Green Building Service User Satisfaction Evaluation Certificated in Bandung Institute of Technology and Science (ITSB) Campus Building

Imron Syahroni[1], Dr. Ir. Dwi Dina Riana, MT[2], Dr. Ir. Hari Nugraha Nurjaman, MT[3]

[1]Student of Master of Civil Engineering Management and Construction Engineering, Faculty of Civil Engineering, Universitas Persada Indonesia-YAI, Email: *andalasengineer1[at]gmail.com*

[2]Lecturer in Master of Civil Engineering, Faculty of Civil Engineering, Persada Indonesia University-YAI, E-mail: *tgdd_yai2017[at]yahoo.com*

[3]Lecturer in Master of Civil Engineering, Faculty of Civil Engineering, Persada Indonesia University-YAI, Email: *hari.nugraha1969[at]icloud.com*

Abstract: *Green Building is part of a global response to increasing awareness of the role of human activities in causing global climate change. Global climate change can increase the effect of carbon dioxide, on development contributing more than 40% of all global carbon dioxide emissions as one of the main causes involved in the phenomenon of global warming. The purpose of this research is to identify the awareness, application and satisfaction of Green Building users in Indonesia. Based on a survey conducted on the satisfaction of using green building services at the Bandung Institute of Technology and Science (ITSB) campus building,*

Keywords: Green Building

1. Preliminary

One of the main environmental issues facing the world today is global warming (Ramli Utina, nd). Jerry Yudelson in 2007 in his book Green Building A to Z stated that green building is part of a global response to increasing awareness of the role of human activities in causing global climate change. Global climate change can increase the effect of carbon dioxide, on development contributing more than 40% of all global carbon dioxide emissions as one of the main causes involved in the phenomenon of global warming (Yudelson. J. 2007).

Evidence that the state participates in maintaining the sustainability of resources for the benefit of society is the enactment of law number 32 of 2009 concerning Environmental Protection and Management. Environmental Benefits and Impact Analysis (AMDAL) or Environmental Management Effort (UKL) - Environmental Monitoring Effort (UPL).

Public awareness of green building is growing, however, there is a debate about what green building is or what green building should cover. Of course, the unclear definition of green building presents a challenge for promoting and implementing green building.

Formulation of the problem
1) The government has made clear rules and laws, especially those that regulate environmentally friendly sustainable development as stipulated in PerMen PUPR No. 02 / PRT / M / 2015 concerning Green Buildings and PerMen PUPR No.05 / PRT / M / 2015
2) The participation of every element of development, starting from the government, planning and construction implementation is a significant cause.

3) The participation of each user benefits from the construction of a green building (Green Building) for the sake of survival and the earth in the future.

Research purposes
The objectives to be achieved in this research include:
1) Identifying awareness, application and satisfaction of Green Building users in Indonesia, especially at the Bandung Institute of Technology and Science (ITSB) in Bekasi, West Java.
2) To evaluate the application of green building construction (Green Building) based on the Green Building Council Indonesia (GBCI) in terms of users of green buildings.

2. Theoretical Basis

2.1 Green Building

Green building refers to structuring and using environmentally responsible and resource efficient processes throughout the life cycle of a building: from siting to design, construction operations, maintenance, renovation, demolition. This practice extends and complements classic building design concerns of economy, utility, durability and comfort

Green building is a concept for 'sustainable building' and has certain conditions, namely location, planning and design system, renovation and operation, which adheres to the principle of energy saving and must have a positive impact on the environment, economy and social.

2.2 Green Building Application

In his journal, M. Maria Sudarwani, Lecturer at the

Department of Architecture, Faculty of Engineering, University of Pandanaran, 2012, explains that in its application, Green Building must meet the following requirements:
1) Energy Efficiency
2) Water Efficiency
3) Material / Material Efficiency
4) Environmental Quality Improvement
5) Operation and Maintenance Optimization
6) Waste Reduction
7) Optimization of Costs and Benefits
8) Regulation and Operation

2.3 Green Building Council Indonesia (GBCI)

One of the institutions that provides green building measurement tools in the Southeast Asia region is an institution in Indonesia, the Green Building Council Indonesia (GBCI) which was founded in 2009 by professionals in the building design and construction sector who are concerned about the application of green building concepts.

On the official GBCI page explained, the Indonesian Green Building Council or Green Building Council Indonesia is an independent (non-government) institution that is fully committed to public education in applying environmental best practices and facilitating the sustainable transformation of the global building industry.

GBC Indonesia has 4 main activities, namely: Market transformation, Training, Certification *green building* based on a typical Indonesian assessment tool called Greenship. (GBC Indonesia, 2019).

In Indonesia, the green building certification process is guided by a rating tool prepared and implemented by the Green Building Council Indonesia. The rating system or benchmarking device is a tool containing items from an aspect of the rating called rating. Each rating has criteria, each of which has a point value. Currently, GBC Indonesia has issued 5 types of Greenship, namely:
1) Greenship New Building,
2) Greenship Existing Building,
3) Greenship Interior Space,
4) Greenship Homes,
5) Greenship Neighborhood.

Greenship is divided into six categories consisting of:
1) Appropriate Site Development (ASD)
2) Energy Efficiency and Conservation - Energy Efficiency & Conservation (EEC)
3) 3.Water Conservation - Water Conservation (WAC)
4) Material Sources & Cycle - Material Resources & Cycle (MRC)
5) Air Quality & Indoor Air Comfort - Indoor Air Health & Comfort (IHC)
6) Building Environmental Management - Building & Environmental Management (BEM)

Greenship for New building version 1.2. consists of 6 categories and 101 points. Each building to be certified must meet a prerequisite or prerequisite in all six categories.

Furthermore, the ranking will be determined based on the points earned. With the assessment stages as follows:
1) Design Recognition Stage (DR), with a maximum value of 77 pounds. At this stage, the project team has the opportunity to receive a provisional award for the project at the final design and planning stage based on the GREENSHIP assessment tool. This stage is passed as long as the building is still in the planning stage.
2) Final Assessment Stage (FA), with a maximum value of 101 points. At this stage, the project is assessed as a whole from both design and construction aspects and is the final stage that determines the overall performance of the building.

Each category has four ratings, namely: platinum with a minimum of 73% of all tool ratings, gold with a minimum of 57% of all tool ratings, silver with a minimum of 43% of all tool ratings and bronze with a minimum of 36% of all tool ratings.

3. Research Methodology

Research sites
This research was conducted at the Bandung Institute of Technology and Science (ITSB) campus building which occupies an area of 5 hectares, in the central business district of Kota Deltamas, Central Cikarang, Bekasi Regency.

Method of collecting data
1) Observation
The author makes direct observations, sees and retrieves data on buildings, these observations are related to the 6 categories of each greenship, namely:
a) *Site* Appropriate Land Use - Appropriate Development (ASD)
b) Includes policies on site management, policies on reducing the number of motorized vehicles, community accessibility, reducing motorized vehicles, site landscaping, heat island effect, management of rainwater runoff, site management, environmental and site development.
c) Energy Efficiency and Conservation - Energy Efficiency & Conservation (EEC)
d) Includes energy management policies and plans, minimum energy use in buildings, optimizing the efficiency of energy use in buildings, operation and maintenance, as well as matters that support the effectiveness of energy use.
e) Water Conservation - Water Conservation (WAC)
f) Includes policies in water management, sub-meter water consumption, control of water monitoring, clean water efficiency, water quality, use of recycled water, use of filtration systems to produce drinking water, reduction of well water use, efficiency of tap water.
g) Indoor Air Quality & Comfort - Indoor Air Health & Comfort (IHC)
h) Includes campaigns to minimize smoking activities in buildings, introduction of outdoor air, environmental monitoring of cigarette smoke, monitoring of carbon dioxide and carbon monoxide, physical, chemical and biological pollutants, temperature comfort, visual comfort, sound level and reverberation time in buildings, and survey of building user convenience.

i) Building Environmental Management - Building & Environmental Management (BEM)

j) Includes policies for use and maintenance, innovation, design intent documents and owner's project requirements, an integrated structure to maintain the implementation of green buildings, has SPO and training in operation and maintenance.

2) Interview

Interviewing is a technique used to obtain information on authorized persons (*stakeholder*) in the building, namely the operation / maintenance management of the building (ITSB Campus) related to clarifying the validity of the data obtained through questionnaires.

3) Questionnaire

The questionnaire is a method of collecting information to study attitudes, behavior, characteristics and level of user satisfaction with the parameters applied to the existing greenship building. This questionnaire is shown to active building users,Students as the dominant active users, Educators (lecturers) and Education Personnel (Campus Administration). This questionnaire is related to the comfort of building users, and the rules in the questionnaire are tied to the regulations for green building certification in the Existing Building category 1.1 on the indoor health and comfort aspect of the building user survey. Conducting a survey on the comfort of building users, including air temperature, room lighting levels, sound comfort, building cleanliness and the presence of pest control. The number of respondents required is taken using slovin formula:

$$n = \frac{N}{1 + N(\alpha)^2}$$

Sumber: Noor, 2012

Keterangan: n = Jumlah sampel
N = Jumlah populasi
α = Tingakat error (0,1)

maka ; $n = \frac{709}{1 + 709(0,1)^2} = 88$ sampel.

The instrument must have a scale in the research used to take measurements with the aim of producing accurate data Sugiyono (2012). The scale used in this study is the scaleLikert. The Likert scale is a psychometric scale commonly used in questionnaires, and is the scale most widely used in survey research. This method was developed by Rensis Likert. The Likert scale is a scale that can be used to measure the attitudes, opinions and perceptions of a person or group of people towards a type of public service. On a Likert scale, respondents were asked to determine their level of agreement with a statement by choosing one of the options available in this study to measure the level of satisfaction of building users, the scores on the research instrument were as follows:

Table 3.1 Likert Scale

Pilihan Jawaban	Singkatan	Skor
Sangat Setuju	SSE	5
Setuju	SE	4
Netral	N	3
Tidak Setuju	TS	2
Sangat Tidak Setuju	STS	1

Sumber: Sugiyono, 2012

(Sugiono, 2012)

The table above shows the point scale of each respondent's answer, where the scale has an order of values from 1-5, with the smallest value indicating the worst response to the questions contained in the questionnaire.

Method of Analysis

This study uses a descriptive-evaluative qualitative analysis method, namely by knowing the existing conditions of the building against the existing building greenship parameters, describing the existing conditions then evaluating the service satisfaction assessment questions/ operating existing greenship buiding, so that it can be seen the targets or achievements that have been implemented by applying the green concept. building from a user perspective.

The taking of question points is based on the data obtained and adjusted to the existing greenship building regulations.

There are 3 data conditions, namely data in the field, the second data in the archive and the last is secondary data from literature.

1) Calculation Phase
2) Data Quality Testing
3) Data analysis

4. Research Results Implementation and Discussion

4.1 Implementation

This research was conducted at the ITSB Campus which occupies an area of 5 hectares, in the central business district of Kota Deltamas, Central Cikarang, Bekasi Regency. In this campus area, 10 building blocks are planned for ITSB academic and non-academic facilities.

4.2 Discussion

Based on the IKM value, the value is 85.19, so by referring to the Conversion Interval Value (NIK) table, green building services in the ITSB Campus building get a Service Quality B value with GOOD Service Performance.

Descriptive analysis of questionnaire data with a Confident Index (CI) of 95%,From the reliability test, the Cronbach's Alpha value is 0.648, based on the scale described (Cronbach's alpha value 0.61 to 0.80 means reliable), then the data is included in the Reliable category. For the validity / correlation test between items, there are high and very high correlations, but there are some that have no correlation at all. This may be dueusing content validity, sometimes also

called face validity, is determined based on theoretical basis and or expert opinion (Solimun in Sani, 2010: 249), because the questions asked are based on indicator criteria set by the Green Building Council Indonesia (GBCI).

From the results of the normality test, see the Sig value. for the Kosmogorov-Smirnov test the value is 0.000 (Zero), which indicates that the data distribution does not meet the normal distribution of data, therefore the Mann Whitney U Test is selected, as a non-parametric test used to determine the difference in medians of 2 independent groups, if the data scale is not normally distributed (*www.spssindonesia.com*).

From the results of the Mann Whitney U Test, the U value is 3076,500 and the W value is 5287,500. If converted to Z value, the amount is -0.215. The Sig or P value is 0.830> 0.05. If the p value> the critical limit of 0.05, there is no significant difference between the two data groups (*www.spssindonesia.com*).

5. Results and Discussion

5.1 Conclusion

Based on the results of the survey conducted, the following data and processing results were obtained:
1) The number of ITSB building users registered based on the 2019/2020 Dikti data was 1243 people, consisting of permanent and non-permanent lecturers, students and alumni (table 4.1)
2) The number of respondents obtained was 161 respondents, where the minimum required number of respondents was 93 people (Slovin formula chapter 4.3.1)
3) Based on the results of data processing that refers to *Permenpanrb no.14 of 2017* obtained the IKM value (community satisfaction index) of 85.19 which indicates that the service unit's performance is GOOD (Table 4.3)
4) By conducting a questionnaire validity test using the IBM SPSS 25 program, good validity results (highly correlated) were obtained from the questions asked with an error rate of 5 - 10%, although there were 5 questions that had no correlation (Pearson Correlation)
5) To test the reliability of the questionnaire questions using the IBM SPSS 25 program, the Cronbach Alpha value was 0.684 which means reliable (*Cronbach's alpha value of 0.61 to 0.80 means reliable, Sugiono 2013*)

5.2 Suggestion

To get good and maximum results from the survey on community satisfaction with public services, you can consider the following suggestions:
1) The survey period from one period to the next, should be carried out within 3 (three) to 6 (six) months or at least 1 (one) year (Permenpanrb no.14 of 2017)
2) Paying attention to the place, situation and contours of the area in conducting the survey, especially the green building service satisfaction survey both in terms of the questionnaire submitted and the method of the survey method itself

3) For the green building service standard itself, the assessment standard (GBCI), needs attention. There should be a distinction between hot, temperate and cold climates, especially in the application of room temperature

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