share facilities with related organizations has been crucial to expanding their activities, as the former facilities were inadequate for attracting more students, employees and research activities. The Knowledge and Innovation Center should provide a shared reception, cantina and meeting rooms for all tenant organizations. In the case of the bank, the new building is designed with a limited number of cell offices. A free seating system is introduced and there is a general “overbooking” of office space. The new layout draws on the results from the mapping of the occupancy rate of space in the outdated building. Altogether, the level of area efficiency is high in both projects.

The extremely low energy consumption positively contributes to cost saving in both cases. After a period of adjustments to meet user experiences and fine tune the energy and air management systems, the saving of energy costs was found to not hamper the quality of work in the organizations. Both buildings are found to be rational for their purpose and cost efficiency, thus providing a better quality of work. With regard to effectiveness, in both cases, there were registered improved results during the first year of occupation in the new buildings. The new bank headquarters and the Knowledge and Innovation Center experienced an increasing cooperation, sharing of knowledge and development of activities. In case of the bank this was determined by an increased number of business agreements, while in case of the university colleges this was determined by development of more specialized education programs and increased research activities.

Public buildings are good models for such projects because they are often the result of shared consensus about community needs and goals. Because they are publicly accessible, they provide wide exposure to green technologies. They are built for long-term use, which allows for evaluation of the lasting environmental and economic benefits of such technologies. Finally, operating budgets for public agencies are often tight, so any savings achieved by increased energy efficiency are highly valued ([Barnes, 2012](#)). Reduce potable water is used by considering alternative on-site water sources (e.g. rainwater, stormwater, and air conditioner condensate) and graywater for custodial uses and toilet and urinal flushing. These technologies can easily be transferred from public buildings to residential areas. For example, a library could use their rainwater collection system as a springboard to educate the community on residential use of rain barrels. The site of renewable energy systems including solar, wind, and geothermal, provide an independent supply of energy. Take advantage of net metering with the local utility company.

Energy dashboards and other energy monitoring software allow tracking of building energy use over time and provide data for measuring overall energy efficiency. They also make it easier to publicly report and display the building’s energy use over time, which visibly illustrate the building’s energy use to the public. During the design process, it is relatively easy to incorporate green materials, including rapidly renewable materials like cork, wool, cotton insulation. To reduce the demand for virgin materials and waste, libraries can integrate salvaged materials into the building design when practical. It has been proven that the performance of the material (thatch) itself is able to help the design to achieve the required energy performance and the green certificates. But this data are unrecognized by the design and construction industry. Moreover, the industry would prefer to purchase an industrial product due to their convenience and ease in acquiring information about the products. As a result, there would be no business for natural handicraft building materials or products even if they possess the necessary quality for green building.

In order to help the production of handicrafts and the community, there is a proposed promotional program that endorses the design and construction industry to specify and purchase these products. One of the tools that could help promoting them is the green building mechanisms that have the criteria required for the products manufactured or sourced locally, resulting in lower transportation costs and fuel consumption and creates the demand for local goods. Use these as examples to educate the public about the environmental costs of transporting other products over long distances. The buildings are to specify and utilize handicraft products made from renewable natural material. In order to share an economic value to the society while promoting the environmentally friendly and sustainable business, the authorities of the green building certificates and assessment tools should create criteria requiring that any project pursuing the certification must specify and purchase a certain amount of the natural handicraft building materials. The sustainability of the building and construction industry could be created not only from minimizing or eliminating the impacts of the activities of the business, but also from sharing the economic value to the environment and society by specifying and selecting the handicraft products made from natural renewable materials from the right producers. Lighting is a critical part of library building design. Occupant controlled and task lighting provides adequate lighting while managing overall building energy use. Some technologies include lower partitions, interior shading devices, interior glazing, and automatic photocell-based controls. Adjustable window shades can help filter light during the day.

### **3. Research methodology**

The benefit of green building is the efficiency of energy and other resources. The other opinion is that green building is expensive building but actually the initial investment of green building will be compensated from cost efficiency. Related preview of research summarized as follows :

Green buildings are sustainable buildings that can reduce energy use and are friendly to the surrounding environment. Some criteria applied by green building are preparing green open space , having adequate and air circulation, designing and planning following green building standards and following the time of building operation so the operation cost of building management becomes cheaper than building as usual ([Feng & Hewage, 2014](#)).

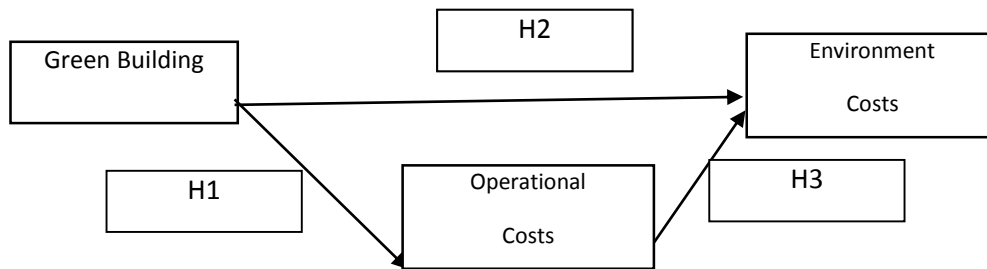
To prepare a green open space requires quite expensive and more profitable when optimizing land for sale or lease as a commercial area. So that an alternative is to use the roof as a landscape and hardscape to meet the appropriate site development. The roof of the building can also be used for energy conservation by installing solar cells and savings of the use of clean water by preparing a rainwater reservoir ([La Roche & Berardi, 2014](#)).

Some ways that can be used for energy efficiency and other resources in green buildings include cooling the room by maximizing air circulation so that the use of air conditioner and lighting devices or lamps can be reduced. ([Niachou., et al , 2001](#)). The financial statement is not enough to reflect really financial performance, because it only reflects the short-term performance of the company. The main difficulty is preparing reports that can link from three sides: people, the planet and profit.

The building price reflects both current and expected future policies. Fourth, developers may charge a higher price for green buildings due to a larger cost of development. We also find that buildings with green labels are associated with less consumption of electricity and water after controlling for the observed sustainability features. Green labels are determined on the basis of a long list of green building features. Thus, these features that we do not observe in our data have an additional effect on the reduction of the energy and resource consumption. This is one of a few studies about the actual energy consumption for green buildings. Although a large number of engineering studies confirm the energy efficiency of green building features, the energy efficiency does not guarantee the actual reduction of energy consumption. It is because users may actually increase the energy consumption because of a lower energy and water cost. Our finding confirms that green buildings contribute to the reduction of the consumption of electricity and water.

Based on the explanation above, the hypothesis is formulated as follows:

- H1: Green Building affects Operational Cost
- H2: Green Building affects Environmental Cost
- H3: Operational costs affect the environmental costs



To answer the research problem that has been proposed, this study used the research method through the exploration of data from the questionnaires collected by using simple arithmetic techniques and graphics techniques in summarizing observational data. Based on this research model, it is hoped that it can further explain the causality relationship between the variables analyzed, and at the same time can make the research implication useful for the development of science as well as a method and technique for problem solving in the field. The questionnaires set up with the consultation from the experts of green building, including property manager, consultant of green building. They are green building certificate holders.

#### 4. Results and discussions

Descriptive statistics are summaries of respondents' answers to the statements in the questionnaire. The scale provided for all variables is 1 which means strongly disagree to 5 strongly agree. Descriptive statistics aim to provide an overview or description of a data reviewed from the average value, minimum value and maximum value, and standard deviation. In the descriptive statistical analysis described below, the value (Mean) is the average value of all respondents to the variables studied, whereas the standard deviation shows the variation of respondents' answers. There is no limit on the standard value, but the standard deviation value that goes from zero indicates that the data spread (respondent's answer) is varied. The minimum value is the answer (scale), the highest selected respondents.

#### Table

##### Descriptive statistics

Variable	N	Min	Max	Mean	Std. Deviation
ASD	110	1	5	3.61	0.93
EEC	110	2	5	3.65	0.97
WAC	110	2	5	3.70	0.87
MRC	110	1	5	3.65	1.04
IHC	110	1	5	3.79	0.95
BEM	110	1	5	3.70	0.85
Green building	110	2	5	3.69	0.79
Bo1	110	2	5	3.85	0.83



Bo2	110	2	5	3.95	0.87
Bo3	110	2	5	3.83	0.90
Bo4	110	2	5	3.84	0.85
Bo5	110	2	5	4.05	0.91
Operational Cost	110	2	5	3.90	0.75
Bli1	110	1	5	3.75	0.94
Bli2	110	1	5	3.69	1.00
Environment Cost	110	1	5	3.72	0.93

The above table shows the green building variable, with an average value of 3.69, which means the respondent's answer to the variable is relatively agreed with the standard deviation of 0.79 which means the respondent's answer is relatively varied to say agree. It is marked with a larger standard deviation value 1, with the smallest value of 2 and the largest value 5. The variable of operational cost, with the average value of 3.90, means that the respondent's answer for that variable is relatively agree with the standard deviation of 0.75, meaning that the respondent's answer is relatively varied to say agree on the mark with a smaller standard deviation value 1, with the smallest value 2 and the largest value 5.

The environmental cost variable, with an average value of 3.72, means that the respondent's answer for that variable is relatively agreed with the standard deviation of 0.93, meaning that the respondent's answer is relatively varied to say agree on the mark with a larger standard deviation value 1, with the smallest value of 1 and the largest value 5. Hypothesis testing is done by looking at the significance value of each relationship. The specified level of significance ( $\alpha$ ) is 5%, which means that the tolerable error tolerance limit is 5%. In other words, the level of confidence of this hypothesis testing is 95%. If p-value is  $<0,05$ , hence it can be said that independent variable there is significant relation to dependent variable.

**Table**  
**Hypothesis Testing Results**

No	Model	Estimate	S.E.	C.R.	P	Decison
1	Green Building => Operational Cost	0.243	0.105	2.304	0.021*	Ha accepted
2	Green Building => Environment Cost	0.305	0.117	2.595	0.009*	Ha accepted
3	Operational Cost => Environment Cost	0.310	0.114	2.708	0.007*	Ha accepted

level of significance ( $\alpha$ ) is 5%

Hypothesis 1 #

This hypothesis examines the effect of Green Building on Operational Cost, the alternative hypothesis (Ha) is arranged as follows:

H1. There is a significant positive influence of Green Building on Operational Cost

Based on table 4.2 above, it can be said that the Green Building variable with p value of 0.021 is smaller than 0.05, and t value (CR) of 2.304 is greater than t table (df: 108) of 1.6591 so it can be said

that Green Building variables affect Operational cost variable (H1 accepted), with a beta coefficient of 0.243, which means that any increase in Green Building variable for one unit will increase Operational Cost by 0.243.

#### Hypothesis 2 #

This hypothesis examines the effect of The Green Building on Environmental Costs, the alternative hypothesis (H<sub>a</sub>) is structured as follows:

H2. There is a significant positive influence of Green Building on Environmental Cost

Based on table 4.2 above, it can be said that the Green Building variable with p value of 0.009 is smaller than 0.05, and t value (CR) of 2595 is greater than t table (df: 108) of 1.6591 so it can be said that Green Building variable affects Environmental cost variables (H2 accepted), with a beta coefficient of 0.305, which means that any increase in Green Building variable for one unit will increase the Environmental Cost by 0.305.

#### Hypothesis 3 #

This hypothesis examines the effect of Operational Costs on Environmental Costs, the alternative hypothesis (H<sub>a</sub>) is structured as follows:

H3. There is a significant positive influence of Operational Costs on Environmental Costs. Based on table 4.2 above, it can be said that the variable Operational Cost with p value of 0.007 is smaller than 0.05, and t value (CR) of 2.708 is greater than t table (df: 108) of 1.6591 so it can be said variable Operational Cost affects Environmental cost variables (H3 accepted), with a beta coefficient of 0.310, which means that any increase in Green Building variable for one unit will increase the Environmental Cost by 0.310.

Based on the above data processing, it can be seen that the building that has been implementing green building will release operational costs and environmental costs efficiently. Operational costs incurred by the building management due to the cost of efficient electricity usage. This is caused due to several things, namely: more efficient use of air conditioning equipment with the design of adequate air circulation (ventilation), more efficient use of lighting equipment with the lighting system design adequate building (Natural Lighting), more efficient clean water usage with the existence of adequate water management design water reduction system (reduce), reuse water, reuse, recycle, back groundwater (recharge) ([Sekaran, 2006](#)).

## 5. Conclusion

The result of the exploration of 6 benchmarks of the green building code indicates that all the criteria have not been met the building manager. This is due to limited knowledge, the experience of green building design and experience of using green building materials from building management. Similarly, there is still a presumption that green building is an expensive investment. Theoretically, the result of this research can strengthen the theory of sustainability accounting. One of them is green accounting, which is triple bottom line (planet, people and profit). So the implementation of green building that has been applied only from the technical aspects of building civil, building architecture and electrical engineering of building but now can be measured and calculated in terms of profit and loss and value of green building.

From a micro (organizational) standpoint, this study contributes to educating property companies and stakeholders that green building is not an expensive but cost-effective solution. So that the public can distinguish the value of buildings. The quantity of respondent and lack of willingness to complete the questionnaire are the limitations in this research. Selection of data collection methods can be made with different methods in future research, so that the number of research responses is more representative. Thus, future research can strengthen the results of this study.

## 6. Limitation and study forward

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

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